RESEARCH AND APPLICATION OF URBAN FUNCTION, AESTHETIC EXPRESSION AND HUMAN BEHAVIOR ON COMMERCIAL STREET IN CHINESE OLD DOWNTOWN AREA

—— RENOVATION OF NANJING ZHUJ IANG ROAD

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RESEARCH AND APPLICATION OF URBAN FUNCTION, AESTHETIC EXPRESSION AND HUMAN BEHAVIOR ON COMMERCIAL STREET IN CHINESE OLD DOWNTOWN AREA -- RENOCATION OF NANJING ZHUJIANG ROAD

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ABSTRACT

Commercial street is a frequently-used urban space for citizen’s social contact and public life. Coexistence of traffic function and business function is the main situation of commercial street in old downtown area of Chinese cities. Its specific geographic location and function features results in great influences on urban structure, traffic condition and life quality of downtown area. However, as the rapid development of urbanization and economic growth in recent years, the commercial street in downtown area witnesses more and more problems resulted from the booming population, the prevalence of private vehicles, the springing up of commercial buildings and diversified demands of public spaces. Those problems are in urgently need of being solved through renovation design of commercial street.

This thesis conducts the research on commercial street in Chinese old downtown area. It aims to do a deeply study on how theories of urban function, aesthetic expression and human behavior are applied to make assessments and guide the design of commercial street in Chinese old downtown area. To reach the research aims, the thesis elaborates the situations and problems of commercial street with explanation of the causes. Based on the problems, the theories of urban function, aesthetic expression and human behavior are studied and discussed. To implement these theories, Zhujiang Road in Nanjing has been chosen as a case, which is a typical commercial street with many problems in old downtown area. The assessment of this case based on the theories shows the serious issues of traffic congestion and disorder of cycle lane and sidewalk, bad walking environment and lack of public spaces. Follows the assessment is the design proposal for renovation, the surrounding area is replanned for a reformatory traffic system and land-use, the street width is rearranged for better traffic environment, the public spaces and details of the street are redesigned into a rational and human-friendly commercial street. The thesis concludes by providing specific solutions to a case practice and summarizing series of solutions to the general problems of commercial street in Chinese old downtown area. It contributes to literature on problem-solving research of commercial street in Chinese old downtown area.

Key Words urban design, commercial street, urban function, aesthetic expression, human behavior, public space, Zhujiang Road, China.
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CHAPTER 1
INTRODUCTION

► BACKGROUND
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CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Street, as a significant element of a city, forms the urban structure and texture. Street works not only for transportation which is its original function, but also as public place for citizens’ social lives. Commercial street refers to one common type of street which is mainly used for commercial function. Along commercial street are usually stores, restaurants, shopping malls, public institutions and so on, all these buildings and spaces are arranged in linear order following the direction of the street. Because of the function, commercial streets are usually located at the most prosperous areas in a city to serve the surrounding urban districts. As commercial street is a popular place for citizens’ shopping, social activities and public lives, it plays an important role in a city and represents the portrait, economy and culture of a city. Compared to non-commercial street, it stresses more on the street environment and public spaces for people's staying and activities. People's civil life, including his livelihood, inhabitancy and employment, would be associated with commercial street to some degree. Therefore, commercial street has great influences on people's daily life.

However, commercial streets in China are facing more and more problems nowadays. Especially in downtown areas, the mass traffic flow, high-density population make those problems intensified during the evolution of the old city blocks. This is because China's rapid urbanization in recent years brings about heavy traffic, booming population, overgrowth of private vehicles and disorder of city pattern together with the fast development of economy. An increasing number of issues emerge on commercial streets in Chinese old downtown area that were unprecedented in the old time. The prevalence of private vehicles and irrational downtown structure results in traffic congestion. The disorder of cycle lanes and sidewalks leads to terrible shopping environment on the street. The poor street facilities and lack of public spaces fail to provide a decent place for shopping and relaxation.

Under such circumstances, this thesis conducts a scientific study of commercial street in Chinese old downtown area to deeply analyze the problems and attempt to find solutions by theories studying and empirical learning.

1.2 RESEARCH OBJECT

Compared to other street, ‘commercial street’ is defined by the function of commercial use. In many scholars’ researches, they often point at ‘commercial pedestrian street’ when talking about ‘commercial street’, which means the vehicle-free commercial street as this subtype of commercial street is very common in metropolis’ downtown areas especially in China, like the famous Wangfujing Street in Beijing, Nanjing Road in Shanghai, Shangxiajiu Street in Guangzhou and so on. These scholars would like to discuss the facades on two sides and spatial experience of pedestrian environment as this is a hot topic in street design field. However, the special type of commercial pedestrian street is just one specific form of commercial street that be deliberately set free from the effects of automobile traffic, so this type cannot stands for the majority of commercial street in quantitative terms. Hence, it need to be clarified that in this thesis, the ‘commercial street’ refers to the street which has both motor vehicle lane and non-motor vehicle lane. This case is more common in Chinese old downtown areas and the situation is much more complicated as it is involved with a serious of traffic issues. Thus a certain proportion of this thesis will discuss about the traffic problems including the motorized traffic like traffic congestion aroused from automobiles as well as slow-moving traffic like bicycles and pedestrians.

Meanwhile, the research object is commercial street, but the statements and studies in this thesis won't be limited in the contents merely on commercial street. As street works by connecting city blocks, under no circumstances can street be isolated out of the city environment. So this thesis will put commercial street in the city environment to study its functions and manifestations. And the study with traffic system in commercial street will take the surrounding environment and the circumjacent city blocks into consideration to reach the comprehensive assessments and work out with general solutions.
CHAPTER 1   INTRODUCTION

1.3 AIM & RESEARCH QUESTION

The aim of this thesis is to do an in-depth study on commercial street in Chinese old downtown area by analyze and discuss what are the problems and how to solve these problems based on theories of urban function, aesthetic expression and human behavior, then implement the theories in the assessment and solutions of Nanjing Zhujiang Road with renovation design proposal.

In order to reach the research aim, there are three research questions to be answered:

1) **What are the general problems of commercial street in Chinese old downtown area and why?**
   
   This question will be answered by systematic statements and illustrations of the problems and explanations of the causes in the specific situations of Chinese cities' development in a mixed perspective of urban planning, politics, economy, history and culture.

2) **How can theories of urban function, aesthetic expression and human behavior be applied to solve the problems of commercial street in Chinese old downtown area?**

   This question will be answered by deep elaborations of the three theories based on literature reviews and empirical discussions associated with specific situations in Chinese old downtown area.

3) **In the chosen case for design proposal, how to assess Nanjing Zhujiang Road and how to solve its problems based on theories of urban function, aesthetic expression and human behavior?**

   This question will be answered firstly by the discussion of the existing situation through investigation and graphical analysis based on site mapping as well as illustrations according to the theories to have an assessment of the site, then by a renovation design proposal of Nanjing Zhujiang Road with detailed explanations to solve its specific problems.

1.4 MOTIVATION

The importance of commercial street to a city and city life has been introduced and will be emphasized several times in this thesis. Commercial street located in old downtown area shows the research value as it occupies a dominant geographical location and has a relatively high rate of utilization in the city. Specifically, the research values of commercial street in old downtown area can be explained in four aspects:

- Firstly, as a street for transportation, it connects different blocks in a city, forming the traffic system in old downtown area;
- Secondly, commercial behaviors and activities take up a large proportion in citizens' daily life, so commercial street is a necessary place where people will often go to;
- Thirdly, due to the diversification of commercial street in contemporary urban development, it becomes a place for entertainment and tourism apart from buying goods, it represents the image of a city to some degree, and it works as a carrier for citizens' social contacts and public lives.
- Lastly, the pattern and appearance of commercial street in downtown area is associated with a city's development, and it shows the developmental condition of a city's physics, economy and culture indirectly.

And the following statements explain why the scope of this research is restricted in Chinese content. After People's Republic of China was founded in 1949, the implementation of opening-up and reform policy from 1978 brought about industrialization and economic growth, the fast development of urbanization happened under that background. In this process, cities were rapidly expanding and new buildings for residence, business and public uses were springing up. At the same time, old town was facing a serious of changes. Many old buildings were torn down to be replaced by new buildings and new uses, city pattern was also facing changes according to the roads and city blocks, therefore old town becomes a collage and mixture of old and new. The renovation and renewal of old town is a hot issue in urban planning and city construction in recent years. Under this condition, commercial street in old downtown area, where urban elements are integrated and public activities occur, reveals those problems most typically. Old town, as a foundation of a city, embodies the city's history.
and culture, and contains complicated mixture of different social and urban elements. Thus the renovation of commercial street in Chinese old downtown area is facing many opportunities and challenges that worth being researched and discussed.

My major is urban design, which targets at solving urban problems by design proposal based on theory guidelines. And the chosen site for design proposal in this thesis is Zhujiang Road in Nanjing, my hometown. Zhujiang Road is a commercial street famous for electronic products near city center. The street plays an important role in downtown traffic system, and is a multiple commercial street for shopping, catering and business besides selling electronic products. The street is surrounded by old residential buildings as an old street in downtown area. Popularity and problems coexists on this street. Every time I went to Zhujiang Road or passed this street, I saw the traffic congestion, awful environment for cyclists and pedestrians, the terrible public spaces and so on, all of these problems drive me to have an in-depth research on this topic. And after my investigation and survey, the related theories and materials provide motivation and possibilities for the processing of this research.

1.5 LITERATURE REVIEW

In this thesis, the research on commercial street in Chinese old downtown area will be stressed on the traffic system and land-use of surrounding area, the vehicle lane, cycle lane and sidewalk inside the street, the public spaces on the street including street plaza and pedestrian space, while the interior of buildings will not be taken into consideration. Based on the emphasis and the problems occurred in commercial street in Chinese old downtown area, I have read a number of literatures including books, journals, dissertations, research reports and materials on websites, covering literatures in English and in Chinese language. As the research object is narrowed down into the type of commercial street and scope in downtown areas of Chinese cities, there aren't any literatures just talking about this specific topic, but those literatures on a wider topic can provide some theoretical guidelines like the books covering the theories regarding to urban planning, street and square, public spaces. There are many dissertations talking about pedestrian commercial street with an emphasis on pedestrian space or street façade, although few are about commercial street automobile environment but similar theories and perspectives can be used in my topic. And from the research reports and websites I can find some materials about cases and explanation of terms and concepts.

As this is a problem-solving research, the problems generated in commercial street of Chinese old downtown area are integrated and complicated effects of several factors, so a single theory may not be able to explain them or provide guidelines for solutions. As a result, I summarize as three main aspects of theories from my broad reading in the limited time: urban function, aesthetic expression and human behavior.

The theories of urban function are mainly about the roles commercial street plays in a city and the discussions about traffic congestion in streets and urban region. Famous scholars like Kevin Lynch (1960), Jane Jacobs (1961), Bill Hillier (1976), Christopher Alexander (1978), Yoshinobu Ashihara (1983) and Cliff Moughtin (2003) all have talked about the significance of street to a city in their works. Besides that, Jacobs (1961) had some profound views about how to ensure safety and create diversity on a street, she also explained the phenomenon of traffic congestion and claimed that through attrition of
automobiles can relieve the effects of automobiles on street life positively and spontaneously. And regarding traffic congestion on street, a currently popular strategy named Transportation Demand Management primarily originated from United States is dissected.

The theories of **aesthetic expression** are generalized to analyze street interfaces, street spaces and street landscape from the aspects of proportion, dimension and structure to create aesthetic experience. Japanese architect Yoshinobu Ashihara expounds a number of design principles in his book ‘The Aesthetic Townscape’ (1983) and ‘Exterior Design in Architecture’ (1981), he also discussed about some concepts as evaluation criterion of aesthetics to describe or explain the elements in street space like D/H ratio, primary and secondary profile of building envelops, positive space and negative space, motion space and static space and so on. Regarding these elements, scholars like Kevin Lynch (1960), Matthew Carmona (2010) and Jan Gehl (2004, 2010) share some opinions and similar theoretical guidelines.


Urban function, aesthetic expression and human behavior are three aspects about commercial street design, but these three are not isolated. Theories of urban function states from a macroscopic overview of laying commercial street in the city environment, theories of aesthetic expression processes from a mesoscopic focus on interface and space of commercial street, and theories of human behavior conducts from a microscopic view into human's experience on the street. The scope of perspectives goes from a broad area gradually to narrowed points, and from city, to street, then to people on the street. They three are united together to provide theoretical guidelines to solve problems of commercial street in Chinese old downtown area. The theories chosen are either talking about street design, or provide clear principles that directly pointing at the problems about my topic. Meanwhile, most theories and views are quite famous in urban design theory area, the general guidelines and principles are frequently quoted and discussed in many scholars’ further research. However, as what I focus on are the specific problems in Chinese old downtown area, some viewpoints will be criticized according to current situation, culture difference and other reasons. And my thoughts, comparison and discussion will go with the explanation of these theories.

These literatures and theories will be elaborated detailedly in the fourth chapter, and be applied in analysis and design proposal of the chosen case in the fifth and sixth chapter.
The thesis is divided into seven chapters.

Chapter one is the introduction. A general background of commercial street in Chinese old downtown area is introduced. The research object is confined as commercial street which has both vehicle lanes and non-motor vehicle lanes rather than just commercial pedestrian street and the research scope includes the surrounding environment of the street. The aims and research questions are specifically stated which run through the whole thesis. The motivation of why choosing this topic is explained. A brief literature review is summarized while the theories will be discussed in details in the fourth chapter. And the thesis outline is generalized.

Chapter two is the methodology. The main method – case study is described in this chapter, including how theoretical framework is conducted to provide guidelines, the tools used in case study, the process and evaluation.

Chapter three is statements of problems and causes of commercial street in Chinese old downtown area. The general problems will be listed, described, discussed and explained according to the current situation of China and the political, economic, cultural and historical characters in Chinese cities.

Chapter four is the theoretical framework, where the main theories are systematically introduced and discussed. This chapter has three part to analyze the main three concept: urban function, aesthetic expression and human behavior.

Chapter five and chapter six are about the design proposal that apply the theories into case study in Nanjing Zhujiang Road. Chapter 5 is the analysis and assessment of the case that introduce the site, the current situation and the problems. While chapter 6 is the solutions and improvements according to chapter 5 and be presented by design proposal.

Chapter seven is the discussions and conclusion of the research. This chapter concludes this thesis with discussion and evaluation of the theories and the design proposal. Some further thoughts will be stated and general solutions to the problems will be discussed.
CHAPTER 2

METHODOLOGY

► RESEARCH METHOD
► THEORETICAL GUIDELINES FOR CASE STUDY
► THREE-STEP PROCESS IN CASE STUDY
CHAPTER 2: METHODOLOGY

2.1 RESEARCH METHOD

This thesis, as stated before, mainly focuses on commercial street in Chinese old downtown area. The objective of this thesis is to do an in-depth study on commercial street in Chinese old downtown area by analyze and discuss what are the problems and how to solve these problems based on theories of urban function, aesthetic expression and human behavior, then implement the theories in the assessment and solutions of Nanjing Zhujiang Road with renovation design proposal.

In order to reach the research aim, the main method used is case study. However, before the process of case study, a literature review is needed to collect and organize the necessary theories and information as a guidance to conduct the implementation of case study. So the literature review goes through the general theoretical concepts and viewpoints to provide the theoretical base for application, then the case study, which is the assessment and implication of a real example takes theories into practice.

2.2 THEORETICAL GUIDELINES FOR CASE STUDY

Theoretical guidelines for case study are conducted by literature review. Literature review is a tool to collect and analyze the current knowledge and viewpoints about my topic thus to explain the concepts and provide viewpoints as well as guidelines for my research. As this thesis is a problem-solving research based on general situation and a specific case, so theoretical framework is rather important for scientifical analysis and study of problems and the field where the problems are generated. Under this research background, the problems are usually complicated and resulted from various facts, so a broad scope of choosing literatures is needed.

A literature review requires literatures relevant to the research topic and have appropriate qualities, and the choosing and statements of literature review should be conducted in an objective way. Meanwhile, the literature review is not a simply summary of viewpoints, generalization, comparison, criticism and discussion are needed associated with the research field of this thesis, so the same topic in different literatures are needed to collect comparative data of various perspectives.

The literature review first concentrates on the definition, standpoints and principles of commercial street, street and square, urban design, urban traffic system and public spaces. The books of mainstream theories are searched and read. After reading, collecting and selecting of viewpoints that needed according to the research topic, three main concepts are chosen as three aspects to analyze commercial street: urban function, aesthetic expression and human behavior. As on one hand this three aspects are highly referred when discussing street design in those books, on the other hand, those problems in commercial street can be analyzed from these perspectives so as to be solved in a comprehensive way.

Articles of second analysis are another important source of literature review. Four major electronic bibliographic databases are searched: National Knowledge Infrastructure (CNKI), BTH school library, Chinese education library, and Google scholar. Key words to search the databases were: commercial street, street, urban traffic system, public spaces and Zhujiang Road.

In a whole, the results of searched literatures are mainly books, journals, dissertations and research reports from those databases and searching engines. The books provide theories, arguments and guidelines relevant with commercial street design. From the journals the current issues and discussions about commercial street can be found. The dissertations selected focus on one aspect on street and public spaces in Chinese downtown area. And in the research reports some data about commercial street especially about the case Zhujiang Road can be found. And if some special concept or information about cases need to be look up, materials are searched on the internet like Wikipedia and google search engine to support those literatures. All these literatures help me to organize a theoretical framework for case study.
The results of literature review is presented in chapter three and chapter four. The arguments and information on journals, dissertations and research reports related to commercial street in China's specific environment help me to form a systematic statements about the problems and to explain those problems. The theories and guidelines in the books and viewpoints founded in journals and dissertations help me to organize an integrated theoretical framework in chapter four.

2.3 THREE-STEP PROCESS IN CASE STUDY

Based on the theories, viewpoints and guidelines in literature review, a case study is applied for the assessment of a specific site as well as implementation of theories to solve the problems in the site. Yin (1994) defines that 'a case study is an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident.' As the research aim is to define problems and then to solve the problems based on theories, a case study is a clear way to illustrate problems into details and to present solutions by design proposal that visible and easy to understand in graphic environment.

This thesis targets at problems in commercial street of Chinese old downtown area, so a typical case that is problematic and can stand for commercial street in Chinese old downtown area needed to be chosen. Therefore, the chosen case in this research is Zhujiang Road in Nanjing. On one hand, this is a famous commercial street in downtown area that has a large people flow every day and a variety of social activities on that street, which result in the problems on that street are obvious and can represent the general problems in Chinese old downtown area. On the other hand, Nanjing is my hometown so I am quite familiar with that street, also the accessible geographical data and research information found of that street provide possibilities for the case study on this site.

The case study starts with an investigation of this site, then analysis are done to declare the problems and to assess the street based on the theories in literature review, after that a design proposal is presented to give a detailed solutions to the problems of the street.

a) INVESTIGATION

To have a fully understanding of the site, a deep investigation is needed. It includes searching materials and site survey.

Necessary materials help to know better about the site and to be fully-prepared before the site survey. The materials needed are: (1) the basic information about the city and the surrounding area; (2) a basic geographic map of the site to know the surrounding environment, the traffic system of the area and the structure of the street, which can be found on baidu map (http://map.baidu.com/) and google map (http://maps.google.com/) on the internet; (3) the opinions that medium has towards the site, including news and reports.

After the materials are collected, a rough understanding of the site is formed, following is the site survey. The aims of site survey is to investigate the physical structure of the street and to know how people are using the street. Observation, photographing and measuring are done to know the physical structure, including (1) the layout of vehicle lane, cycle lane, sidewalk, bus stops and parking; (2) the function, appearance and condition of the buildings on two sides and parking place near the buildings; (3) the location and layout of square and public spaces; (4) the relation between the traffic road and the buildings as well as the spaces on two sides. Apart from the physical structure, how street is used by people is investigated through observation, photographing and informal short interview with stakeholders, including: (1) the traffic condition on vehicle lane, cycle lane, sidewalk and crossings, if traffic congestion happens and how is the condition; (2) how are people using the public spaces, like the space in front of shops and shopping malls; (3) give short informal interview with stakeholders on the street and ask their opinions about Zhujiang Road if they are willing to answer. The collected data from investigation are some notes and a large amount of photos.

b) ANALYSIS

The process of analysis is an organization of the results from investigation as well as to form the foundation of the design proposal. It begins with the arrangement of the notes, photos and maps from the investigation that
According to the newest data to update the maps from the Internet to the latest version. Then those photos are sorted into different categories like the ones describe the traffic system on the street, the ones reflect the facades of the buildings, the ones illustrate pedestrians' behaviors on the street.

After that, the analysis are divided into three parts based on the three aspects of theories from large scope to a small scope: urban design, aesthetic expression and human behavior. And the analysis are presented into mapping, tables, concept images and texts. The analysis of urban function includes the discussion of the city, the region, the surrounding area, the land-use, the building function, the traffic condition in the region and on the street. The analysis of aesthetic expression includes the D/H ratio, the primary and secondary profile of building envelopes, the facades, building height, street furniture and so on. The analysis of human behavior focus on possible users on the street, existing activities, dimensions of the street and evaluations on whether the street is human-friendly.

After the analysis, a whole assessment of the case is formed. The merits and problems of the street is listed and depicted. Therefore the objectives of design proposal are raised according to the problems from assessment.

c) DESIGN PROPOSAL

The design proposal is conducted on the basis of investigation and analysis to provide solutions to the problems. As the chosen case is an existing commercial street, the design proposal is a renovation and transformation rather than a re-design. What should be kept, what need to improve, what can be remove and what are added to the site should be made clear before the design process. The final design proposal is confirmed by numerous modifications from sketches, while the sketches are drawn from an overall pattern to details of the street. Meanwhile, besides providing solutions, the method of design proposal represents the values of the designer. It is an artistic composition of urban design items, and as such it carries aesthetical characteristics.

The design proposal is presented by master plan and detailed plans to show the new arrangement of the site, sections of important spots to show the structure of the street, perspectives of public spaces like street plaza, road crossing to illustrate the details and the appearance of the new design, concept images to describe the ideas as well as bird-eye view to give whole image of the designed site. 3D model, analysis map and text instruction are needed to express the design ideas clearly. And the software used in the process of design proposal are autoCAD, SketchUp, Photoshop, Illustrator, etc.

As the three-step process shown in case study, this method can collect a lot of data can have a deep research into many details so as to solve the problems in elaborate solutions. However, the limitation of case study is the data and problems in the case shows the specific condition, which means that it cannot present the general issues as in a case it always has the emphasis while in other case the emphasis is different according to the practical situation. And the case study of design proposal is conducted by one person so it may more or less reflect one's empirical experience, the solution expressed in the design proposal is a possible solution but not a universal solution.
CHAPTER 3
PROBLEMS & CAUSES

► SITUATION IN CHINA
► GENERAL PROBLEMS
► CAUSES
► SUMMARY
CHAPTER 3: PROBLEMS & CAUSES

3.1 SITUATION IN CHINA

The historical development of commercial street in Chinese old downtown area undergoes its process of changes. Commercial street in China emerged in Earlier Song Dynasty (960-1127), from when streets were no longer used just for transportation, stores appeared on street in residential communities and people began to have commercial activities on the street. From then on, the scope of commercial lives in downtown area were expanded gradually, and a variety of commercial activities were conducted on commercial streets. As the transport tool used in ancient time was horse which has a much slower speed, the population was small also the street scale is small, so people had their social lives on commercial street in a harmonious way.

However, in modern society, the form of commercial streets in downtown area was changed. The three decades after People’s Republic of China was found in 1949 witnessed an abrupt population explosion, and the implementation of reform and opening-up policy lead to fast economy growth. People’s living standards were enhanced, so the original structure and function of commercial street could not meet people’s need. Meanwhile, the prevalence of automobiles bring Chinese cities into automobile age that cars acquired dominant status on street. Although the functions and scales of commercial streets were enlarged, pedestrians’ life on commercial street were neglected. Many problems occurred by that time.

Nowadays, the population of China is more than 1.35 billion although its whole area is about 9.6 million km$^2$. Many problems occurred in Chinese cities are initially resulted from the huge population. And facing the huge population, people have to cope with those problems because of the high demand from such population. So cities are expanded to provide more spaces for citizens. Even so, commercial streets in old downtown area still have much higher land value and appeal to developers and citizens. Compared to new town which has new urban facilities and relatively more rational urban functions, old downtown area has more intensive population, mixed urban function and sophisticated urban conflicts. Those urban conflicts also appears in commercial street of old downtown area. The traffic system is complicated and the buildings are mixed with old buildings and new buildings, old use and new use, and social activities interact with each other on the street. Old town of Chinese cities area facing their renovation and renewal, and the importance of pedestrians’ street life are gradually gaining people’s attentions. In such situation, the general problems of commercial street in Chinese old downtown area are summarized and listed in the following.
### 3.2 General Problems

There are some general problems in commercial street of Chinese old downtown area, mainly can be classified as about traffic, about building conditions, about public spaces and about street facilities.

#### 3.2.1 Traffic Problem

**a) Traffic Congestion**

Traffic congestion is a common problem in old downtown area of Chinese cities (image 3-1), and in commercial street the issue is more obvious because the commercial activities and shopping behaviors on the street result in many stops of vehicles and people, which help hinder the fluent traffic flow on the street. On one hand, the road width in old downtown area is relatively narrow that cannot accommodate such heavy traffic, and the traffic system in old town area is complicated; On the other hand, the increasing ownership of private cars and the need of freight aggravate traffic congestion. The phenomenon is rather severe in peak commuting time (about 7 a.m. – 9 a.m. and 5 p.m. – 7 p.m. in weekdays), festivals and holidays.

![Image 3-1: Traffic congestion on Xidan Commercial Street in Beijing](http://www.jianzhan589.net/new/beijingxidanshangyejie/2680922.htm)

**b) Mixture of Pedestrians and Vehicles**

In new town, the streets are usually divided into vehicle lane, cycle lane and sidewalk and they three are separated clearly. But in old downtown area, as the road width is not wide enough, the different lanes in some old streets are in mix-used, or there isn't a clear demarcation between them. For example, the vehicle lane and cycle lane are in mix-use (image 3-2) or the cycle lane and sidewalk are in mix-use (image 3-3), the latter condition is extremely awful in commercial street as it affects pedestrians’ commercial activities on sidewalk. This also results in safety threats to pedestrians and cyclists on the road and in the crossings, as well as bad traffic efficiency.


**c) Narrow Sidewalk**

Due to the small dimension in old town, the width of sidewalk on commercial street is usually too narrow to provide a good walking experience (image 3-4). Some streets used to be residential area or for other use so the narrow sidewalk weren't constructed for pedestrian activities. Those narrow sidewalk make little space in front of the stores for pedestrians’ activities and stay, and make the sidewalk quite crowded. Furthermore, the roadside bike parking and big street trees make the sidewalk much narrower for the transport of pedestrians.

d) Parking Issue

Parking issue results from the limited land and lack of management on commercial street. On the one hand, many roadside parking cars make the existing traffic space more crowded as well as block the fluent traffic flow and result in the traffic disorder on the street (image 3-5); On the other hand, the spatial place like the space in front of some shopping malls are designed to be public square, but with the increasing need for car parking, they are used as large parking lot that affect public activities (image 3-6).

e) Poor Public Transport

Metro system as an advanced public transport mean is in its developing phase in whole China, only metropolises like Beijing, Shanghai and Hong Kong has a well-developed metro system in the whole city, in many middle and small cities metro system is under construction, so people mainly rely on bus and bicycle for their daily travel in the city. However, the condition of bus in commercial street is not that good. As the traffic condition in commercial street of old downtown area is usually crowded, some bus stops avoid being set right on the commercial street, so the accessibility to bus stop is not convenience (Wang, 2006, p.17). Also, the environment of bus stop is old and shabby on the street (image 3-7). The congested traffic makes buses have to spend a long time on the street to pass through.

f) Irrational Walking Dimension

People have a finite walking distance in their physical limitation, exceed that distance people will feel tired. However, some commercial street blindly pursue economic benefit that the length of street is quite long and lack interesting facilities and public places for relaxation (Wang, 2006, p.18). The irrational walking dimension fails to consider pedestrians physical and psychological abilities.
3.2.2 PROBLEMS OF BUILDING CONDITION

a) Disorder of Buildings

As old town underwent the urban renewal and reform, the buildings present the collage of old and new as well as different functions. The buildings on commercial street of Chinese old downtown area are usually in mix use. However, the different shapes, appearances, colors and materials lack a unite style that made the buildings in disorder (image 3-8). And many large and colorful commercial advertisements on the building façade block the original shape of those buildings result in a dazzling street landscape (image 3-9). The combination of buildings from different ages, styles and elements reveal the diversity of street façade and street pattern, but if they are not combined organically or managed well, the disorder of them is still a problem. Furthermore, demolishment of old buildings can often cause citizens' resentment.

[Image 3-8: Donghu Commercial Street in Wuhan
Source: http://qing.3shui.com/blog/13257.html]

[Image 3-9: Dazhalan Commercial Street in Beijing
Source: http://www.86art.net/sj/Print.asp?ArticleID=2959&Page=2]

b) Loss of Identity

The loss of identity is a general problems to the new buildings in old downtown area. Because of the trend of globalization, those new buildings blindly pursue the international style and European appearance to show their top grade, and developers made those buildings have a dull and a large shape to make full use of the floor space (image 3-10), which result in the loss of the city’s own identity and traditional style (Chen, 2008, p.9). Chinese traditional style in old town is exquisite building appearance and small human dimension. Compared to new town, old town still keep this original style more or less, but through the process of urban renewal, they are losing the traditional identity gradually.

[Image 3-10: Dongshan Shopping Mall on Zhongshan East Commercial Street in Ningbo

3.2.3 PROBLEMS OF PUBLIC SPACES

a) Neglect of Street Life

The neglect of street life on commercial street performs at an overemphasis on the traffic function on the street, so people’s social contact and social activities on the street are overlooked (Chen, 2008, p.11). In Chinese old downtown area, the street is occupied by traffic lanes, and few pedestrian crosswalks discourage pedestrians from passing through the street (image 3-11). The unsafe and uncomfortable walking environment on commercial street prevent the happening of a vivid street life.

[Image 3-11: Dongshan Shopping Mall on Zhongshan East Commercial Street in Ningbo
b) Lack of Public Spaces

The spaces on commercial street area always used as motion space for passing, contrarily static public spaces for relaxation is lacking, so the pedestrians sometimes have difficulty finding comfortable public places for sitting and communication (image 3-12), also the recreation facilities and street landscape like sculptures and fountains is few on the street (Song, 2002, p.15). Under this condition, pedestrians have to go to restaurant or coffee shop to consume for relaxation.

3.2.4 PROBLEMS OF STREET FACILITIES

a) Carelessness of Barrier-free Facilities

The disabled are vulnerable groups in contemporary society, barrier-free facilities on the street are basic requirements that they are able to have social activities in outdoor space. However, many commercial street in Chinese cities fail to consider their special need that lack fine barrier-free facilities, even on the street are some barrier-free facilities they are in disorder that cannot afford for the disabled's activities, those steps stop the disabled from using the street. One obvious example is the messy sidewalk for the blind on the street (image 3-14, image 3-15).

c) Demand for Green

Green space like trees, flowers and grass are good for the air quality and visual landscape in public space. However, in the process of urban renewal the green space in commercial street is overlooked. The street space is narrow and crowded, the small corner spaces are also left empty (Chen, 2008, p.12). Meanwhile, the green space on street is dull that lack exquisite design (image 3-13). Street park and street plaza is in needed in commercial street for relaxation and a better street landscape.
b) Lack of Management

Not only the physical layout of commercial street affects people's street experience, the labor management also contribute to preserve the street order and provide a comfortable environment on the street. As commercial street usually has many restaurants and snack bars on two sides, the lack of management and cleaning is a problem in Chinese cities that the ground is sometimes dirty (image 3-16). Yet it cannot be denied that some civilians' bad quality result in the bad environment. Meanwhile, the dustbins, bus signs and other street furniture lack periodic maintenance that make the street in disorder.

3.3 CAUSES

Three main causes can explain those general problems stated above according to the specific condition of commercial street in Chinese old downtown areas: the historical causes, the ideological causes and the separation of disciplines in street construction.

3.3.1 HISTORICAL CAUSES

Those problems of commercial street nowadays are not suddenly occurred, as they are located in Chinese old downtown area, the problems are actually the conflicts between the present demand and the old supply, they can be explained from the historical development in the old towns. In the past, the street has a small scale because the need for transportation is not that large, also the traditional Chinese city planning pursue the beauty of small and delicacy, that's why the street in old town usually has a relatively narrower width. However, the population boom and economy growth in recent years bring about high-density in downtown area, as well as heavy transportation flow of automobiles, bikes and pedestrians, and the increasing ownership of private cars and rising transaction in goods aggravate the burden of the street. Meanwhile, the diversity development of entertainment activities attract more and more citizens to experience their social life in outdoor spaces, like on commercial street. All the increasing needs result in the problems on commercial street in old downtown area, which may not be such problems in new town area.

They are also the sequel from the process of rapid development of urban construction these years. As the social demand is increasing by the growing population, and the developing economy calls for more investments and construction, so the developers are consuming money into urban construction to make profits, the results of this are the tearing down of old buildings and springing up of new buildings, which are built for commercial use. Hence, the commercial street present an appearance of mix-use of old and new, that's the reason for the disorder on the commercial street. The spontaneous rapid development lack control and well planning, so those problems are generated from the historical development.
3.3.2 IDEOLOGICAL CAUSES

This situation also results from the ideological causes in China. The urban planning in China always focus more on road transport that put traffic needs higher than human needs (Chen, 2008, p.15). In those urban planners’ minds, the streets are used for transportation while the walking spaces on the street are just subsidiaries, so they mainly consider the traffic function in street design. The importance of walking spaces on the street is neglected so the sidewalk lacks careful consideration.

Meanwhile, the developers and investors blindly pursue the economy effects so they stress on what can bring them profits like new commercial buildings and large parking lot around the new buildings to attract more and more people to consume. On the contrary, the walking place like sidewalk and public spaces like public plaza cannot help them earn money, so those places are ignored. They occupy more and more land in the existing old town space for buildings and commercial space, while the outdoor public spaces on the street become narrow and public activities are pushed out of the street.

And it cannot be denied that there is a gap between designers and users. The designers work for developers so what they design on the street is the appetite of those developers, and designers’ thinking mode is different from users (Song, 2002, p.14). Also, urban design in China seldom pays attention to public participation so citizens have no voice in the designing process (Xu, 2007, p.33). As a result, those commercial street lack public spaces for relaxation, human dimension and human-friendly facilities.

3.3.3 SEPARATION OF DISCIPLINES AND MANagements

As the division of labor is delicate in nowadays’ society, the separation of disciplines leads to problems in commercial street: the civil engineer care about the construction of the road, the transport engineer focus on the efficiency of traffic flow, the city planner is interested in the controlling of capacity of building on blocks, while the architect is concerned with the shape and appearance of buildings… The separation of disciplines and emphasis made the things on the street in disorder. Similarly, the managements of commercial street are in the charge of different department: the road construction is invested by municipal department, the greenery is supported by the park bureau, the public transport facilities are controlled by public transport sector, while the commercial buildings are built by those developers… (Chen, 2008, p.16) Different departments lack communications and exchanges with each other. In addition, the overall planning of government lack a comprehensive thinking and a whole consideration. So the commercial street is fragmentized and problems occurred in those fragments.

3.4 SUMMARY

This chapter illustrates the general problems in commercial street of Chinese old downtown area and gives general explanations to those problems. The situation in old downtown area of Chinese cities is introduced as a background of research object. Then those general problems are described with photos and depictions. The first problem is traffic problem, including traffic congestion especially in peak commuting time, the mixture of pedestrians and vehicles that disturb each other, the narrow sidewalk fails to provide enough space for pedestrians’ street activities, the parking issue of random roadside parking and large parking lots occupying public spaces, the poor public transport which means a weak accessibility to bus stops and bad environment for waiting bus, and the irrational walking dimension that in some commercial street the distance is extremely long. The second problem is the bad building condition on both sides of street, it performs as a disorder of new buildings and old buildings as well as the mixture of building functions, and the loss of the traditional Chinese identity on the building style. The third general problems are the neglect of street life, the lack of public spaces for relaxation and the missing of green trees, shrubs, flowers and grasses. The last problem is the carelessness of barrier-free facilities for the disabled and the delinquency of management of street furniture. The causes are explained from historical development perspective, Chinese city’s ideological perspective and the separation of disciplines and management in Chinese street governance. Solutions are needed for those problems through renovation under theoretical guidelines.
CHAPTER 4
THEORETICAL FRAMEWORK

► URBAN FUNCTION
► AESTHETIC EXPRESSION
► HUMAN BEHAVIOR
CHAPTER 4: THEORETICAL FRAMEWORK

This thesis aims at solving problems of commercial street in Chinese old downtown area under theoretical guidelines, to reach the research aim, the theories used for the research are mainly theories about urban function, aesthetic expression and human behavior. This chapter will have a detailed elaboration and discussion of these theories.

4.1 URBAN FUNCTION

The first section of the three concepts is Urban Function. In this section, the research object – commercial street will be put in the whole city environment in discussion. Section 4.1 will mainly talk about the definition and significance of commercial street to a city, several historical views and debates on street’s functions, how to ensure a street’s safety and diversity and traffic congestion issue in commercial street. The discussion will be associated with China’s situation when necessarily.

4.1.1 DEFINITION & SIGNIFICANCE

When defining the term ‘street’, the Cambridge Advanced Learner’s Dictionary says it is ‘a road in a city, town, or village that has buildings that are usually close together along one or both sides’. In the book ‘Street and Square’, Moughtin (2004, p.129) distinguishes street from road by elaborating that road is ‘a two-dimensional ribbon’ while street is ‘an enclosed, three-dimensional space between two lines of adjacent buildings’. Hence, street is not only a linear road in a city, but also contains the space and buildings along the road. The research of street concerns its location, shape and route, more importantly, relates to the spatial form and the function of buildings along the street.

Commercial street is one type of street according to its function. Literally, commercial street means the space and buildings on the street are mainly for commercial uses. Thus the space on the street are mostly in public or semi-public use compared to non-commercial street like the road between residential communities. Famous commercial street in the world are avenue of Champs-Élysees in Paris, Ginza Street in Tokyo and Fifth Avenue in New York, they all have busy traffic and gorgeous walking and shopping environment.

In China, common commercial land-use is commercial block and commercial street. Commercial blocks (image 4-1) is usually an area or zone that locates several commercial buildings, shopping malls and office buildings, the space is dominated by the large building blocks, the streets and squares are surrounding the buildings or enclosed by buildings, the linear space is weak. While commercial street (image 4-2) emphasizes the linear space no matter the shape is straight or curved, so the buildings along the street is more often to be stores and shops rather than big malls to cater to the physical street projection of the road. The commercial buildings include various shops like fast-food restaurants, boutiques, cafes, groceries, also public institute like bank, post office, and private office buildings, etc. In Chinese cities, especially in old downtown area, the buildings of commercial street is always in mix-use, the first floor or the lower floors that facing the street is store, while the upper floors can be residential building or office building.

Street plays a significant role in a city. ‘Streets and their sidewalks, the main public places of a city, are its most vital organs. Think of a city and what comes to mind? Its streets. If a city’s streets look interesting, the city looks interesting; if they...
look dull, the city looks dull’. Writes by Jane Jacobs (1961, p.29), a great apologist in her book ‘The death and life of great American cities’. Streets constitute a whole city and they represent a city. Kevin Lynch (1960) divide the image of city into five aspects: paths, edges, districts, nodes and landmarks, in which, path, can be understood as street is put in the first place to show how urban streets function in creating a good city image. Hillier (1976) thinks street network is the most evident form to define the space system in a city, so streets somehow seem to be the city, and the life of streets can represent the life of the city. This means street system not only reveal the physical city structure, but also stands for the experiential city. Based on that point of view, commercial street, which is the street that open for public and usually crowded of citizens for various commercial activities and public lives, reveals a lot of a city’s characters.

Talking about the function of streets, the first come to my mind and the most important is for transportation, including vehicles, cyclists and pedestrians. Streets link the different places of a city into an urban network. However, street is the place that holds several urban activities, the function of it should be not only for fast going through but also staying on it. Le Corbusier (1935), a great architect and city planner raised his concept of a radiant city that describe a city as is made up be skyscrapers, parks and high-speed expressway. In the proposal, he made many contributions to the city planning theory, but he completely denied streets’ function by saying that ‘Our streets no longer work. Streets are an obsolete notion. There ought not to be such a thing as streets...’ Thus in his mind, street was just used for passing through. Jacobs (1961, p.342) disagreed this idea because he just regarded streets as decoration in a city. Moughtin (2003, p.129) writes ‘The conception of the city as a product of urban functions dominated by transport deprives the street of its role, or meaning and such functional analyses leave the urban street without an existence or a reason for being’. And Ashihara (1983, p.128) thinks the idea lacks human kindness that nearly negates human’s existence. From the debate we can figure out that besides being used for passing through, it is crucial that a street should be attractive for people to stay. Besides being passed through, a good commercial street lies in how people enjoy the walking or staying in the space even they don’t consume any money.

Meanwhile, streets are formed from the city structure, and street network has a large influence on citizens’ urban life and social activities. According to Hillier’s (1999) space syntax analysis of street grids, he explained that when the urban street network evolves, it create a pattern of citizens’ natural movement, which reflects in that some places are busier that others due to the structure of grid. So the movement-seeking land uses like commercial stores, will seek out movement-rich locations like downtown area, then more and more commercial stores are gathering on the street, and the place attract more movements, at last those place represent the scene of prosperity with various social lives. Therefore, commercial street in old downtown area has rich movements, and it is closed associated with citizens’ lives in a city.

4.1.2 SAFETY & DIVERSITY

a) Safety

As described above, the function of street is for transportation and make people stay and enjoy the space. On a street, the vehicle lane, cycle lane and sidewalk all possess the function as transportation, while the stay and activities usually occur on the sidewalk and the spaces in front of the buildings along the sidewalk. In commercial street, the sidewalk’s function is more obvious and frequent. So safety is stated here as a viewpoint to ensure and provide a better environment on sidewalks of commercial street.

As Jacobs (1961, p.30) writes, ‘When people say that a city, or a part of it, is dangerous or is a jungle what they mean primarily is that they do not feel safe on the sidewalks’. By referring that, she raises three main qualities to make a street safe.

First, there must be a clear demarcation between what is public space and what is private space (Jacobs, 1961, p.35). Besides public commercial buildings and shops, commercial street also has buildings for private use as it is always mix-used in a city. However, in most cases, the shops and building’s first floor that facing to the street are usually for public use so as to attract people. Some of the upper floor will be private uses like residential or office buildings. Some private single buildings on commercial street will be distinguished from the other public space by fences or distance from the other space. In this distinction, the public buildings can have accessibility to fulfill its commercial function, while
the private spaces floors have a relatively secluded space.

Second, there must be eyes upon the street, eyes belonging to those we might call the natural proprietors of the street (Jacobs, 1961, p.35). The mix-use of residential and commercial is very common in Chinese old downtown area. Unlike in some new town, the commercial streets can be very empty and dangerous in the night because there are no residential buildings nearby. Commercial buildings emerged according to the residents’ need in old town’s development, then some of the first floors are transformed as store to make a profit, and the old residential buildings on upper floors are kept, although those old residential buildings are shabby and not that modern, the stakeholders’ use of the buildings provide the safety of the street and the vitality of this area especially in evening.

Third, the sidewalk must have users on it fairly continuously, both to add to the number of effective eyes on the street and to induce the people in buildings along the street to watch the sidewalks in sufficient numbers (Jacobs, 1961, p.35). The uses of commercial street contains the staff who work there, the visitors consuming there and the citizens who pass by the street. In commuting peak time the users are mainly citizens passing by, in the daytime the users are mainly consumers and staff, in the evening the uses are residents live there. As for the commercial street that has a specific function, which I will elaborate in the design case part latter -- Nanjing Zhujiang Road, mainly for selling electronic products. To attract more visitors to make the street safe, common service function is needed like fast-food restaurants, cafes, convenience store and so on. It is undeniable that the diversity of a street make sense in attracting people as well as the safety of the street.

b) Diversity

While pedestrians’ need of security is satisfied, they began to work as carriers of various human activities on street, which to some degree relies on a street’s diversity. The diversity of a street promotes the utilization of economic resources and creates a vivid urban environment. Four conditions can be concluded from Jacobs (1961) proposals about how to generate exuberant diversity in a street.

The first is the function diversity that the street must serve more than one primary function. A street should has a primary use, for dining, for shopping, or for other use. An explicit primary use can attract the target consumers. But single function means the single type of activities. Thus the other uses that serve the primary use are needed which bring various interests and demands, like the development of restaurants and cafes can satisfy the needs of staff’s dining and visitors’ relaxation.

The second is about the length of street that it must be short to make it easy to turn corners. A long street will be isolated because it interacts little with other streets and the city. Contrarily, more corners make more possibilities for transportation and more opportunities of activities.

The third is about the buildings along the street that the street must mingle buildings that vary in age and condition. This point emphasize the mix of new buildings with old buildings. On one hand, new buildings have a much higher rental price than old buildings. If on a commercial street are all new buildings, the enterprises will have to pay the expensive high rents. But old buildings can attract several medium and small-sized enterprises to make a street more diverse. On the other hand, old buildings can reveal the memory of a city, the mix of old buildings and new buildings shows the evolution process of a street, that is much more interesting than streets of pure new buildings. However, the bad condition of old buildings and how to combine old buildings with new buildings in a harmonious way to show a beautiful street landscape is an issue, so consciously design of new buildings and renewal of old buildings are needed.

The fourth is about the density that there must be a sufficient dense concentration of people, for whatever purposes they may be there. The population density of different time and different period in a street make contributions to the operation of a commercial streets as well as to the prosperity of the street’s economic effect. It is certainly positive to have residents, commuters, consumers, staff, residents and passerby on the street to create numerous possibility for activities of a vivid urban life.
4.1.3 TRAFFIC CONGESTION

4.1.3.1 Attrition of Automobiles

The safety and variety of street is discussed through looking into street itself. Afterwards, the discussion proceeds by putting street in the whole city, then one common issue comes out – the traffic congestion, which is rather obvious in commercial streets.

The street scale of old downtown area in Chinese cities used to be small and narrow in old times compared to nowadays. As the city developed, the economic grows and the population increases, which brings more business opportunists and visitors to commercial street, meanwhile, the emergence and popularization of automobiles occurs along with the process of urbanization, together brings the problem of traffic congestion in those streets. Then urban streets become crowded of cars, the time spent on the road becomes longer and longer for waiting, also pedestrians have to face the danger while cross the street, in the meantime, many urban lands turn into parking places to park those automobiles. On commercial street in old downtown area, the traffic congestion is rather sever because the place attracts many people every day and the demand for goods delivery is high. Therefore, many city planners and citizens in this century express their resentment or negative attitude towards automobiles, as if this problem would be solved if automobiles all vanish. However, should we totally blame traffic congestion on automobiles?

The answer is no. The existence and prevalence of automobiles goes along with the city’s prosperity and urban sprawl, it stimulates the economic development as well as brings convenience to citizens. In addition, automobiles and people need each other in contemporary society. In Alexander’s (1978, p.301) view, ‘cars are dangerous to pedestrians; yet activities occur just where cars and pedestrians meet.’ Modern urban life happens in the junctions of this two systems. As China is a developing country, the use of cars to a large degree represents the economic level in a city. It is common that in many developed western countries, people live in the suburban houses and drive to the downtown area and then use public transport inside downtown district. However, the public transport system in many Chinese cities is not perfect enough to throw away cars, and upper class may probably choose cars as their means of transport in the city. So automobiles are truly needed in urban life, and it is no use to blame them for traffic congestion.

To relief this condition in urban street, a good urban transportation and communication system is needed. According to Jacobs (1961, p.339), good transportation and communication are the most difficult things to achieve, but basic necessities. The prevalence of automobiles is because of city development, so city should transform itself to adapt this change. Jacobs (1961) takes an example that there was a pedestrian scheme, which advocate to apart pedestrian area and automobile area in city, which in her opinion would result in urban disintegration. Under one circumstance could this scheme be possible that the pedestrian area has no enterprisers and commercial buildings in streets, because automobiles are needed for goods delivery. But if no enterprisers and commercial buildings are needed, how could a street make sense in a city. Hence, to handle this problem cannot be simply separate pedestrians and automobiles, but try to decrease automobiles’ domination on those street where a large pedestrian flow occurs, as there is no problems that many automobiles are running on the express way. To decrease the influences of traffic congestion from automobiles, such method could be taken like create a lane for lorries on the back of commercial buildings.

Apart from reduce automobiles’ dominance to pedestrians, another mean is to accelerate the flow velocity of automobiles on street (Jacobs, 1961). For instance, transform a wide road into one-way street, but which could also cause bad effects. There used to be a case that in New York, after one street turned into one-way street, the passengers taking bus to that street decreased. Although one-way street reduce the possibility of traffic congestion but brings inconvenience. As the bus station on the other direction is not on the street, the citizens have to walk more distance to reach the station, so they abandon this street because so much troublesome and inconvenience. Thus the solution to traffic congestion must not sacrifice the convenience and attraction to the street.

Not to reject automobile, but create the process of attrition of automobiles, was put forward by Jacobs (1961). The attrition of automobiles is a spontaneous process. For example, the sidewalk on commercial street need enough spaces,
no matters for street furniture or decorations in front of stores or activities from children and pedestrians, thus a capacious sidewalk is needed, because widen the sidewalk could promote the quality of street environment and urban life. As a result, spontaneously the space on vehicle lane is narrowed. At the same time, some non-commercial street or corners are enlarges according to the change, then the automobiles could choose another way to go if they just want to go through this area. This attrition is positive and long-term process, it complies with citizens' need in street life. In addition, the attrition of automobiles should consider different type of automobiles, like lorries, bus and private cars. If the attrition of private cars affect the use of bus and lorries, new problems will follows.

To sum up, the attrition of automobiles can relief traffic congestion in spontaneous way. The dealing with traffic congestion is a complicated and long-term process, caution is need, and every affected elements should be taken into consideration. Good solutions can bring positive impacts to urban development and street life, not results in inconvenience and loss of pedestrians and users on the street.

4.1.3.2 Transportation Demand Management Strategy

Traffic congestion results from complicated reasons from several aspects, thus simple physical transform of road system is not able to handle this problem. The attrition of automobiles mentioned works through adjustment of urban street environment to control the route of automobiles, another method called transportation demand management strategy works by policy control.

The traditional approach to traffic congestion is to enlarge traffic supply, like construct new roads or broaden existing roads. However, this approach is always restricted by city's economy and geographic condition. Also, such approach may work well momentarily but could not make a long-term effect if the number of automobiles continuously increases. Contrary to that, transportation demand management is a strategy that works by controlling the origins of demands. Transportation demand management, named as TDM for short, came out in 1970s from United States under the background of congested traffic system and disorderly urban structure, then it has been successfully implemented in many European and Asian cities. The definition of TDM is descriptive in many scholars' documents. To generalize the idea, it can be explained as reducing or redistributing the demand of time and space in transportation by influencing travelers' activities (Ohta, 1998). The concept can be illustrated from image 4-3, when transportation demand $D_0$ exceeds the supply $S_0$, the balanced is broken, then issues like traffic congestion, traffic pollution and bad traffic environment occurs. Old approach is like the left picture that enhance supply $S_0$ to $S_1$ that to meet the need of demand $D_0$. TDM considers the environment capacity to moderately enhance the supply from $S_0$ to $S_2$ ($S_2<S_1$) while decrease the transportation demand $D_0$ to $D_2$, at the same time, the pivot is moved towards the transport demand to achieve the balance. In this way, TDM strategy guide people to choose scientific transportation means and use the limited transportation resource rationally.

Based on the idea of TDM strategy, here are some cases that specific TDM measures are implemented according to the city character and transportation condition in Hong Kong, London and Beijing.
a) TDM in Hong Kong

Hong Kong is one of the most densely populated city in China. Its prosperous economic growth, high-density population and intensive transportation call for a high-efficient transportation system. Actually the width of streets in Hong Kong is narrow than normal Chinese street (image 4-4), but in Hong Kong seldom occurs heavy traffic congestion, as the TDM policy in Hong Kong contributes a lot.

First, Hong Kong has a high-density and successful urban metro system, which already takes the distance of metro stations and land-use around metro stations into consideration when planning the metro system, office buildings and shopping malls are always near the metro station area, so public transportation is quite convenient and highly encouraged. To acquire the large sums needed for public construction, Hong Kong Metro authority can reap the increased land values that result from their investment in extended fixed transport systems. Second, the taxes of private cars is rather high than other cities, and the price is raised every several years so the purchase of private cars is controlled by the government indirectly. Third, Hong Kong has a very strict parking index and a high parking price policy. The limited number of parking lots and fairly high parking price especially in downtown area restricts the use of private cars. Last, as Hong Kong is made of several island on water, the city has 11 bridges and tunnels, the high tolls increase the cost of transportation by cars. The regulations of TDM in Hong Kong are modified every year to adjust to the city’s transportation system’s development.

b) London

London, capital city of United Kingdom, also has the problem of traffic congestion. Since the traffic system in central district has limited carrying capacity, the huge transportation demands results in serious traffic congestion. Fortunately London has various public transport means for citizens to choose, including walking, taxi, bus and metro. In peak time only about 10% of transport means is private car (Chen, 2009, p.18). Under this circumstance, the city implemented London Congestion Charging Scheme (LCCS) since 2003.

The scheme aim to reduce traffic use by charging people to pay for entering or
travelling in some particular zones in central area in specific time (image 4-5). London traffic department create a monitoring plan to access the results of LCCS. Statistic data shows it relieves traffic congestion to a large degree after the scheme was implemented. At the preliminary stage LCCS was opposed by many citizens, but as the scheme works, people gradually accepted it and benefit from the scheme. Although the LCCS has some negative effects like to those scattered retails in central area that target at customers driving private car, in general, LCCS is positively control the city’s traffic congestion as a whole.

C) Beijing

Numerous people from other cities swarm into Beijing because it is the political center, economic center and culture center of China, they purchase house and buy car and settle down in Beijing, which leads to the traffic congestion in Beijing much heavier than any other cities in China. Because the historic city block pattern and urban reconstruction in recent years, Beijing’s road width is broader than average Chinese cities, but the traffic congestion still exists as an unignorable urban issue. Thus Beijing government is urged to take several TDM strategies to handle this tough problem.

The first is license plate rule, which targets at private cars that certain cars with certain tail number are forbidden to enter 5th ring road area (image 4-6) according to the license plate table published by government, every two numbers are forbidden one weekday, so every number is forbidden in turn in one week as a period, on weekends no number is forbidden (image 4-7). Every 13 weeks the license plate table is rotated. This rule was initially carried out just within the Olympic Games’ time in Beijing in 2008 for a better urban traffic environment, but the immediate visible outcome makes this rule continues up to now. And the tail number forbidden used to be even number in even-day and odd-number in odd day. Nowadays the rule becomes more humanized. The second is the implementation of Bus Rapid Transit (BRT) system, which is a neotype mass transit system between rapid rail transit and normal bus transit. It has large capacity, fast speed and accommodation road to stop at important spots in the city. BRT brings convenience for public transportation in Beijing. The third is Beijing enacts polity on price of parking lot according to the degree of congestion in downtown area. More near to the city center, the parking price is relatively higher. And this policy contains not only temporarily parking space, but also rental parking place like residential communities’ and office buildings’. The fourth is the restriction of non-local vehicles including private cars and lorries. Those vehicles need to apply for permit pass to enter the downtown area inside 4th ring road area, and the time of the permit pass is limited. Although traffic congestion still exists and causes problems in Beijing’s traffic system, but the ongoing TDM strategies implies the improvement and hope day by day.
In the cases, each city formulate TDM polices and rules according to its particular condition of traffic system, those methods show improvements more or less. Yet from those cases we can conclude some general approaches of TDM strategies:

1. To establish scientific urban layout and land-use to create rational transportation distance and decrease unnecessary urban traffic.
2. To control the amount of ownership and usage of private vehicles.
3. To improve the public transport system to provide optional and convenient transport means.

However, the enactment and implementation should be in extraordinary caution because TDM strategy still faces its threats and challenges. All the rules concerning taxes and prices could arouse public resentment and opposition. The government need to ask for citizens’ understanding and support to some degree. The pure economic and political method may just show a short-term impact as long as people get used to the high price so the policy-maker need to assess the results and modify those method regularly. Some of those TDM strategies like rail system construction call for huge financial support. And although public transport system brings convenient for citizens, we cannot deny many people’s desire of individualized freedom like driving their own cars for transportation.

Transportation Demand Management strategy is an idea towards traffic congestion in the field of policy-making and urban planning rather than urban design. Yet we can learn the way of thinking in urban design of solving problems in small urban lands like how to set the parking lots to transform local transport condition and how to connect public transport spot with public space on the street to create convenient and comfortable expression for public transport.

4.1.4 SUMMARY

The discussion of urban function gives the definition of street by enhancing the space on the street to distinguish it from road and highlights its importance in a city that it is not only for transportation but also for staying and activities. Regarding to make commercial street better for staying and activities, the safety and diversity of street is explored, several principles are raised for providing a pleasant urban environment on street and attracting people into the street. Then the hot and common issue of traffic congestion is analyzed. From some literature’s critical view it is inferred that the phenomenon is not automobiles’ fault and cannot be solved by rejection of automobile or simply separate cars and pedestrians, but through attribution of automobiles in a positive and long-term process. Then the Transportation Demand Management strategy is raised and three cities’ cases of its application are discussed to explain the way to relief traffic congestion by controlling the demand origins rather than enlarging the traffic supply.
4.2 AESTHETIC EXPRESSION

The second section of the three concepts is Aesthetic Expression. Section 4.2 will discuss theoretical views about commercial street in aesthetic aspect. As Lynch (1960) draw a cognitive map (image 4-8) to describe the image of city from five elements: paths, edges, districts nodes, and landmarks. This pattern can also be used to describe a commercial street. Path represents the road of the street, edge depicts the buildings and space in two sides, district means the blocks that constitute the street, nodes is interpreted as street plaza and crossings, and landmark shows the specific symbol of the street. So this section analyzes the spatial dimension of the path between the edges, the aesthetic principles of edges, and some unique views towards nodes and landmark in commercial street, the general elements like green landscape and color will also be referred. Moreover, the standard of aesthetics is not a subjective depiction, but to use theories of rational judgment and scientific spatial scale to create a more beautiful, pleasant and memorable commercial streetscape.

4.2.1 AESTHETIC INTERFACE

Architectural space can be generally defined as an area demarcated by three boundaries: the floor on the bottom, the walls and the ceiling on the top. So is the space of a street. The bottom interface is the ground, the side interface is the buildings and space on two sides, and the top interface is the sky (image 4-9).

4.2.1.1 Bottom Interface

The bottom interface, which is made of the ground, is the main part of a street. It contributes for transportation, space division, landscape structure as well as organization of activities. And it is closely in contact with the main users on street – pedestrians and vehicles all the time.

The plane form of bottom interface is linear no matter it is straight line, broken line or curved line, yet general situation in cities is the integration of two or three above according to the corners and buildings on two sides.

The section form of commercial street's bottom interface is usually made of vehicle lane, cycle lane, sidewalk and green lane for separating different lanes.
According to particular condition, it may also have roadside parking spaces or commercial space for activities (image 4-10). On major commercial street in China, the sidewalk, cycle lane and vehicle lane are separated by green lane, but in small alleys and some old streets, the different lanes may not be separated, which results in transport disorder to some degree.

Regarding the scale to form a street enclosure of bottom interface, Ashihara (1983) has some discussions of D/H ratio, in which D means the distance between buildings on both sides of the street and H means the height of the adjacent buildings (image 4-11). In his explanations, when D/H>1, the feeling of distance goes stronger and while the ratio increases, the space becomes broad when D/H is higher than 2. When D/H<1, it feels close while the ratio decreases. And when D/H=1, there is a symmetry between the distance and height. So D/H=1 is a critical point. Based on the ratio, he compares Japanese street and Italian street to express the feeling of different D/H ratio: the ratio of Italian medieval cities is about 0.5, of baroque cities is about 2, and of traditional street in Kyoto is about 1.3. As pedestrian will have a 40° angle of elevation when walking, he calculated that approximately D/H=2~3 can give pedestrian a broader view to see the buildings on two sides. Song (2002) agree with Ashihara’s views, and she adds that when D/H ≤0.6, it is suitable for many commercial pedestrian street in Asia cities to create the lively atmosphere and strong sense of rhythm. Carmona (2010, p.147) also talks about the D/H ratio to study its impact of enclosure. She claims that the ratio of D/H between 2 and 2.5 provides a good sense of enclosure in a street and that of 1 is often considered the minimum for comfortable urban streets.

However, the D/H ratio just defines the ratio of street interface. As the economic development, buildings in modern cities have the trend to be higher and higher, there are more and more skyscrapers emerging in downtown area. Also, because of the need of automobiles, some important commercial street are widened to meet the traffic demand. If the reference system is just the D/H ratio, the dimension of D and H can be enlarged limitedly as long as the ratio is kept. But the feeling of a traditional small road and a modern avenue with the same D/H ratio is totally different. So Liu (2004, p.27) criticizes D/H ratio and claims that apart from the D/H ratio, the dimension of human should also be the reference system to judge street scale because the height of a persons is fixed. He thinks in a modern street, if the street scale is relatively large, then vegetation like trees, shrubs and street furniture like bench, sculpture, dustbin can help to create an special environment of smaller scale for pedestrians on sidewalk.

4.2.1.2 Side Interface

The side interface refers to the buildings and space in two sides of street, and in commercial street the buildings are usually intensive as various stores and commercial buildings are contacting each other together. In Lynch's (1960, p.51) view, façade characteristics are important for the identity of a street. The side interface is the vertical appearance of a street that people see from their eyes directly, it has the significant role in forming the aesthetic interface.

What makes commercial street different from other street is that it display a character of collage of buildings. Many stores use the first floor of residential buildings or office buildings for commercial use. Although those residential buildings and office buildings are isolated, the stores are physically closely connected with each other. The commercial street in old downtown area is always presented by the combination of new buildings and old buildings. As the
city is developing, the buildings on street are inevitably confronting repairing and repatching from time to time, which results in disordered building façades. Referring to this phenomenon, Rowe (1983) raises the concept of ‘collage city’, he thinks city is like a museum to accommodate history and the present, old things and new things. So the collage of new stores and old stores on commercial street reveals the aesthetics of diversity. The concept also emphasis that history is the sediments of a city, city is made of stamps from every historic period, so the aesthetic value of a new-and-old mixture is recognized. To avoid the disordered result of collage, street design needs consciously planning and methods to bring new things into old things to create a harmonious and regular facades of mixture.

To analyze side interface on street, Ashihara (1983) raises the concept of primary profile of building envelops and secondary profile. The former one referred to the outline of building front exterior while the latter one represents the shape created by the protruding or temporary ephemera. The side interface in western old street is usually made of the primary profile as the buildings are mainly structured by brick walls. While in Asia is sometimes made of the secondary profile especially like in Tokyo and in Hong Kong. He thinks the primary profile shows a strong and clear outline of buildings while the secondary profile is made of small protrusions that looks disarray.

Meanwhile, Ashihara (1983) sorts the commercial boards of big mall which are in the same shape and arranged in the same distance into the primary profile like the equidistant lamps. He speaks highly of primary profile because it make a street aesthetic and says it is better to restrain the secondary profile. When buildings are arranged along the street and we stand near the building to look along the projection of the street, we cannot see the primary profile because it is in parallel with our sightline, what comes into our eyesight is the secondary profile (image 4-12). Then we stand gradually away from the boundary of the building and look at the street, the image of the primary profile that used to be blocked by the secondary profile comes clearer and its visible area becomes larger (image 4-12). In other words, when people is farther from the boundary of the street, the origin outline of the building is clear as lesser is blocked by the protrusions, so the image of the street is more abundant and stronger. When D/H=2~3, people can see clearer of the buildings, and the buildings get its frontality. Ashihara emphasizes the origin shape works as street side interface. Then he gives three main principles in dealing with primary profile and secondary profile on street:

- The first is to enlarge the width of main street in downtown area to endow buildings the frontality in eyesight, like the mainly street in Tokyo is about 30m, the Champs-Elysees Avenue in Paris is 70m wide;
- The second is the width of sidewalk should be at least in 3m to provide a better horizon;
- The third is to restrict the secondary profile which would block the primary profile, especially those commercial boards.

However, Ashihara excessively denies the aesthetic value of secondary profile. In some small scale vehicle free street especially in Hong Kong (image 4-13), Taiwan (image 4-14) and Japan (image 4-15), the colorful commercial boards on the buildings, the local characters and cultural figure on it brightly represents a place's identity that people can tell the name of the city once they see the photos of those streets. Even in the night the colorful commercial boards looks vivid and lively. So the issue may be not to restrain the secondary profile, but to careful consider the design of secondary profile according to the identity of the street. Not only buildings, but also street furniture are part of the secondary profile which need consideration and aesthetic expression.
Gehl (2004) highlight the significance of good street-facing elevations to forming urban street landscape, it makes a street interesting and people enjoying standing near it. He thus lists five points of what boring street-facing elevation looks like: big units nearly without doors, little variation of function; closed and negative façade; monotonous facades; lack of details and interesting construction. There, to create an attractive façade especially on the street-facing elevation of first floor needs positive exterior and interesting details like doors, bright windows and small-scale decorations.

4.2.2 AESTHETIC SPACE

Aesthetic interface which is visible and touchable can help people intuitively create an image of street, aesthetic space functions in the experience and activities on the street sensibly.

4.2.2.1 Positive Space & Negative Space

Space is an abstract concept. Carmona (2010, p.138) thinks positive space is relatively enclosed and it usually has a definite and distinctive shape and boundaries that can be measured and conceivable, while negative space is inconceivable and shapeless like the amorphous residue left over around buildings. The method to create positive space is to create enclosed space. However, on the street most buildings are put in linear order, so Ashihara (1981) thinks the judgment of whether a space is positive or negative is related to people's cognition and consciousness. For example, to space A, if take space B which surrounds space A as an enriched content, then space B can be understand as a positive space to space A. And if regard space B as an unconsciously natural space, then space B is a negative space to space A (image 4-16). Similar principle may be understood better in painting. Oil painting in western usually paint the background with full color so the background is positive space, while Chinese ink-wash painting likes to keep the background blank so it is negative space (image 4-17). Positive space is well-designed and planned for some use and negative space is naturally left. Then put this concept on the street, if a building is an isolated mall, the surrounding empty ground is negative space. Then add the number of buildings to two, three or more, they
connect with each other together, and may have some concave and convex relation in plan, so the spaces outside the buildings are possible to become positive spaces. And some certain function can make a negative space into positive space. On the street, the concave and convex relation and slight angle could be created for activities and public uses. And the combination of new buildings and old buildings is the opportunity for creating positive public space.

4.2.2 Motion Space & Static Space

Based on the status of users, spaces on the street can be divided into motion space and static space. Motion space is used for transportation, walking, games and other activities while static space is used for sitting, watching, conversation, waiting for someone, eating and so on. On the street, the vehicle lane, cycle lane and part of sidewalk is motion space, the roadside parking, the bus station, the buildings along the road and some space in front of the buildings are static space. Those two spaces have disparate design principles. The static space on the sidewalk may need benches, shade of trees, illumination lamps. Some static space like for eating or toilet must be easy to find on a street. Contrary to that, motion space need to be flat, broad without barriers. The transition between motion space and static space can be expressed by distinction of spatial size, pavement materials, elevation height and so on (Ashihara, 1981). Although vehicle lane, cycle lane and sidewalk are all motion space, but as people's speed on those three lanes is different, so they also need clear distinction. Like the transition of vehicle lane and sidewalk is usually by elevation height. And the roadside parking always shows a different pavement on the ground. Also, pavement of motion space especially on sidewalk reveals the trend of direction by pavement, and that of static space shows a neutral pattern.

4.2.2.3 Street Plaza

As stated about motion space and static space, one special static space make important role in street design – street plaza. In street design, usually a visual interruption is needed to cut off the indefinite distant (Jacobs, 1961, p.380). To interrupt a straight and ‘endless’ street, a street plaza, large or small can form the interruption, and the plaza itself becomes a landscape different from the linear street space. For this reason, concave space and convex space need to be discussed. According to Ashihara (1983), concave space is usually an acute angled space and convex space always means obtuse angled space (image 4-18). In outer space on the street, convex space is much easier to create and find compared to concave space. When we arrange buildings along the orthogonal streets, all the outer spaces become convex space, it looks like people are pushed out of the buildings. But if we set back some buildings to leave a concave space, it feels enclosed, whole and warm inside (image 4-19). The concave spaces in western street are usually used for outdoor café. Based on that theories, Ashihara put forwards four aesthetic principles in street plaza design:

- First, street square should have clear boundaries that can form a patterning, like the wall of buildings rather than fences that simply for blocking eyesight;
- Second, good concave space can help form clear patterning;
- Third, the pavement extends to the boundaries to show a clear distinction of spaces as well as to enhance the patterning;
- Fourth, the surrounding buildings are in harmony and coordination and the space have a good D/H ratio.
Clear boundaries implies the attractive trend towards the center of the square. If the boundaries are week, then the street plaza lose focus point.

### 4.2.3 AESTHETIC LANDSCAPE

After the analysis of the interfaces of street and the spaces inside the interfaces, follows perspectives and principles about street furniture and detail construction in forming aesthetic street landscape.

#### 4.2.3.1 Landscape for Viewing

Street landscape can be divided into two types from the direction of views. One is the landscape for viewing from outside, like pedestrians looking at the buildings from the street. The other is the landscape for viewing from inside, like customers eating in the restaurant while looking at the street from the window (Ashihara, 1983). As the buildings on the two sides of commercial street are mainly for public use, they can have big windows to enhance permeability between inside and outside and provide an environment for eye contact. And for example in western roadside shops the shopkeeper would like to put colorful decorations on the windows in Christmas, this way makes the landscape inside open to the public. Similar viewpoints are stated by Gehl (2010, p.79) using soft edge and hard edge. Soft edge on street appears by transparent facades, large windows, many openings and goods on display, which makes the shops nice to view from outside. Hard edge is contrarily always made of solid concrete with black windows and few or no doors, which makes the street cold and people cannot experience the landscape inside. Actually, more interaction of viewing between inside and outside can not only improve the landscape, but also make those shops attractive so as to bring commercial opportunities. Well decorated big windows and goods in showcase help create aesthetic landscape and make shops themselves become the scenery of the street that pedestrians can perceive directly from the outside.

#### 4.2.3.2 Sculpture

Sculpture is a special and interesting street furniture in public space. Ashihara (1983) talks about the importance of sculpture in outdoor space. Sculpture used to be artwork stored in museum or gallery that people cannot touch them in daily life. But if the can appear in the outdoor space like street or street square, then they become public property of aesthetics. In this way, sculpture bring aesthetic landscape into street as well as they can emphasis the culture and identity of a street. An example of Shangxiajiu Commercial street in Guangdong City in Chinese is taken there. The human-shape sculptures on the street imitate how the local people's life were look life in old time (image 4-20). The sculptures are not only landscape of this place, but also a memory of the city.

#### 4.2.3.3 Green Landscape

Green, the vegetation in public space, is of significance in ecological perspective. Also in visual perception, the color of trees brings feeling of quietness and peace. And green, as a natural landscape can purify the air quality and the environment. According to green landscape, Ashihara (1983) raises several proposals. Street trees are usually grown in a line on the street with same distance. If there are more spaces for green, we can grow more street trees and shorten the distance to create more shades. And in the bus stop especially in front of mall, restaurant or office buildings where the space is empty, the close planting of trees could form a green space against wind for people waiting for bus. In addition, he describes the image of a green crossing that have a big tree in the center of a crossing under the promise of no danger to traffic eyesight.

Except trees, shrubs, flowers and grass, vertical green (image 4-21) is a new
trend of green landscape, although it require more money and technology. Green wall on buildings’ façade or use green wall instead of fences between different road and different public zone can create a comfortable and natural environment on street.

4.2.3.4 Color

Commercial street has many colors because on the street there are so many elements and commercial signage. It is common sense that warm colors like red, pink, yellow make people feel excited and cold colors like blue and purple give the calm feeling. On commercial street exist many warm colors to attract people’s attention in those side boards, banners and advertisements, so the colors of the pavements and buildings are better to be cold to form comparison (Ashihara, 1983). The natural color of most construction materials are grey, light blue, light brown or black. These neutral colors can serve as a foil to the commercial advertisements and the colorful clothes of pedestrians on the street.

4.2.3.5 Night Landscape

In the daytime, everything is lighted by the sunshine, the outer space of street is clearer than the inner space. While in the night, it is like the street disappear in the darkness, the brightest things are the windows and lamps. Many luminous windows in the night look like the stars on the sky that from a picture of night street. Based on that, Ashihara (1983) talks about the reverse of image in the night (image 4-22) to emphasis the importance of windows in night landscape. In modern buildings steel and glass are always used, in commercial street they are referred as shopping malls and tall office buildings. The transparent windows implies abundant lights in the night. So the façade design of buildings need to consider the windows for an aesthetic night landscape.

4.2.4 SUMMARY

This section analyzed the aesthetic expression of commercial street in three aspects – the interfaces of street, the spaces on the street and street landscape. The part of bottom interfaces discuss several perspectives about the D/H ratio. Then the primary profile of building envelopes and secondary profile are defined in side interface to highlight the primary profile and restrain the secondary profile. Also principles of street-facing facades are mentioned. Then, several kind of spaces are compared. Positive space can provide a better environment of enclosure rather than negative space. Motion space and static space need different design principle and separation. Also the important of street plaza is emphasized and the need of concave space is stated. At last, the details in street landscape and of street furniture are referred according to some point of views. Although the judgments of aesthetic expression of commercial street is based on the related space theories and empirical experiences, the ultimate aim is to create a beautiful and comfortable street for human and a human-friendly public space.
4.3 HUMAN BEHAVIOR

The last section of the three concepts is Human Behavior. Section 4.3 will discuss the assessment and design of commercial street from the perspective of the terminal users – human, thus human's perception, human activities and human scale is taken into consideration to create a human-friendly public space. First, the typology of travelers and users on the street are classified, then based on human's needs the discussion goes on to how to meet those needs, after that, human's activities on commercial street are analyzed, also the distance and human scale on the street are studied, at last several principles for humanized design are concluded.

4.3.1 USERS OF COMMERCIAL STREET

Before talking about human behavior on commercial street, the classification of users on the street need to be discussed first, and it has two kind of typologies according to the type of travelers and the type of intentions.

4.3.1.1 Types of Travelers

According to the travelers, users on commercial street can be divided into three types as pedestrians, cyclists, drivers and passengers respectively on sidewalk, cycle lane and vehicle lane.

a) Pedestrians

No matter the purpose of the pedestrian on sidewalk is transiting, shopping or sightseeing, they would pay attention to the thing in front of them, this is decided by people's visual rule. People's visual field is an irregular cone, with the range from left to right about 130°, upward the horizontal level about 30°and downward about 45°(Chen, 2008, p.20). So the visual field towards the horizontal level is broader than the vertical level. And pedestrians' sight line is about 10°downward the horizontal level for the sake of watching the ground clearing when they are walking (Chen, 2008, p.20). So what most come to their eyes are the first floor of buildings, the pavements and the public space on the ground. Also, the walking speed of pedestrians is slower than bicycles or cars so they have a stronger, straighter and more specific perception of the public space and street environment. Therefore, pedestrians are the major objects of street space design. What they focus makes the first floor of building facades and the street space rather important for a human-friendly street environment.

b) Cyclists

Compared to pedestrians, cyclists may have an explicit purpose through riding bycicle from one place to another destination. The average speed of bicycles is 10-19 km/h (Chen, 2008, p.21). In peak time, the street may be crowded, cyclist may focus on the 20-40 meter distance in front of them, and when the street is not crowded, they may separate part of their attentions to the buildings and spaces on two sides of street. As cycling is a slow-moving traffic, a fluent cycling environment may help them enjoy more about the environment of commercial street.

c) Drivers and Passengers

The main automobiles on commercial street are cars, buses lorries and taxis. The average speed of buses and taxis are 20-40 km/h (Chen, 2008, p.21). When the automobiles are moving, the outside scenery of building's first and second floors are moving back fast. Because of the fast speed, people on automobiles can only have a vague impression of the street environment. So the things for drivers and passengers to see clearly in the speed like traffic signage or advertising board need big size.

4.3.1.2 Types of Intentions

According to the intentions, people on commercial streets can be divided into four types: visitors, passers, employees and residents. Yet one characteristic of a commercial street is the diversity of services offered, thus combined intentions for visiting are frequent. So users on the street may have more than one intentions.
a) Visitors

Visitors are the major population on the sidewalks, including people go shopping for specific items, go to the public institutions or just strolling on the street. Also they are the main targets of the stores and restaurants.

b) Passers

Passers, like commuters every day or people go through this street need a fluent transportation environment. As the city traffic network is complicated, if passers have other options but choose one street for passing it is mainly because the street has a better and enjoyable traffic environment. However, the necessary passers every day may contribute to the traffic congestion especially in peak time if the street isn’t wide enough to accommodate a large traffic volume.

c) Employees

Because the character of mix-use in commercial street, there are two types of employees: clerks in stores and officers in office buildings. The clerks in stores earn money from the visitors, the success of their business is connected with the prosperity of the street. And for the office works working on the street, the commercial variety and good street public environment can provide a good place for eating and recreational activities after their working hour.

d) Residents

The existence of residents on commercial street is due to the urban development of mix-use of old downtown area in Chinese cities. The residents live in the upper floor of stores or just behind the stores, they ensure the safety of the street in the night, and the environment of commercial street is associated directly with their living standard. Supermarkets and fast-food restaurants on the street can bring them convenience in daily life.

4.3.3 Design Trend Based on Users

The terminal objective of urban design is the users, not the government, not the designer, not the investor. The design process follows after making sure what type of people are using the space and what they need. However, as the government and the developers are the one who provide fund for street construction, the best situation is that the urban designer could carry the common interests of the sponsors and the users. Nowadays, there are two trends appear in humanized design based on users.

The first is from the construction of physical space to the satisfaction of users’ needs. Although street is a physical space, it reveals the users’ needs. The users are not merely for counting the population, but the people who move, stay and perceive the street. The facades, the landscape and the scale are designed to serve people, which endows design the social meaning. The aim of design is not only to create a physical space, but also to create a place for people’s better life.

The second is from the understanding of designers to the truly concerning of the users. To truly concern the users’ feeling, we need to accept that there is always a mind gap between the designers and the users. What the designers want may not be the needs of users. To avoid the misunderstanding, designers need to put down their figures and thinks from the aspects of the users to know what they really need. In western cities, stakeholders sometimes can participate and have a voice in the design process.

4.3.2 HUMAN NEEDS

4.3.2.1 Hierarchy of Human Needs

Maslow (1943) created a pyramid model to show the hierarchy of human needs in five levels (image 4-23). The lowest level is physiological needs is physiological needs that people want air, water, food for survival. The second level is safety needs, as their physical needs are satisfied, they begin to pursue the security of their body, health, family and money. The middle level is love and belonging, people thus need friendship, family, love and social relation. The fourth level is esteem, then human have a need for respecting like self-esteem, confidence and achievement. The highest need is self-actualization, this one is established on the satisfaction of other four needs, the self-actualization includes morality, creativity, spontaneity, etc.
4.3.2.2 Human Needs in Commercial Street

Based on the hierarchy, human needs on commercial street can be deducted from low level, middle level and high level. The low level is the safety of transport and shopping, they need a safe and comfortable environment for walking, riding or driving. Under that circumstance, they begin to pursue social interaction, like communications and activities on the street. The highest level is self-expression and creation, they seek for the urban life on the street and consuming for a better living standard. Nowadays, people come to commercial street not only for buying specific items, they enjoy the shopping, relaxation and recreation environment on the street public space.

4.3.3 HUMAN BEHAVIOR & ACTIVITIES

4.3.3.1 Perception of Space

Hall (1969) claimed that in the perception of space, the eyes, ears, and nose work as distance receptors while the skin and muscles work as immediate receptors. In the perception of street space, eyes, ears, nose and skin make specific role and has their own requirements of design.

a) Sense of Sight

Human's natural motion is mainly the movement of horizontal direction, which explains why people's horizontal visual field is much wider than the vertical visual field. Compared to people in the automobiles, pedestrian's vision is similar to a static vision, the movement of slow speed makes pedestrian can see more environment information as well as more details. In commercial street, the cloud in the top, the skyline of buildings, the pavement on the ground, the various people, the façade of buildings, the advertisements and signage… people can see everything from their eyes to form the image of a street, so sense of sight is the most important one in the perception of space.

b) Sense of Hearing

Sense is the second significant tool that people perceive the world. According to other research, within 7m, people's ears are very acute, and within 30m people still can hear more or less about other's voice, and farther than 35m, the ability of hearing is reduced (Liu, 2004, p.21). This data can be used in the length of bench and the distance of benches to provide a place for communication while reduce the effects from other's disturbance.

c) Sense of Smell

Human's sense of smell functions in limited distance, usually only within 1m can people smell out the weak odor from other's hairs and clothes (Liu, 2004, p.21). Strong smell like perfume can be felt from 2-3m. Special smell in commercial street like odor of food around snack bars can attract people and
give visitors an special impression.

d) Sense of Touch

Sense of touch is the shortest sense of distance, only through contact can people feel the things. However, sense of touch functions a lot in the perception of a street. People touch the seat of bench and the pavement of ground to feel whether it is comfortable. So to create a comfortable street to touch, the materials which people can touch directly need to be taken into consideration.

4.3.3.2 Human Activities

Gehl (2011, p.9) divides human activities into three types: necessary activities, optional activities and social activities.

Necessary activities means compulsory activities to some degree like going to work, shopping or waiting for a bus. As necessary activities are the daily things people have to do, so they as less relation with whether the environment of a place is good or bad.

Optional activities are those things people can choose to do or not to do if time and place make it possible like going for a walk, breathing the fresh air or lying down for sunshine. Optional activities are directly connect to the environment, if the place is good, people are possible to do optional activities. And if the number of people is enough, the social activities are possible to occur.

Social activities happen depending on the presence of other people in public place, like children playing games, communication with others and public activities. Social activities relies on the public places on the street.

In these three types, necessary activities occurs no matter where it is, but optional activities and social activities happen directly or indirectly with the environment. Gehl (2004, p.11) draw this diagram to show the relevancy between activities and the quality of physical environment (image 4-24). If a commercial street has a good quality of environment and humanized design, then people would like to be in the public space, and optional activities and social activities can have more possibility to happen.

4.3.3.3 Human Behavior in Commercial Street

According to the features of activities, human behavior in commercial street can be mainly classified as five types: behavior of visiting, behavior of events, behavior of relaxing, behavior of passing and behavior of staying.

a) Behavior of Visiting

The behavior of visiting reveals the character of commercial street. Generally, it lasts a long time and is mainly done by walking. The original aim of this behavior is to buy goods, but now people enjoy watching and feeling the shopping environment, they also pay attention to interesting things on the road, like other’s beautiful clothes, some performance on the street. The behavior
of visiting will be extended to other activities like communication, relaxation, eating and so on, it depends on the variety of the commercial street.

b) Behavior of Events

To make goods sell better and more well-known, on commercial street sometimes occur events and discount campaign on the wide sidewalk and the square before shopping mall. This behavior only happen in commercial environment and make the space quite lively to attract people's attention (image 4-25). In this way, people may stop to watch the performance of to select good and trade for a discount price.

c) Behavior of Relaxing

The behavior of relaxing is not the specific behavior of commercial street, it occurs everywhere. But accompanied with the behavior of visiting, people often need public space of relaxing. The behavior of relaxing like sitting, communication make sure the behavior of visiting can continue and last for a long time. Hence, a comfortable environment of relaxing contribute the popularity of a commercial street.

d) Behavior of Passing

The behavior of passing occur in every street. And it the street is attractive, people may stop and have activities on the street. The behavior of passing, not only vehicles passing the street, but also pedestrians passing across the road, requires a good transport system to make sure the safety of pedestrians and fluent traffic flow.

e) Behavior of Staying

Behavior of staying includes long stay like living in the street and working in daytime, as well as short stay like eating a meal in a restaurant. As staying occupies the longest time in the street, it has a strongest requirement for a comfortable environment on the street. The better the quality is, to some degree the longer they probably would stay, so the humanized environment is needed.

4.3.3.4 Design Trend Based on Human Behavior in Commercial Street

As the human behavior and human activities are more complicated and diversified, which require various elements and humanized design of commercial, also result in three new trends on commercial street design.

The first is the complexity trend of commercial behaviors. As the fast growth of economy development, pure purchasing behavior cannot satisfy people's need on commercial street. People began to pursue multiple and compositive social activities on commercial street. In the process of buying things, they also feel like recreation, relaxation, communication and social contact. As a
result, the commercial street nowadays not only provide goods selling, but is also combined tourism, business, exhibition and cultural function. Under this circumstance, people visit commercial street is a part of city life and leisure rather than simply buying things.

The second is the strengthen of non-purposive behavior on commercial street. People become more and more enjoyed in the hanging out on the street while just watching the landscape and walking. Sometimes they don't require the outcome, but just enjoy the process of wandering. In this way, the use of public spaces is stressed, even some people go to commercial street are merely for those public places rather than the stores. So a lively public space on commercial street become the trend of contemporary society in China.

The last is dominance of public places in people's life. In contemporary society, people would like to reach the balance of family, work and social life. As the families nowadays in Chinese cities are mainly non-nuclear families and single families, and the work is always stressed and busy, people usually go to public places to pursue relaxation and release. Public places and commercial services meet people's needs of leisure, commercial street is capacity of both two, so more and more people go to commercial street to experience social life. Hence, more and more emphasis are drawn on public spaces in commercial street, thus commercial street is no more a place for buying things, but for public life and citizen's relaxation. The design also stressed at creating a humanized outdoor space for public activities.

4.3.4 DISTANCE & DIMENSION

Humanized design need to comply with human dimension and distance of social contact, so in this part, the figures of distance and dimension are discussed.

4.3.4.1 Social Contact

Hall (1969) discusses several classes of distance from social contact. Within 45cm is the close distance that people express their love or anger; from 0.45m to 1.30m is the personal distance of intimate friends or family members like the distance on the dinner table; from 1.30m to 3.75m is the social distance that neighbors or colleagues communicate with each other; and farther than 3.75m is the public distance like the distance in a lecture hall from the speaker to the audiences. In commercial street, the close distance and personal distance is applied in relaxation facilities like benches outdoor and tables in restaurants, and the public distance is the common distance applied in the public space like the width of sidewalk.

Gehl (2011, p.15) talks about the hierarchy of social contact from different intensities (image 4-26). The highest intensity is close friendships, then friends, acquaintances, chance contacts, and the lowest intensity is passive contacts. Passive contacts, also called ‘see and hear’ contacts, are the most contacts in public spaces like commercial street. When you watch others walking or sit down and view the landscape are all passive contacts. The dimension of public distance can ensure the intensity of passive contacts in public space.

4.3.4.2 Visual Dimension

What we can see clearly is due to the distance between the object and our eyes. In the distance of about 100m, we can see people, and within the range is people's visual dimension (Gehl, 2010). In 100m, we can find people but cannot figure out who he is or what he is doing. And in 70-100m, we can guess the gender and age maybe correctly. And in about 30m, we can see the face of a person. And within 20-25 we can people's facial expression and guess his emotion. In the distance of 1-3m we are able to communicate with people.
Finally, within 0.5m, in the very close distance we can see every detail of a person (image 4-27). Gehl (2010) claims that 25m is a demarcation because within this visual dimension people can observe others’ facial which suggests the possibility of social contact. This illustrates that the small scale on street can encourage people’s activities and provide place of interesting street life.

### 4.3.4.3 Walking Dimension

As the main vehicle of pedestrians on commercial street is on foot, so the length of commercial street cannot be too long otherwise pedestrians would feel tired. Generally, a lighthearted distance of walking is 300m, and the distance that people may begin to feel like needing vehicle is 500m (Ashihara, 1981). However, this figure is absolute, the specific condition is connected with the weather, the pavement materials, the physical strength of pedestrian and so on. The distance can be taken into consideration with the design of bus stop, benches and public space for relaxation. Considering that, Gehl (2010) emphasis the psychological distance. If the street is straight, dull, people would feel it is long, but if it is interesting and have spatial variation, the same distance can make a difference. Also he claims that the psychological distance can be shorten by the deliberate design of roadside building facades like make those stores have narrow street front and interesting appearance. Meanwhile, street plaza, which is a variation of space as well as provision for relaxation can shorten the psychological distance of a street. For example, the famous størgård street in Copenhagen has the length of nearly 1km, which is the longest pedestrian street in Europe, but four street square in divide the length and make the street a much shorter psychological distance.

### 4.3.5 Human-Friendly Design

All the statements about human behavior above call for humanized design of commercial street. Considering human needs and human activities on the street, Fan (2007) concludes four main requirements of what a good commercial street should be like: integrality, accessibility, physical comfort and psychological comfort.

#### 4.3.5.1 Integrality

For users’ better experience on street, an integrated system is needed that every function of the commercial street is tied together to form a whole street system. The elements are connected with each other to provide an integrality of commercial street.

Integrity of public spaces and commercial buildings. Commercial buildings provide the function of consuming, while public spaces connects commercial buildings to form a street space for commercial use as a whole. The walking speed of young people is 60-70 m/min, and according to statistics they would feel tired every 30-min-shopping, so the place of relaxation is need every 500m (Fan, 2007, p.55). Meantime, walking speed of seniors is 40-50 m/min, they prefer to relax every 20min and the distance is about 200m (Fan, 2007, p.55). Hence, on the commercial street could have public space for relaxation every
Besides that the location of public spaces on commercial street should avoid crossings. If a street is long enough it may have several crossings. The function of crossings is to let people and automobiles go across it fast on the base of the guarantee of safety. When a public space is set near the crossing, it may have two problems. If the crossing stresses on transportation, then people effectively go through the across and the public space is neglected. And contrarily if the crossing emphasis on the public space, to many people relaxing may affect the transportation efficiency. So the best way is to set public space far away from crossings to avoid transportation disorder while attract people to public space on commercial street. The common spaces for public places are wide space like the area in front of shopping mall for relaxation and activities.

4.3.5.2 Accessibility

The needs of accessibility on commercial street means that it is easy for people to get to this place. A high accessibility means people can conveniently contact others, use the public services, resources and information, which also encourages people's social activities.

First, the visual accessibility is need, which means that people can see the public spaces on commercial street from other place. If people can see a place before enter it, then they can judge whether this place is comfortable, attractive and safe, this way makes it more possible for people to enter this place. So the visual accessibility requires the commercial street can provide visitors a broad visual field to make them want to go on the street. Also public sight line can prevent crime and evil behavior. The shrubs, flower beds and fences which are higher above eye level can block the sight line and discourage people from going to the street.

Second, the walking accessibility means it is easy to get to the street and is easy to walk on the public spaces. The former requires the street is not far away from residential areas nearby, and has enough metro stations, bus stops, taxi station on the street people can reach the place by many options. There is a town planning mode named transit-oriented development, which proposes that created public spaces around traffic spots like metro stations to provide more opportunities for citizens walking in public places. Also, car parking and bicycle parking would make it convenience to stop people's transport tool can walk on the street as long as the parking services don't affect the traffic fluency. The latter requires a comfortable walking environment, including a relatively wide pedestrian, smooth pavements, safe zebra crossings and optional routes on the street. And people are always prefer to walk in shortest distance like cut crossing rather than a long round, so generally crossings on the ground is better than platform bridge or underground passage (Gehl, 2011). And considering the disables, it is better no steps if not necessary.

Third, the function accessibility means the commercial stores and related public services can create a 'magnetic field' to attract visitors to go through the street. For example, when people go to the street, they may be attracted by some store, and they keep going, then other stores also attract their attentions, in this way the 'magnetic field' provide commercial opportunities and many possibilities. A bright window and open space in front of the store can draw people's attention. And the organization of commercial stores with other buildings like bank, office buildings need to be considered. In addition, stores of foods like snack bar, fast-food restaurant and café will always be popular place with people inside on commercial street, these elements can enhance attraction of the 'magnetic field'.

4.3.5.3 Physical Comfort

As Maslow (1943) put physiological needs on the bottom of the hierarchy, people's physical comfort is the basic thing to satisfy on commercial street. For example, in hot summer and in snowing winter days, the people on the street is fewer than sunny days. So the degree of physical comfort is associated with the environment on the street.

A good microclimate can provide a better environment for physical comfort. Except extremely hot summer, people like place with shine and can against strong wind. Hence, public place facing the south without shelter from sunshine can attract people as the sunshine is in the south direction in China. And deciduous trees are good for provide this environment because in summer its thick leaves can create shadow from sunshine while in winter sunshine go
across the tree as leaves fall. Meanwhile, seats under sunshine with trees above can be adorable. Considering the wind, Gehl (2004) says the high-density low-rise buildings can let wind go through easily while isolated high-rise buildings could accelerate the win speed around it.

Apart from walking, the second frequent activities in public space is sitting and relaxing, so comfortable seats are important for physical comfort. People needs place for sitting in public places, if the public places is not enough, they will seat on other things like steps, sunk fences, fire hydrant and so on, so enough seats are needed. Gehl (2011) says that seating can also be combined with landscape in public space like the seats on building facades, the seats as the guard bar of fountain basin as well as with lamps and sculptures. The comfort level can affect the use of seats, a wider bench is better than a narrow bench and the material like wooden feels softer than stones, although wooden material is easier to corrode.

4.3.5.4 Psychological Comfort

Besides physical comfort, psychological comfort of people is equally important in humanized design. People choose to go to which commercial street as based on their psychological intentions. They want to go to public places to have social contact with others, but if the place is too crowd they would feel they are disturbed. Hence there is a balance between people's needs for social contact and privacy. Small scale on street can provide possibilities for contact and communication, but too close distance in public space would make people feel violated.

One method to provide psychological comfort is the human dimension in street design. Many modern square blindly emphases its large style for a gorgeous impression while makes it empty and lifeless (image 4-28). Too large scale would result in long distance between people so as the possibilities of activities are reduced. Hence, human dimension for psychological comfort requires small scale.

Also, the empirical phenomenon that people prefer to stay at the boundary of space rather than the open center. It is easy to understand that staying at the boundary can give people the sense of defense as privacy and at the same time they can have a broad vision towards the space. On the street, people like to walk along the boundary of the buildings and the shopwindows, building facades are always attract to them. It is the same reason in the location of seats. People like to seat at the boundary of a space with back, walls or trees in the behind. Therefore, those boundaries are best place for seats and people's 'privacy' in public space.

If a public space need to have two functions for passing and staying at the same time, it is better to separate them in slight distance (Fan, 2007, p.77). If a person want to pass across he won't like to pass through a crowded square, and if a person want to sit down and have a quiet stay, the busy steam in front of him would also make him uncomfortable. So it is rational to divide a place for motion for traffic and static for staying, variation of spaces' wide and street furniture like trees or lamps can sometimes work with this function.

It is easy to understand that lively and crowded places are attractive to people, then the place would be more lively and crowded. So if many people are together in public space on the street, then they can attract more and more people in joining them, which is how social activities happen. And in China recent years has a popular public activities that many middle aged women and teenagers like dancing together on public square (image 4-29). Thus a spatial
and plat place can promote this activities. People like to watch others, the interaction of sight line enhance the vitality of a place and bring a psychological belonging. Also, outdoor coffee seats is more lively than indoor coffee that customers watch pedestrians while drink coffee and they enjoy the eye sight from pedestrians.

4.3.6 SUMMARY

In this section, the discussion of commercial street design is from the perspective of human behavior and human activities. At the first, the users of commercial street is classified according to the types of travelers and the types of intensions on the street to underline who are really use the street and the street design should take the users as the objective, not the designer, the government, or the sponsors. Then the human needs in commercial street are analyzed according to the hierarchy theory from Maslow (1943). After that, the statements come to human behavior and activities, how people perceive the space is studied and several types of possible activities and behaviors on commercial street is concluded based on different users and different purpose to show there is a comprehensive trend of integration of commercial behavior with social contact of public life. And then is the discussion of the dimension of the distance related different intensity of social contact, the degree of visual dimension decide the possibility of social activities and the walking dimension decide the length and facilities on the street. At last, the humanized design is raised and elaborated to ensure the integrality, accessibility of the street and to provide a good street environment of users’ physical comfort and psychology comfort.
CHAPTER 5
ANALYSIS & ASSESSMENT

► ANALYSIS
► ASSESSMENT
5.1 ANALYSIS

CITY OF NANJING

The site of case study is located in the city Nanjing in China. Nanjing, the provincial capital of Jiangsu Province, is located in the lower Yangtze River drainage basin, about 300km northwest of Shanghai. The geographical coordinates of Nanjing is 31°14’N-32°37’N, 118°22’E-119°14’E. The whole area of Nanjing municipality is about 6587.02km$^2$, and the population is 8.161 million up to 2012 according to documents on Nanjing government official website. Nanjing is the second largest city and commercial center in eastern China region after Shanghai, and it is the political, economic, educational, cultural center in Yangtze River delta area. As a result, Nanjing experiences fast urban development in recent years and the process of urbanization extends more urban areas as new towns and bring tremendous changes to old downtown area.

Nanjing has a long history and used to be the capital of six historical dynasties in China. As Nanjing has a large natural lake (Xuanwu Lake) and a large natural mountain (Purple Mountain) in its urban area, so the city structure is affected by the lake and mountain that the streets and blocks are sometimes not in regular shapes and forms, the old town area is regarded as the area inside the city wall demarcated by the emperor in Ming Dynasty, the irregular shape of old town area is shown in image 5-4 that surrounded by Xuanwu Lake, Purple Mountain and small city moat along and outside the city wall (dashed line) although the old city walls are not totally continuous nowadays. Up to 2014, Nanjing Municipality has 11 districts, the urban area (image 5-3) is made up by four well-developed districts, while the new town areas are the fast developing area along the northwestern bank of Yangtze River and southeastern bank of the urban area, the urban area and the new town comprise the main city area of Nanjing (Nanjing City Planning 2007-2030).
CITY OF NANJING

Although the new town is in its rapid development, the main population and city life is gathered in the urban and old town area, which results in many usual problems like traffic congestion, high density and high housing prices. The public transportation of metro is in fast construction, there are two existing metro lines, others are under construction or planned to be constructed. Based on the newest documents on Nanjing metro official website (http://www.njmetro.com.cn/), Nanjing will have totally 22 metro lines in the future, and when they are all constructed, the metro network density is 1.36 in old town and 0.90 in main town, which will bring huge changes to the urban structure and public lives. The analysis and design proposal of the case in this thesis will take the future development of metro lines into consideration to think about how to change people’s street life in downtown area to make full use of public transportation. The biggest city center of Nanjing is Xinjiekou area shown in image 5-4. the site of the case – Zhujiang Road is northeast to city center, and is just one metro station’s distance from city center.
INTRODUCTION OF ZHUJIANG ROAD

Zhujiang Road is the chosen site in case study (image 5-5). It is a commercial street famous for selling electronic products like computers, cameras, mobile phones, etc. It locates in the central district – Xuanwu District in Nanjing old town area, and is just one metro station from the city center (as shown in image 5-4), the distance from Zhujiang Road to city center is lesser than 1 km. The road named Zhujiang Road has a whole length of 3.1 km, while the western period of it as commercial street has the length of 2.1km, which is the study area of this thesis.

Before 1980s, Zhujiang Road is just a normal street without so many stores and shops. Until 1980, many electronic stores gradually emerged on the street and in 1992, Zhujiang Electronics Industries Association was established, then the road was nominated as Zhujiang Technology Street. In 1995, the adopted Nanjing City Planning 1991-2010 defined Zhujiang Road as a particular technology street in Nanjing. Nowadays, there are hundreds of IT companies on this street, and it becomes the biggest marketing center for electronic products in eastern region of China. The status of Zhujiang Road in southern China is equal to Beijing’s Zhongguancun in northern China. And Zhujiang Road has an intense competition that every year some new companies appear on the road as well as some companies disappear from the street.

Its population of electronic products makes Zhujiang Road no longer a street merely for electronic products, nowadays it becomes a comprehensive commercial street including electronic stores, office buildings, and various commercial stores like shopping malls, restaurants and so on. The frequent commercial activities and high-density flows on the street also result in some problems. These will be analyzed systematically in the following maps and discussions.

Image 5-5 Zhujiang Road shown in Google Map
Source: Marked by author from http://maps.google.com/
PEOPLE’S VIEWS

Views towards Zhujiang Road from various groups are asked and sought to form a general impression of the site. Those views are gathered by some informal interviews and literature reading. However, due to the limit of time and energy, also because this thesis was written in Sweden, I failed to conduct a scientific interview or investigation by questionnaires. So the collected views may not come from reliable sources, but those random examples of views can still provide some perspectives into the descriptions of this street. The opinions are gathered in the table and be divided into positive views and negative views. Those views are gathered from the following group:

Media’s views

Several mainstream news websites are searched for media’s views towards Zhujiang Road: http://news.baidu.com/, http://news.ifeng.com/, http://news.sina.com.cn/, http://news.sohu.com/, http://news.qq.com/, etc. The views are mainly news and reports of the current situation of Zhujiang Road, so they are quite objective in those views. Apart from many of them talking about the news and trends of IT industry, some other information of the road environment and road construction can be found.

Stakeholders’ views

Stakeholders’ views are gathered from several short informal interviews through site survey on Zhujiang Road, the interviewees are pedestrians on the street, shopkeepers of newsstand and of street front stores. Also views from my relatives, my friends and my classmates are collected, some of them have lived in Nanjing for many years while some just came to Nanjing for studying a few years ago.

Scholars’ views

Scholar’s views are acquired from journals and reports related to Zhujiang Road.

<table>
<thead>
<tr>
<th>Positive Views</th>
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<tbody>
<tr>
<td>Rapid and diverse development of IT industry</td>
</tr>
<tr>
<td>Easy to get to this place</td>
</tr>
<tr>
<td>Always go to Zhujiang Road to by electronic products</td>
</tr>
<tr>
<td>Several favorite restaurants and stores on Zhujiang Road</td>
</tr>
<tr>
<td>Easy to go to city center from Zhujiang Road</td>
</tr>
<tr>
<td>Street is always vivid and lively</td>
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<td>Public service is convenient</td>
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</tbody>
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<table>
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<tr>
<th>Negative Views</th>
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<tbody>
<tr>
<td>Severe traffic jam in peak time</td>
</tr>
<tr>
<td>High price for commercial rent and residential house</td>
</tr>
<tr>
<td>Bad street environment</td>
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<tr>
<td>Hard to ride bike and walk on the Street</td>
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<tr>
<td>Different buildings in a mess</td>
</tr>
<tr>
<td>Crowded of traffic flow</td>
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<tr>
<td>Lack green environment and place for relaxation</td>
</tr>
<tr>
<td>Too many residential buildings along the street</td>
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<tr>
<td>Poor street furniture</td>
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<td>Sometimes ground is dirty</td>
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</tbody>
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Views from Internet

Views from Internet are some brief comments about Zhujiang road from social network site and BBS: http://tieba.baidu.com, http://www.xici.net/, http://bbs.wm090.com/, etc.

In the collected views, the media, stakeholders, scholars and comments on Internet always complain and reflect the traffic problem on the road, especially traffic congestion and bad environment for walking and riding bikes. Most positive views are about its location and commercial services, while negative views are mainly about problems of the physical street environment. Those views will be taken in consideration and be discussed into details in the following site mapping and analysis.
The analysis of land use (image 5-6) aims to show the current surrounding urban environment of Zhujiang Road (red dashed line), this map is drawn by author, facts are acquired from site investigation, google map and baidu map. However, as city blocks are complicated and always in mix-use especially in downtown area, it is hard to define one block as single use in real city environment, the colors in this map just summaries the main function of blocks. Around Zhujiang Road the lands are mainly used for residential, commercial, office and educational. As is in old town, there are many old residential communities, those residential buildings are old and may be demolished in the future, and the first floor of those old residential buildings facing the street are mostly used for commercial like stores or fast-food restaurants. Also some residential buildings are newly-built high-rise buildings, the price of those houses could be very high in such area. Based on the needs of residents, there are universities like Nanjing University, Southeast University and some middle schools as well as primary schools. And some lands are used for office buildings based on the need for business. Part of residential area and office area are combined with commercial use. This map shows the complexity of the various land use in this area, and the dimension of blocks are small and in mix-use. The complexity of land use bring more diversity and commercial opportunities on Zhujiang Road but also result in high-density, crowded urban life and conflicts among various social elements. Thus the organisation of land use need some rearrangement to combine other uses with commercial uses in well structure.
The surrounding transport system is illustrated in image 5-7. In China, urban roads are usually sorted as express way, primary road, secondary road and tertiary road according to transport system planning classification. Zhujiang Road is a secondary road that is connected to primary road in its west end and east end, and the primary road in its east end is also an express way as underground tunnel. On Zhujiang Road there are three main crossings and many tertiary roads extends to each blocks and communities. As it is located in the old downtown area, the bus stops are distributed in relatively high density. The existing two metro lines goes along the two primary road and crosses at the city center area. There is just one metro station on the west end of Zhujiang Road, but in the future, Zhujiang Road will have three metro stations on its two ends and in the middle. Its location, road grade and transport environment reveal that Zhujiang Road is an important urban road in the surrounding downtown area, and it carries a certain quantity of automobiles, cycles and pedestrians every day. Therefore, the existing transport system could be intensified especially near and cross Zhujiang Road to deal with the high traffic demand.
Image 5-8 illustrates the metro stations and bus stops on Zhujiang Road and the surrounding environment, the metro stations includes the existing metro stations and planned metro stations in the future, and the bus lines drawn in colorful lines are merely lines passing or crossing Zhujiang Road. As Zhujiang Road is located in a high-density downtown area, the bus lines are fairly complicated that there are 14 lines passing or crossing the road, especially on the east half period there are eight bus lines together. Although so many bus lines ensure a good accessibility to this place, bus's occupation on the road and short stops may aggravate the traffic congestion on the road. At present there are just one metro station on Zhujiang Road, but in the future the metro stations will add to three, metro as a fast public transport would change the transport structure on Zhujiang Road, so the amount of bus lines on Zhujiang Road can be decreased then.

The two photos (image 5-9) shows the conditions of bus stops. The bus stop is located between the vehicle lane and the cycle land, the space is demarcated between the two bus signs, the width of which is just 1.5m. The space for waiting bus is quite narrow and has no relaxing facilities like seats, and it is a little dangerous as there are no barriers between the bus stop and the cycle lane.
TRAFFIC CONDITION

As I was born and grow up in Nanjing, according to many news reports and my own empirical experience, Zhujiang Road is always in traffic congestion, especially in commuting peak time. Nearly every taxi drive would avoid to pass through Zhujiang Road and each time I travel on the bus it takes a lot of time to go through this road. Also traffic data can describe this traffic condition. The four maps (image 5-10, 11, 12, 13) shows the traffic condition in 8:00, 12:00, 18:00 and 22:00 on weekday perspective from the degree of smooth to congested in four grades. The data are collected and organised from google map which receive mass signals of GPS from mobile phones to get the information of moving speed and direction, so this data can elucidate this problem to some extent. The four maps illustrate that traffic congestion is always exists on Zhujiang Road and especially near the crossings. Around 18:00 which is the commuting time the congestion is most severe. Meanwhile, the difference of traffic congestion in commuting time and non-commuting time is not that distinctive on Zhujiang Road compared to other roads. This is because on one hand, its location make Zhujiang Road important in the surrounding transport system, on the other hand the residential, commercial and office function on the road has a huge transport demand every day while the road structure cannot afford such a large demand.
PARKING

The distribution of main parking lots and roadside cycle parking on Zhujiang Road are marked in image 5-15. As it is a commercial street with heavy traffic and located near the city center area, the parking fee is quite high and it is hard to find parking lots for car just along the road. Car parking are mainly in two forms -- underground parking lot in or near shopping mall or high-rise office buildings, and ground parking lot behind those big buildings or on the branch road, and some parking lot of office buildings are not open to visitors. Citizens’ reviews on parking lots of Zhujiang Road can be collected from the Internet (http://www.dianping.com/) that generally say it is difficult to find place to park their cars unless go to the parking lot very early. Apart from car parking, roadside cycle parking (image 5-15) is a very common phenomenon on Zhujiang Road, as can be seen from the analysis map, some are temporary parking in front of the stores. There is a high demand for cycling parking on this commercial street while the supply of parking places are limited and the roadside parking affects pedestrian environment if the sidewalk is already quite narrow.
There are three types of traffic lanes on Zhujiang Road -- vehicle lane, cycle lane and sidewalk, the relation of three lanes are abstractly illustrated in image 5-17, the width of sidewalk in different period are exaggeratedly to show the variation. Below the map is the grade of assessment of sidewalk's walking environment in every period. Zhujiang Road has six vehicle lanes with the whole width of 21m and additional 1.5m of green lanes in both sides. On the other side of the two green lanes are two cycle lanes in two direction with the width of 2.5m. The space between the cycle land and the buildings is the sidewalk and it is demarcated by differentiation of pavement. The width of sidewalk is decided by the degree of building’s setting back, some period is quite wide with around 8m walking space while some period is extremely narrow that the width is just 1m so the sidewalk and cycle lane are in mix use. According to the width and pedestrians environment, the sidewalk are classified into four grades from I to IV.

I. The sidewalk has a wide space with positive and open commercial facades, and has clear boundary from cycle lane like elevation difference of ground, also the walking environment is kept safe from bicycles like two lanes are divided by railing. Relaxing facilities like bench can be found for staying (image 5-18, 19).

II. Commercial stores are along the sidewalk but no public facilities can be found, the walking area is not too narrow but the space is occupied by other things which make the sidewalk feels not spatial (image 5-20, 21).

III. Some are not along stores or positive facades, although the sidewalk has a certain width and a boundary between sidewalk and cycle lane can be found, but the walking environment is dull or not that phycologically pleasant (image 5-22, 23).

IV. The width of sidewalk is extremely narrow and is in mix-use with cycle lane, although the pavement shows the difference but is impossible to let pedestrians walk on just 1-meter-wide lane, the lane is sometimes occupied by temporary cycle parking and safety issue is severe (image 5-24, 25).

Better sidewalk period are mainly in front of newly-built shopping malls and office buildings as new buildings are consciously set back from the street to leave more outside public space, while bad pedestrian environments are always those sidewalk in front of old buildings that’s why the distance is quite narrow.

According to survey report of questionnaires on Zhujiang Road, 85% pedestrians think the sidewalks are crowded, 60% claimed that walking on Zhujiang Road takes more time than on other road, and 95% think the width of sidewalk is a problem, and referring to the safety issue, 82% worries about being crashed by automobiles and bicycles when they are walking (Zhou, Chen, 2012, p.76).
TRAFFIC LANES

Image 5-22 South side of EF Period

Image 5-23 North side of KL Period

Image 5-24 South side of AB Period

Image 5-25 North side of HI Period
Image 5-26 displays the main function of each building in Zhujiang Road area. It can be seen that along the street are mainly commercial, office and residential buildings, as well as small amount of subsidiary functions like hotels, education and public service. Combined with analysis of building height in next page it can be figured out most of the street front buildings are combined with commercial functions -- the first floor of residential buildings are transformed as stores and the lower floor of office buildings are built as shopping malls or stores and fast-food restaurants. As there are many old residential buildings, education buildings like universities, schools and kindergartens are set around them. The mixture of buildings and mix-use of building functions contribute to the variety of this street. Firstly, it is located in the downtown area, those commercial buildings attract citizens and bring profits to this street; Secondly, those office buildings operate for the marketing of products and provide customers of the commercial buildings as a large amount of employees are working on this street every day; Thirdly, these old residential buildings give vitality to this street and ensure the safety especially in the night, at the same time those commercial functions provide services and convenience to the residents. However, the existing crowded public environment are partly resulted from the small street scale by old residential buildings and old office buildings, also highly mix-use may cause difficulty in management of the street. Hence, the various functions contributes the street variety while the structure of buildings need reorganization.
As shown in image 5-27, most buildings around Zhujiang Road are lower than 10 storey, in which old residential buildings are usually 6 or 7 floors' height, those few buildings have more than 10 floors are mainly newly-built office buildings, hotels and high-rise apartments, the tallest one have 58 floors. As the land price in downtown area is quite expensive so those new high-rise buildings usually have a relatively smaller floor area, therefore they won’t block too much sunshine in morning or at dust. Meanwhile, those new buildings are consciously set back from the street to leave more public space along the street, their high-rise part are set more back, and also the amount is not much so the sense of oppressing from them is weak on the street. Those high-rise buildings are always locates on the corner of crossings to provide a better accessibility for cars and convenience for parking behind them or in the underground parking lot, while those dense old building which are far away from the crossings of the street don’t demand for cars and have no place for parking around them, which aggravates traffic congestion near crossings as there are already traffic signals to stop the cars, which has been shown in the analysis of traffic condition. The sense of enclosure of buildings on the street are to be discussed in next page based on typical sections drawing.
Six typical sections are chosen to illustrate the lane width, sidewalk environment and road side parking, building enclosure ratio in different period of Zhujiang Road. The cutting locations are marked in map of Parking, Transport Lanes, Building Function and Building Height to show the detail environment information in plan. Also D/H ratio of each section is calculated. In the section, the left is the north side and the right is the south side of the street, the dark blue area means the cycle lane and the orange ones means the sidewalk.

**Section (a):** The building on left side is shopping mall and on right side is store. The sidewalk along the left side provide good environment with wide public space, benches for relaxation and railing to keep separated from the cycle lane, thus activities are able to occur in that space. Contrarily, the sidewalk on right side is terrible because the pedestrian is too narrow so it has to been in mixed use with cycle lane. Referring to the D/H ratio, the left side have a better sense of enclosure by the building than the right side.

**D/H ratio:** left side 1.59, right side 4.17

*mean value: 2.88*
Section (b): The building on the left side is office building with stores on first floor and on the right side is shopping mall. The sidewalk on left side is narrow although the stores on the first floor are set back for some distance to allow a bit more space in front of those stores. The walking space on right side is quite wide but lack relaxing facilities like seats and trees for shade in summer. The space for roadside cycle parking is provided. The D/H ratio is approximately 2 on both two side. According to Carmona's (2010, p.147) point of view, this ratio gives a good sense of enclosure.
Section (c): The buildings on two sides are both for commercial use, and the sidewalk environment in two side are similar. The lane for shrubs under trees are canceled for temporary cycle parking, for that reason, the cycle lane may be affected by the people who are stop their bicycles, and as the sidewalk is extremely narrow, it is very difficult for the cyclists to ride their bicycles in a smooth speed because they need to watch out for pedestrians on the cycle lane. The left side gives a better sense of enclosure because the D/H ratio on right side is larger than 3.

D/H ratio: left side 1.59, right side 3.23
mean value: 2.41
Section (d): The 20-floor high-rise building on the left is a government office building without any other mix-use. To reveal the dignity of government, this building is kept far away from the sidewalk by fences. The space in front of it is spatial and can be used for temporary parking for internal cars. Meanwhile, as a large part of the sidewalk outside the fence are used for temporary cycle parking, the walking space is left narrow. On the other side is a 5-floor commercial building containing stores, restaurants, the middle of the sidewalk is used for cycle parking, therefore pedestrians are automatically separated into two ways -- one way for shopping and stops on the right, and one way may for merely passing the place on the left of the bicycles. Referring to the D/H ratio, as the high-rise government office building may give a pressing sense of enclosure, in the other side the relatively low-rise commercial building release the tense feeling by a D/H ratio of 3.23 to reach a total balance of the street.
Section (e): The buildings on two sides are both for commercial uses. The walking space on left side is under the second floor of building, so it can prevent rain in rainy day and hot sunshine in summer, but the narrow width is still a big spatial and safety problem. Compared to cycling parking in the left side, the way in the right side would be better as it does not affect the flow of cycle lane. As the direction of sunshine in China is from south, the set back of building’s high-rise part in the south side of the street (the right side in this section) can bring more sunshine to the street.
Section (f): The building on the left side is a residential building with stores on first floor and the one on the right side is an office building on the higher floor while commercial use in lower floors. The problem of sidewalk on the left side is the same as section (e). The cycle parking on the sidewalk of right side is dispersed that divide the walking space into many pieces, it is better to concentrate them together.

D/H ratio: left side 1.82, right side 2.56
mean value: 2.19

To sum up the six typical sections, the D/H ratio are mainly from 1.5-2.5, which keep a decent sense of enclosure according to Ashihara (1983) and Carmona (2010), this is because old low-rise buildings are mostly closer to the street and the new high-rise buildings are set back from the street. Due to the high land price in downtown area and the characteristics on commercial street, the demand for high-rise office building is a common phenomenon in China, so in this case, it is better to have low-rise building on the other side of the street if one side is high-rise building to keep a balanced sense of enclosure and street scale.
FACADE

Facades of newly-built shopping malls are mostly in regular large shape and are ornamented by commercial advertising boards, the materials are mainly dedicated stones and glass (image 5-34). And of office buildings are usually in repetition of same elements with glass curtain wall (image 5-35). The facades of street front stores on first floor (image 5-37) are mainly soft edge with glass to show the interior environment and colorful commercial decoration to attract customers into these stores. Pedestrians are the main objects who can perceive most about street facades in their walking, meanwhile, the big trees on the street always block the eyesight of facades on upper floor, and the sidewalk are generally narrow, so the main image of facades on Zhujiang Road comes from the facade of first floor. Therefore, the photos of facades of shopping mall are taken in the other side of street and in crossings. It shows in image 5-35 that only in winter the facades of upper floor can be seen easily by pedestrians. Therefore, it is better to put commercial advertisement on the first floor and to widen the sidewalk to let street facades easier to be seen by pedestrians.
To sum up the six typical sections, the D/H ratio are mainly from 1.5-2.5, which keep a decent sense of enclosure according to Ashihara (1983) and Carmona (2010), this is because old low-rise buildings are mostly closer to the street and the new high-rise buildings are set back from the street. Due to the high land price in downtown area and the characteristics on commercial street, the demand for high-rise office building is a common phenomenon in China, so in this case, it is better to have low-rise building on the other side of the street if one side is high-rise building to keep a balanced sense of enclosure and street scale.
Based on Ashihara's (1983) theories of primary profile and secondary profile of building envelops, six photos of Zhujiang Road are chosen to be analyzed, the area colored green is the primary profile, which means the main outline of buildings, and the area colored red is the secondary profile which are those protruding or temporary ephemera. The analysis (image 5-38) shows that the secondary profile is weak on Zhujiang Road as no matter shopping malls or street front shops on the street are organized into similar structure although different stores have different color. Hence, the sense of linearity on the street is strong.
As Zhujiang Road turned from a street for electronic products to a multiple commercial street, along the street are a variety of service facilities. Those service facilities are presented in image 5-39, regarding the numerous small stores, the icon in the map represent the location but the number of same type stores may be more than one in one icon’s location. To manifest its characteristics of electronic products, along the street are four IT shopping malls for a variety of electronic items and numerous IT stores especially in the east half period. However, IT stores of similar type of products can be organized into several clusters for goal-directed customers and better management. In addition, as it is block trade for electronic products like computers, cameras and mobile phones, along the street are many bank counters and ATM from different bank companies to serve consumption. In public recreation and entertainment, there are two main comprehensive shopping mall on the street and a large amount of restaurants, milk tea shops, coffee shops, snack bars, bakeries and clothing shops along the street to attractive people who shopping here. Public services like convenience stores, pharmacies, hotels are also provided on the street for the residents and employees who work on Zhujiang Road. The abundant service facilities make Zhujiang Road popular and attract many people every day. To make use of so many service facilities, Zhujiang Road requires a good street environment for commercial activities.
PUBLIC SPACES

Public spaces are those places that citizens can stop and have relaxation and social contacts. As street is linear space, public spaces on street are open spot spaces along the road. However, as on Zhujiang Road the street space is crowded and walking environment are generally narrow, most outdoor space are motion space that it is hard to stop or find an open area for activities, the existing public spaces are those squares in front of newly-built shopping malls and IT malls.

As image 5-40 shows is a relatively wide linear square in front of Jinying Shopping Mall which is separated from the cycle lane and have benches for seating, but it lack of landscape or recreation facilities so few activities are held in this place.

In image 5-41 is a square in front of an IT mall, part of the square is used for product publicity and promotional campaign. It can be seen from the photo that some citizens are attracted into those activities but because there are no seats they have to sit on the stones which are used for traffic safety.
Image 5-42 shows the square in front of another IT mall, this square are always occupied for product promotion. As the area of the square is small, the campaign affects the pedestrians passing through and nearly blocks the entrance of the IT mall. Separation of motion space and static space is needed in such square.

To sum up, Zhujiang Road is lack of public spaces as well as relaxation facilities and public landscape. The existing few public squares are mostly used for commercial campaigns. As the total length of this road is about 2.1km, it does need public space like street square or street park for relaxation and entertainment.
VEGETATION

As Zhujiang Road is an old street in downtown area, along the whole street are two lines of old big alee-trees and most period are shrub green lanes under the big trees (image 5-43), which can never be seen in new town area. These trees provide shadow in summer days and falls in winter so the sunshine is not blocked. Apart from those vegetation, Zhujiang Road is lack of green space on two sides because the sidewalk is narrow and the street front stores are in high density, only some newly-built shopping malls have shrubs besides the building (image 5-44).

Image 5-43 Alee-trees along Zhujiang Road

Image 5-44 Shrubs in front of shopping mall
5.2 ASSESSMENT

5.2.1 PROBLEMS

As a commercial street in old downtown area, there are many problems of Zhujiang Road found out and mentioned in the analysis, they are summarized into four main problems.

a) The most obvious problem of Zhujiang Road is the traffic problem, it reflects as traffic congestion as well as mix-use of cycle lane and sidewalk that result in slow traffic flow and safety issue. As an important traffic road and popular commercial street, the traffic demand is large on the road while the existing street traffic structure is irrational to deal with the traffic demand.

b) As an old street, the street pattern nowadays is disordered. Old residential communities are mixed with commercial functions and office buildings, which leads to issue of management and too small street scale. Meanwhile, it lacks well-organized static space for cycle parking and bus stops.

c) The walking environment is bad and not human-friendly. Most of the sidewalk is too narrow and lack separation from the cycle lane, the walking space is always occupied by commercial use, bicycles and promotion campaigns, and there are few place have relaxation facilities like seats on the sidewalk.

d) Lack of public spaces and facilities. The street has the length of 2.1 km but there is no well-designed street plaza or street park in the middle for relaxation. Also it lacks street landscape and facilities to provide a place for people to stay and have social activities.

5.2.2 ADVANTAGES & POSSIBILITIES

Although there are many problems on Zhujiang Road, as a commercial street in old downtown area, it possesses its own advantages which may provide possibilities in its future development.

a) As Zhujiang Road is located in old downtown area and near city center, the good location makes it attractive to citizens and easy to get to that street.

b) A large amount of commercial buildings, residential communities and office buildings give this street diversity of various social elements and guarantee its safety especially in the night, the abundant public and commercial services along the street can meet people's commercial demand and stimulate consumption to bring profit to this place.

c) The commercial street has its own characteristic – the fame of electronic products, which can be emphasized as the image of the street.

d) In the future there will be three metro stations on the street, the public transportation would make a change of the existing traffic system and condition. That means in the future the residents, employees and visitors on the street could rely more on the accessibility of fast public transport to the street, and traffic congestion may be released.

e) The existing old big street trees are valuable natural resource on the street, under those big trees are comfortable places for public activities and walking experience in outdoor environment.

Based on the analysis and assessment, a design proposal will be put forward and elaborated in next chapter to solve these problems while make full use of the advantages and possibilities of Zhujiang Road.
CHAPTER 6
DESIGN PROPOSAL

- DESIGN STATEMENTS
- MASTERPLAN
- DESIGN CONCEPT
- PLANNING
- DETAIL DESIGN
DESIGN OBJECTIVES

The renovation design of Zhujiang Road and the surrounding areas aims to create:

► Fluent and harmonious street traffic;
► Good Accessibility of public transportation;
► Comfortable and enjoyable walking environment;
► Diversity and order in land-use;
► Attractive and accessible public spaces;
► Aesthetic and characteristic street landscape.

DESIGN CONDITIONS

As the chosen site is a mature urban street, so the design is based on the facts and elements in the existing urban environment, which means the design proposal is a renovation design rather than a re-design, so certain design conditions need to be stated:

1) What should be kept?
   - the characterized buildings on Zhujiang Road, like those existing large electronic malls;
   - the modern buildings, like the several shopping malls, high-rise office buildings and newly-built high-rise residential apartments;
   - the overall width of Zhujiang Road, which means there shouldn't be mass demolishment or mass reconstruction of those existing commercial buildings along Zhujiang Road;
   - the two lines of old big street trees on Zhujiang Road, also their positions are fixed;
   - the small river go though and across Zhujiang Road and its own urban texture.

2) What can be removed?
   - the buildings which are too close to the street that disturb the pedestrian space;
   - the old residential buildings which are in bad state of condition and organized in disorder thus not easy for management, also those buildings fail to provide a good dwelling environment for residents.

3) What need be improved / transformed?
   - The traffic environment;
   - The land-use organization;
   - The street landscape.

4) What will be added?
   - Public spaces;
   - Green area;
   - Street furniture.

DESIGN CONTENTS

The followings are fulfilled in the design proposal:

► revised traffic planning of the surrounding environment;
► reorganization of land-use as well as the circumjacent ground, green land, parking space in the area;
► several chosen spot on Zhujiang Road for detail design including traffic environment, street landscape and street furniture;
► other concepts and ideas which cannot be illustrated by visualized images will be discussed by text description.
The masterplan shows the whole planning of the area, including the slight changes of the road grid and some rearrangement of landuse as well as building organisation. The design focus on the blocks surrounding Zhujing Road which will be seen in the masterplan with more colorful details. Green spaces, small plazas, parking lots and open spaces are taken into consideration in the masterplan planning. Detailed design concepts and changes will be elaborated and illustrated in the following.
As the existing street environment on Zhujiang Road is bad for pedestrians and cyclists, and considering the development of metro stations in the future, the vehicle lane is decreased from 6 lanes to 4 lanes, and because the old street trees are kept, so the cycle lane is isolated from sidewalk that moved to the other side of the street tree. In this way, the sidewalk is widen and a better walking environment is provided for pedestrians, also social activities on sidewalk become possible on a broader space.
As the importance of a good pedestrian environment is enhanced in the design proposal, facing to the decreased number of vehicle lanes on Zhujiang Road, the compensation for the vehicle traffic is to slightly intensify the traffic grid in the surrounding area: two parallel roads and one vertical road are upgraded into secondary roads, so the vehicle traffic flow on Zhujiang Road could be distributed to the surrounding traffic grid (image 6-4, 6-5, 6-6).

With the densified traffic grid, car drivers would have more traffic options when they want to reach or leave some certain spot on Zhujiang Road, they don’t need to drive through the whole Zhujiang Road but can choose the several transverse roads and branches road to avoid traffic congestion. Also if they just want to go through this area, they even don’t need to drive on Zhujiang Road. Image 6-7 and 6-8 shows the comparison of traffic options from Zhujiang Road in the surrounding traffic grid before and after design.
In the future, there will be three metro stations on Zhujiang Road, the 500m-radiation of these three metro stations will almost cover all Zhujiang Road period (image 6-9). This rapid public transport will greatly release the situation of traffic congestion and provide better and faster accessibility to Zhujiang Road, also it will encourage citizens to go to this area by foot. Thus, to make full use of metro transportation, buildings of high density users like shopping mall, IT mall and high-rise office buildings are set near the metro stations (image 6-9,10). The gradient that higher office buildings area near metro station and lower buildings are far away from metro station can also form a sequential urban skyline (image 6-11).
Although two more metro stations will be constructed in the future, since metro is an underground public transport in long distance, while bus system, which stops in short distance on the ground is still important for urban public transportation system, and some citizens prefer to take bus rather than metro because in this way they can avoid walking up and down stairs or looking for the right exit of metro station. Therefore, the existing four bus stops on Zhujiang Road are kept in the design proposal. But as has been analyzed in chapter 5, the number of bus lines go through Zhujiang Road is a bit more, and considering it would cause traffic congestion when the traffic flow are paused too frequently by bus stopping on the four vehicle lane in design proposal, it is suggested to change some period of bus line route to the transverse road and branch road upgraded on the designed traffic grid, and some bus stop can be place on the branch road to remove the effect of traffic flow stop on Zhujiang Road. Below are some possible change for existing bus line and suggestion for possible location to place bus stop on the branch road.

**DESIGN CONCEP T RE NOVATION - BUS SYSTEM**
**DESIGN CONCEPT**

**RENOVATION - PARKING**

**Car Parking**

As Zhujiang Road is located in old downtown area, the landuse is in high density, so most parking lots open to public are underground. However, due to the need of goods delivery and numerous office buildings along the road, private parking behaviors may also cause traffic congestion. Thus those internal parking lot and few public parking lot on the ground are rearranged in the design proposal. If the building is at the street corner, the parking lot could be set on the transverse road or at the back of the building; if the building is in the middle of other buildings, then its parking lot is set at the back of the building, so car drivers would drive their car to the parallel road (image 6-16, 17, 18). In this way, the stopping of cars are transferred to other road to keep traffic fluence on Zhujiang Road, and some cars drivers even don’t need to go to Zhujiang Road if their desitination parking lot is on the other side.

**Cycle Parking**

Similarly, if the building is a large shopping mall or IT mall that have some space around the building, then cycle parking lot can be set on two sides of the building rather than on Zhujiang Road, so the cycle parking behavior are transferred to the transvers road. And to those intensive street front stores which are close to the street, temporary cycle parking is in high demand, the previous analysis shows the existing cycle parking are alway on the cycle lane which may affect cycle traffic, so in the design proposal the cycle parking lot are moved to the edge of sidewalk, different color of pavement material shows the function of cycle parking, and when no temporary cycle parking is needed, the area is a part of sidewalk belongs to pedestrians (image 6-19, 20).
CHAPTER 6   DESIGN PROPOSAL

DESIGN CONCEPT
RENOVATION - LANDUSE

Commercial buildings, residential buildings and office buildings are three main landuse type in Zhujiang Road area. As has been discussed in chapter 4, diversity is important for a street no matter to make it attractive and lively or to keep the street safe, and in chapter 5 the analysis shows Zhujiang Road has a good diversity that different buildings are mixed on the street, but the organisation of buildings are in disorder which make it difficult for management. Therefore, in the design proposal, to keep the diversity of the street those different buildings and different functions of land are kept but some are slight reorganized to have the whole order. Especially to the residential buildings, because residential buildings nowadays are usually integrated into residential communities and are enclosed by block or vegetation to keep a relatively private from other type of building, so as image 6-21 shows, the scattered residential buildings are organised into some clusters in the design proposal, and to maintain the diversity, those facing the street would have commercial use in first floor. The landuse in design proposal is shown in image 6-22, nearly all office buildings and residential buildings facing Zhujiang Road have commercial uses in lower floor.

Image 6-21 Residential buildings organised into several communities

Image 6-22 Landuse of building functions in design proposal
Design Concept
Renovation - Public Spaces

Add street furniture like benches for sitting, dustbins for throwing rubbish, sculptures for viewing, as well as create more green spaces for nice street landscape and comfortable micro climate like trees against sunshine in summer to create a street environment (image 6-23, 24, 25, 26, 27).

Demolish old buildings which are too close to the street thus to provide open public space as well as create more variation of pedestrian space on sidewalk (image 6-28).

Several street plaza are added using the open spaces in front of shopping mall or near residential buildings for relaxation and social activities, also two street park are added for more green spaces and vegetation. Five of them are chosen for detail design (image 6-29).
The west period part has the existing metro station, and it is nearest to city center area, so the commercial services are developing well. There are two newly-built large shopping mall, so large open spaces in front of the shopping malls are utilized as open plaza for public life. Residential buildings are organized into several communities in the area with commercial uses in the roadside interface.
PLANNING
WEST PERIOD PART

office building cluster
shopping mall
residential community
middle school
high-rise office building
high-rise residential building community
metro station underground
On the middle period part are many old residential communities, so public services and schools are set surrounding them. The commercial environment of this period are mainly road side stores sounding residential and office building clusters. A green belt is created along the river near the new metro station.
PLANNING
MIDDLE PERIOD PART

residential community
primary school
IT mall
metro station underground
green belt along the river

Image 6-35 Birdeye view of middle period part
In the east period part, spaces along the river are utilized for landscape and public life. Residential buildings and office buildings are reorganized into clusters with green spaces in the central. High-rise office buildings are set near the planned metro station in the east end.
PLANNING
EAST PERIOD PART

office building community  university dormitory  IT mall  commercial stores  research institution  pedestrian commercial block

government agency  metro station underground  residential community

Image 6-38 Birdeye view of east period part
Area 1 - Plan

- Landscape pond
- Shrub
- Sidewalk
- Cycle lane
- Shopping mall
- Vehicle lane
- Kiosk
- Bench
- Cycle parking
- Bus stop
- Street light
- Office building with stores on first floor
- Car parking
- Green lane
- Landscape pond
- Office building with stores on first floor
- Vehicle lane
Area 1 is near the crossing of the existing metro station. As shown in the plan (image 6-39), the open space in front of the shopping mall are designed into a street plaza. A landscape pond is added in front of the main entrance of the shopping mall building. Public facilities like kiosk (selling newspapers, magazines, beverages, etc.) benches, dustbins, street lights are arranged, also green area of shrubs are considered. These street furniture are also used to separate different space as they are put into the public space in harmonious with the pattern of pavements. The sidewalk on south side is narrower so benches are arranged near the edge of the sidewalk. And the first floor of the building on south side are set back to give more space for pedestrians. And since the first floor are various stores, space for cycle parking are provided on sidewalk with a distinctive color of pavement. Bus stop is redesigned to have wider space and seats for waiting.
DETAIL DESIGN
AREA 1 - RENDERINGS

Rendering A:
bird-eye view of the plaza in front of shopping mall

Rendering B:
designed benches on sidewalk near shopping mall

Image 6-41 Area 1, Rendering A
Image 6-42 Area 1, Rendering B
DETAIL DESIGN
AREA 1 - RENDERINGS

Rendering C:
designed bus stop between vehicle land and cycle lane, cycle parking on sidewalk in front of stores

Rendering D:
benches on narrow sidewalk
DETAIL DESIGN
AREA 2 - PLAN

- residential building
- stores
- sculpture of letters
- high-rise office building
- shopping mall
- 'keyboard' plaza

Image 6-45 Detail plan of Area 2
In Area 2, to make full use of the whole and isolated space in front of the shopping mall (image 6-45), it is designed into an ‘IT plaza’ to show the character of Zhujiang Road. An enlarged ‘keyboard’ is placed on one side of the plaza, each ‘button’ of the ‘keyboard’ has different height, in which the highest is 500mm that can be a seat for relaxation. The ups and downs make it interesting to walk on the ‘buttons’ of the ‘keyboard’. What’s more, there are the sculptures of 26 English letters from the keyboards scattered on the grassland on the plaza, they have different shape and angle with the grassland. Benches are put near those grasslands for relaxation or for parents sitting while watching their children playing on sculptures of letters.
DETAIL DESIGN
AREA 2 - RENDERINGS

Rendering E:
'keyboard' plaza

Rendering F:
sulptures of 'letters' on grassland
CHAPTER 6   DESIGN PROPOSAL

DETAIL DESIGN

AREA 3 - PLAN

- office building with stores on first floor
- IT mall
- pavilion for commercial promotions
- office-commercial building
- office building with stores on first floor
- revenue bureau
- hospital

Location of Area 3

Image 6-49 Detail plan of Area 3
In Area 3 (image 6-49), the design is focus on the public space in front of the IT mall which has been discussed that the space was always crowded of pedestrians as well as people holding commercial promotions. To solve that problems, one method is to widen the sidewalk which has been stated in the design concept. On the base of a wider space in front of the building, specially pavilions are designed closed to the building to provide a certain room for commercial promotions, salesmen can used the space defined under the pavilion for promotion campaign, commercial event or commercial show, or it can just be a landscape of street furniture for pedestrian to relaxed under it. Benches in front of the pavilions are for relaxation or audience seats for those commercial campaign if it is a wonderful commercial show.
Rendering G:
street plaza in front of IT mall, cycle parking on the edge of sidewalk

Rendering H:
pavilion for commercial promotions
DETAIL DESIGN
AREA 4 - DESIGN DESCRIPTION & SECTION

Area 4 is a crossing where various street elements collide in the design (image6-53). Along the existing small river, a linear street park is designed. As this crossing is in the middle length of Zhujiang Road and a metro station will be constructed in the near future, along the river is the best position for a street park. Water and green area provide a natural environment for relaxation. On the northwestern quarter some outdoor coffee seats and a kiosk for selling coffee, beverage and snacks are set. On the southwestern is a large wooden platform under tree shade for conversation, chess, reading, etc. A metro station is near the green area. As the northeastern quarter is an IT mall, so in front of the main entrance of the IT mall a dry fountain landscape is designed, it will make the place lively and vivid in summer, and children are especially be fond of play with water in the fountain. Also pavilions are designed to be an option for commercial promotions as it is a popular IT mall and usually have commercial activities on its outdoor plaza. On the southeastern quarter a square is designed surrounded by tree to be a place for plaza dancing, roller skating or other large activities on the street.
**DETAIL DESIGN**  
**AREA 4 - RENDERINGS**

Rendering I:  
offoor coffee seats

Rendering J:  
linear street park along the small river
DETAIL DESIGN
AREA 4 - RENDERINGS

Rendering K:
metro station in the future

Rendering L:
wooden platform under tree shade
DETAIL DESIGN
AREA 4 - RENDERINGS

Rendering M:
dry fountain on the street plaza in front of IT mall

Rendering N:
roller skating on the street square
Area 5 is chosen to design as a street plaza because there are many residential buildings nearby (image 6-61). Two old residential buildings which were located quite close to the cycle lane are considered to demolish in the design proposal. Based on that, an open space for public is created, and the street have a variation of pedestrian space so social activities are able to happen on those open spaces. Sculptures of geometrical frames with different shapes are designed into three landscape corridors, the lowest height of the corridor is 2.5 and the tallest is 2.8m so both children and adults are able to walk in the corridor. The pavement of ground is soft plastic cement so it is safe for children running on it. Also benches are set near the space for relaxation and watching the playing children and the landscape.
DETAIL DESIGN
AREA 5 - RENDERINGS

Rendering O:
bird-eye view of three corridors

Rendering P:
sculptures in the corridor
DETA B DESIGN N
STREET FURNITURE

Kiosk

Bus stop

Pavilion

Kiosk have windows on two sides selling newspapers, magazines, coffee, beverages, snacks, etc.

commercial board dustbin wooden seat bus information bus information

pavilion for commercial promotions, commercial campaign, commercial shows, public relaxation, etc.
CHAPTER 7
DISCUSSION & CONCLUSION

► RESULTS & THINKINGS OF DESIGN PROPOSAL
► GENERAL SOLUTIONS TO GENERAL PROBLEMS
► CONCLUSION
In the case of Zhujiang Road, there are some specific problems found out in the analysis, suitable solutions are trying to be figured out in the design proposal under the circumstances of the existing physical and social environment, also in the solution-finding process, the theories discussed in chapter 4 provide guidelines for comprehensive thinking.

**Solutions to Traffic Problems**

The most complicated problem as well as the vital one on Zhujiang Road is the traffic problem, the traffic congestion, the mix-use of cycle with sidewalk lane and the bad walking environment on sidewalk are closely connected to each other because the whole width of the street is fixed, but the demand from vehicles, cyclists and pedestrians are all increasing, yet it is inappropriate to tear down all the roadside buildings to enlarge the road width, so facing such conflict, choice must be made and other approach need to be found to cope with this problem. Under this condition, the demand from cyclists and pedestrians are considered higher than vehicles because the significance of street is for staying which has been stressed by Jacobs (1961), Mourghhtin (2003) and Ashihara (1983), in their opinions street’s significance is not just for transportation, especially on commercial street where social activities are conducted frequently. Therefore in the design proposal, vehicle lanes are decreased from 6 to 4 thus the road width is transferred to sidewalk, in this way the sidewalk has decent lane width and proper space for pedestrians and activities, the cycle lane and sidewalk could be separated from each other, pedestrians’ basic needs on second level of the hierarchy – safety (Maslow, 1943) is ensured.

As the width of vehicle lane on Zhujiang Road is shorten in the design, it seems the problem of traffic congestion would be aggravated, so other approach is needed to deal with this problem. However, the opportunity as well as a positive aspect is that in the future development, there will be finally three metro stations on Zhujiang Road, the new pattern of public transportation would bring tremendous changes to the existing transport structure, since the concept of TDM strategy (Ohta, 1998) aims as influencing travelers’ behavior pattern to change the transportation demand, and the case of TDM strategy in Hong Kong succeed in constructing a sound and high-density urban metro system that transfer citizens’ traffic demand from private vehicles to the fast public transportation. Still, rational traffic grid and urban structure is also mentioned and emphasized in TDM strategy, which has been also referred by Jacobs (1961), and there are certain traffic demand of vehicles on Zhujiang Road apart from private cars due to the business needs of the numerous office buildings as well as delivery of electronic products and commercial goods. Based on these thinkings, the traffic grid surrounding Zhujiang Road area is slightly changed – a few urban tertiary roads which are not in a heavy commercial content are upgraded as urban secondary road to bear part of the traffic flow on Zhujiang Road, which forms a more densed and well-proportioned traffic grid. In this way, vehicles would have more options rather than go through all the Zhujiang Road, also this makes cars easy to turn corners on the street is in accordance with Jacobs (1961) theories of diversity. This approach aims to guide the attribution of automobiles (Jacobs, 1961) in a positive and spontaneous way because vehicle lanes give way to sidewalk to create a better walking environment and at the same time other options for vehicles are provided. Meanwhile, the design proposal arrange car parking lots on the transverse road or on the back of buildings to avoid cars stopping on Zhujiang Road and make car drivers go on other roads, so the behaviors of car drivers are also influenced and traffic demand on Zhujiang Road is decreased.
**Solutions for Land-use Disorder**

After the solutions for traffic problems come out, follows the thinking with the land-use organization on the blocks inside the traffic grid. Disorder of buildings as a land-use problem is not that direct visibly compared to the traffic problems like traffic congestion, it required a more comprehensive thinking into the urban environment and the social elements. Mix use of different urban functions contribute the diversity of a street, which has been analyzed on Zhujiang Road - no matter the mixture of commercial buildings, residential buildings, office buildings or the different types of commercial and public functions in the roadside buildings. In Jacobs’s (1961) statements about a street’s diversity, having more than one primary function, buildings mingling various ages and conditions, having a sufficient dense concentration of street users are all happening on Zhujiang Road, and the certain number of residential buildings on Zhujiang Road ensure the effective eyes and stable users on the street, which contribute to the street’s safety (Jacobs, 1961) especially in the night, so to remain the diversity of Zhujiang Road, the amount of different types of buildings are kept in the design proposal. In Rowe’s (1983) views, the mixture of various building represents the collage of city image and remind the city's history, thus in order to keep the character of collage, consciously designing means are needed to combine various urban element together to reach the overall harmony of townscape, which indicates the renovation design of land-use organization on Zhujiang Road – keep all the functions and quantities while slightly reorganize the building layout, especially to gather the scattered residential buildings into several communities for better management and dwelling environment, meanwhile settle commercial use and public services surrounding those residential communities facing to the street.

Besides the rearrangement of the land-use layout under diversity, the design proposal also tries to adapt the land-use to the highly utilization of public transport, like set those high-rise office buildings near the three metro stations on Zhujiang Road to make citizens benefit from the radiation of metro transportation. What's more, to create better city environment, more green lands in city blocks are considered in the planning, the old residential buildings which are too close to the street are demolished in the reorganization to provide open space on the street as well as create the variation of pedestrian spaces. Furthermore, as Ashihara (1983) and Carmona (2010) both have discussions on D/H ratio of street to create a better sense of enclosure and street scale, the building height is considered in design proposal of Zhujiang Road, and because D/H ratio represents the section of street, but when people are going forward the buildings are ‘falling back’ so the D/H ratio is changing all the time, so in real case it is rather to keep a balance of the dynamic D/H ratio, like setting low-rise buildings on the other side of high-rise office buildings. And based on Lin's (2004) supplemental opinions on D/H ratio, the actual perception of street scale of pedestrian is not only the space enclosed by buildings because the existing old big trees on Zhujiang Road have already created a secondary street space, so in this scope street landscape based on human scale is another reference system in the detail design.

**Solutions for Public Spaces & Street Landscape**

In general, the public spaces for pedestrians on Zhujiang Road are the sidewalk and those wider and open spaces in front of buildings and on the street corner of blocks as the building along the road have various distance from the street – the narrower spaces are merely used as sidewalk while the wider places like the open space in front of a shopping mall could be used for staying, meeting, relaxation and social activities, so there isn’t a strict distinction between the sidewalk and those open space for other uses, but consciously design could be done to imply the different type of public spaces on the street. The analysis shows Zhujiang Road is lack of public spaces for various street activities, lack of street furniture for relaxation and lack of street landscape for viewing. To solve these problems, the design proposal aims to create public spaces, beautiful street landscape and design various kind of street furniture on Zhujiang Road. The widened sidewalk space provide possibilities for the detail design on Zhujiang Road.

Public space on a commercial street mainly displays as street plaza and street park, the importance of which has been mentioned by Jacobs (1961) and Ashihara (1983) when talking about street. So the first step is to choose the site for designing as a street plaza or street park on Zhujiang Road, then the walking dimensions referred by Ashihara (1983) is taken into consideration. The whole length of Zhujiang Road in the research is approximately 1.2km, as a...
The lighthearted distance of walking is 300m while the walking distance people may feel like needing vehicle is 500m, so theoretically at least four evenly distributed public spaces are needed along Zhujiang Road, then according to the actual situation on Zhujiang Road, several open spaces in front of shopping mall, IT mall and residential buildings are chosen for designing as street plaza, while the space around the metro station along the small river in the middle along the river and the other one at the east end are chosen for designing into street park.

In creating positive space (Ashihara, 1981; Carmona, 2010), concave spaces (Ashihara, 1981) is chosen to emphasize the sense of enclosure, most street plaza are surrounded on three sides, or two sides by buildings, even those are only in front of buildings, conscious design of the surrounding spaces are done to make it as a positive space. Meanwhile, due to the different type of activities in the space, layout of pavements in different pattern, material and colors are designed to distinguish motions space and static space (Ashihara, 1981) on Zhujiang Road. Motion spaces are deigned rather open, less divided from the sidewalk, while static spaces are mostly differentiated from the sidewalk by trees, shrubs, green lands and street furniture to create a peaceful atmosphere. In addition, the reference system is human (Liu, 2004) in such secondary street space so the detail design is based on human scale and human behavior.

On the side interface of street, many existing small stores on first floor of Zhujiang Road and their multiple, colorful and transparent facades is in accordance with Gehl’s (2004) views of soft edge. And Zhujiang Road has a relatively strong primary profile of building envelops (Ashihara, 1983), so uniform street furniture like benches, street lights, kiosks, tables are designed and arranged on the whole Zhujiang Road thus they are also belong to the primary profile in a regular form. Being as the public property of aesthetics (Ashihara, 1983) on Zhujiang Road, the design of sculptures tries to present the character of information technology of Zhujiang Road, so they are either connected with electronic feature or concise with geometrical characteristics. More green spaces are added to both to create the natural landscape and provide environment under tree shade for pedestrians physical comfort. Also the design or street furniture take human behavior and human feelings into consideration like the distance of benches refers to the distance of sight and hearing to keep privacy while provide possibility for social contact (Hall, 1969; Gehl, 2011). The material of bench surface is wooden. The color of pavements are mainly natural color and neutral color (Ashihara, 1983) to serve as a foil to the commercial advertisements and the colorful clothes of pedestrians on Zhujiang Road.

7.1.2 EFFECTS OF DESIGN PROPOSAL

The design proposal aims at solving the existing problems as well as renovating Zhujiang Road and its surrounding area. It renovated the traffic grid of the area and did some change of the traffic structure on Zhujiang Road. On the basis of keeping the existing diversity and characters of Zhujiang Road, it did some rearrangement of land-use and building layout. Also, the streetscape and public spaces are improved through detail design.

With the renovation design proposal of Zhujiang Road, the problems stated in the analysis would be solved to a large degree. The most obvious improvement would be the sidewalk environment and public spaces on Zhujiang Road, the wider spaces and revised street landscape would bring about more social activities and add vitality to the street, it would be easy to access to Zhujiang Road and walking or staying on the street will be enjoyable and comfortable for pedestrians.

Besides, the traffic conditions on Zhujiang Road would be more fluent and safer than before. The possibility of traffic congestion would be relieved as car drives would have more options in the surrounding traffic grid. Also congestion resulted from stopping of cars and cyclist would be decreased as the parking is rearranged. The street would benefit from the development and high utilization of public transportation especially metro and slow-moving traffic as walking and cycling.

Meanwhile, the diversity of Zhujiang Road would be kept while the environment inside blocks would be promoted. The residents would have a better dwelling environment in those residential communities while enjoying the convenience of commercial and public functions on Zhujiang Road as well as having social activities on the public spaces on the steet.

However, the design proposal also may have limitations. The relived traffic
congestion on Zhujiang Road may result in the congestion on other roads which are upgraded in the road grid, although those roads are not such high-density commercial roads like Zhujiang Road. Also the widen of those roads for more public used and the demolishment of some old residential buildings would result in their residents’ opposition and resentment.

7.1.3 OTHER THINKING AND SUGGESTIONS IN THE CASE

TDM strategies, as has been discussed, aims at decrease the traffic demand by affect travelers’ behaviors. Its way of thinking has been applied in the design proposal, like the renovation of road grid to provide more traffic options, the utilization of metro transportation and the rearrangement of parking spaces to avoid traffic stopping on Zhujiang Road. However, the method related to charging fee has not been adopted in this case because Zhujiang Road is in high-density land-use so the parking lots open to public is limited, so there is no need to raise the parking price. Also the causes of traffic congestion is not only private cars but also vehicles belongs to those commercial buildings and office building, so even set the charging fee to enter these area, the vehicles for commercial delivery and for office buildings are still in demand while those rich private owners can still afford the money. The radical solution for traffic problems in the design proposal goes from the physical environment of the traffic grid, public transportation and parking organization.

As the design proposal focus on the planning of the whole area and the detail design of public spaces, the buildings themselves along the roadside were not taken into consideration in the research, yet here are some suggestions as building facades are also the interface of public spaces on the street. For those office buildings and residential buildings on upper floor, there could be balconies stick out from the buildings to create more contact from the people in the buildings and the pedestrians on the street, so they have intake fresh air and having eye contact with the street to contribute to the safety and vitality of Zhujiang Road. Also because the land tension on commercial street in downtown area, vegetation could appear as vertical green apart from green lands on the ground, so green wall on building facades is another suggestion although the related technology is not such advanced nowadays.

To make highly use of the metro stations on Zhujiang Road, high-rise office buildings are set near the metro station in the design proposal. In this way, to have more public spaces on the first floor around metro station, the strategy of incentive zoning from American urban design can be learnt that if the high-rise buildings provide public spaces and arcade or set back on first floor, then it can be awarded for more building areas on its higher floor (Jin, 123).

Furthermore, to keep a better and tidy environment of sidewalk in front of stores, the business community of shopkeepers can be organized on Zhujiang Road. Therefore, in holidays and festivals they could discuss to stagger the closing time of their stores to guarantee the safety of the street. Also the community could form a monitor system to maintain the outer environment of each stores.
7.2 GENERAL SOLUTIONS TO GENERAL PROBLEMS

The case study of Zhujiang Road aims to solve specific problems by providing specific solutions in design proposal, yet some indications for general solutions to general problems of commercial street in Chinese old downtown area could be summarized after the research of case study.

1). Regard pedestrians prior than vehicles. This is determined by the terminal function of commercial street. If there is conflict of traffic demand between pedestrians and vehicles, the solutions should first consider to ensure a good walking environment by either enlarging the width of sidewalk or tearing down some old shabby buildings according to the actual situation. A clear distinction between sidewalk, cycle lane, and vehicle lane is needed to guarantee safety. Then try to cope with the traffic problem on vehicle lane by other approach.

2). Create a rational and harmonious traffic grid based on present demand. During the evolution and development of city blocks, the old traffic grid maybe is not in accordance with the need nowadays, so changes of traffic grid are needed. The fundamental method to solve urban traffic problem is to create a rational traffic grid. Busy areas need a denser traffic grid in the surrounding to provide options for high traffic flow.

3). Develop good public transportation in old downtown area. In many Chinese cities, metro construction is still in its developing phase. Compared to bus, metro is faster and more convenience. Metro stations on those commercial street can provide good accessibility, encourage the transport means of walking and cycling, and relieve the traffic pressure on the ground. Meanwhile, commercial and business in the radiation loop of metro station can also benefit from its good accessibility.

4). Maintain the diversity of commercial street. Merely commercial function on the street could result in lack of public spaces and safety issue. The combination of commercial buildings, public institutions, residential communities and office buildings can stimulate various needs and create possibility for the vitality on a commercial street, thus public places will spontaneously emerge and sprawl on the open spaces. Although safety issue will be ensured because of the residents nearby. But a rational organization of those functions in land-use is needed.

5). Consciously design public spaces on every period of commercial street. On one hand, pedestrians need relaxation after walking for certain distance; on the other hand, public spaces on every period serve for the surrounding users of the street and create the variation of spaces on commercial street. Public spaces on street are mainly street plaza and street park. Concave space in front of buildings or open spaces on the block corners can be possible choices for social contacts.

6). Create uniform and characteristic street landscape. As commercial streets in Chinese old downtown area are always lack of street furniture like bench for relaxation, sculptures for viewing or vegetation, so such things need to be added in the landscape renovation. Also because those street-front stores and commercial buildings are always appear in various facades shapes, so uniform street landscape can contribute to an integral primary profile of the street. Those design should embody the own characters of the commercial street.
CHAPTER 7   DISCUSSION & CONCLUSION

7.3 CONCLUSION

This thesis conducted a research on commercial street in Chinese old downtown area. It did an in-depth study on commercial street in Chinese old downtown area by analysis and discussion of the general problems and managed to find solutions based on theories related urban function, aesthetic expression and human behavior. An application case study of Zhujiang Road in Nanjing is done by analyzing and assessing its specific problems and solving the problems based on the theories in the renovation design proposal.

After the discussion, four general problems of commercial street in Chinese old downtown area are summarized. The first problem traffic problem, including traffic congestion, mixture of pedestrian s and vehicles, narrow sidewalk, parking issue, poor public transport and irrational walking dimension; the second problem is the bad building condition, including the disorder of buildings, the loss of city identity; the third problem is about public spaces, reflecting as neglect of street life, lack of public spaces and green area; the last problem is of street facilities including carelessness of barrier-free facilities and lack of management. Causes explains those problems are from historical aspect, ideological perspective and separation of disciplines and managements.

To solve the problems, theoretical perspectives are discussed in urban function, aesthetic expression and human behavior. Theories on urban functions focus on the definition and significance of street, the guarantee of safety and diversity of street, and several views and strategies towards the traffic congestion issue. The perspectives of aesthetic expression analyzes street spaces by discussing aesthetic bottom interface and side interface, several types of street space and street plaza, and street landscape including some detail elements. The part of human behavior studies the users of commercial street, human needs on the street, human behaviors and activities, human distance and human dimension, and human friendly design.

The application case of Zhujiang Road in Nanjing is a typical example chosen that represent some general problems as well as the implementation of theories into design. The analysis and assessment reveal the traffic problem, land-use disorder bad walking environment and lack of public spaces and facilities. So the design redistributed the traffic lanes on the road, did some change of the traffic grid, reorganized the land-use pattern, and added public spaces as well as did the detail design. The result of design showed a renovated commercial street and surrounding area, and those problems are to be relieved in the design proposal. Based on the results, six general solutions to general problems in Chinese old downtown area are summarized.

This thesis contribute to the field of urban design by a problem-solving research of commercial street in Chinese old downtown area that the theoretical guidelines and solutions are found based on the problems investigated, also in the application case the specific problems are solved by elaborate research and detail solutions. Meanwhile, it not only focuses on solving problems on the commercial street but connects it with the surrounding urban environment thus the solutions are presented in a broader way.

However, due to the limit of energy and time, this thesis still have some limitations. There may be other general problems in commercial street in Chinese old downtown area and other specific problems in the case of Zhujiang Road as the research are done by literature reading and investigation, a detailed questionnaire survey may needed to gather more comprehensive and more scientific information.

As problems of commercial street in Chinese old downtown area are emerged during the process of city evolution and development. So the solving of problems are always done by renovation rather ran replanning of the whole area. So various social and physical facts may affect the renovation process. A system of adjustable urban traffic grid and modularized urban blocks that easy to rearrange in the future renovation phase and easy to combine with public transport could be a topic for further research.


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