

Evaluation of Convenience for Public Transport according to Built-up Characteristics of Suburban Area

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Synopsis

The built-up process of urban area including the development of transport facilities should be due to the social needs according to the life style. In Japan, the amazing motorization in 1960's has significantly changed the urban structure of many cities. Since then, many cities sprawled out to the suburban area due to be convenient for car use. Therefore recently, the improvement of public transport facilities as well as the conversion of automobiles to public transport should be required to improve the urban environmental problems caused by automobiles.

In this paper, the inconvenience for public transport was analyzed according to the difference of built-up process, in case of Matsubara city of Osaka. Especially, the relationship between transport facilities and travel behavior for daily life was analyzed, and then a transport policy to improve travel convenience of each area was referred, according to the characteristic of built-up process of each area.

KEYWORD: Convenience for public transport, Urban structure, Built-up characteristic, Living condition, Classification of Urban area

1. Introduction

The built-up process of urban area including the development of transport facilities should be due to the social needs according to the life style. Therefore, urban growth, transport system and life-style must be closely related, each other. Especially, the amazing motorization in 1960's has significantly changed the urban structure of many cities in Japan. Since then, many cities sprawled out to the suburban area due to be convenient for car use. Furthermore, huge of automobiles have made the urban environment worse. Therefore recently, the conversion of automobiles to public transport should be required to improve the urban environmental problems. In addition, the alternation of generations has changed the social structure like the nuclear family. As a result, the convenience of living, especially from viewpoint of mobility has changed, then the improvement of convenience for public transport should become one of major works of local government.

In this paper, the inconvenience for public transport is analyzed according to the difference of built-up process, in case of the suburb city of Osaka, Matsubara city. Especially, the relationship between transport facilities and travel behavior for daily life is analyzed, and then a transport policy to improve travel convenience of each area is referred, according to the characteristic of built-up process of each area.

2. Classification of areas for survey

2.1 Area definition based on the convenience of public transport

Generally, the inconvenient area for public transport is defined as the area is located far from the railway station and/or bus stop, or with low service level of them. Then in this paper, the inconvenient area for public transport was defined according to the condition (1) or (2). Of course, other areas except these conditions will be expected to be convenient for public transport.

- (1) The center of area is located more than 700meters away from railway.
- (2) The centre of area is located more than 200meters away from bus stop or the bus service frequency is less than one run an hour.

2.2 Classification of area according to the built-up process

Each urban area has some features from viewpoint of transport facilities according to the built-up process. Some old villages were depressively located, because they were built-up according to the peculiar life style like agriculture. Then, there is not adequate public transport facilities in these areas usually called the old community, as I shown in Table-1. After then, many bed-towns were built-up according to the development of public transport facilities. Therefore, these areas (II in Table-1) are usually convenient for commuting and/or shopping. On the other hand, according to the motorization, some new developments outside of downtown progressed on condition of car use. In these areas (III in Table-1), the inconvenience of public transport has become pointed out, because the family structure has changed according to the alternation of generations. The major features of these three kinds of areas are summarized in Table-1.

Table-1 Major features of peculiar area according to the built-up process

No.	Area pattern	Built-up period	Convenience for public transport	Type of development
I	Old communities	– 1950	gradually become inconvenient	located depressively
II	Convenient area	1950 – 1970	continuously convenient	depend on public transport
III	Independent area	1970 –	rapidly become inconvenient	sprawled out with car use

2.3 Outline of survey

In this study, Matsubara City of Osaka was selected as the case study, because urban structure in Matsubara City has remarkably changed according to both increasing automobiles and decreasing bus services. As a result, the area without public transport service has spread. Then, some inconvenient areas for public transport were selected by applying the conditions mentioned in 2.2. Furthermore, their areas were classified into the area pattern according to the Table-1. Here for seven areas, questionnaire survey was executed to investigate the residential

evaluation of the convenience for life from view point of commuting and shopping, according to the area pattern. The number of distributions and respondents was shown in Table-2.

Table-2 The number of distribution and respondents

Area pattern	I & III	II
Number of distributions	132	162
respondents	110	132
Rate of respondents (%)	83.3	81.5

3. Evaluation of life convenience according to the area pattern

3.1 Evaluation of life convenience

There are remarkable differences of evaluation between area I & III (the inconvenient area) and area II (convenient area), as shown in Figure-1. Especially, in the area I & III, the evaluation of shopping mobility was lower than one of commuting mobility. In addition, the trend is remarkable in case of area I (old community). The major reason of this evaluation may be the decrease of both living facilities like shopping center and transport facilities, due to the depopulating and aging.

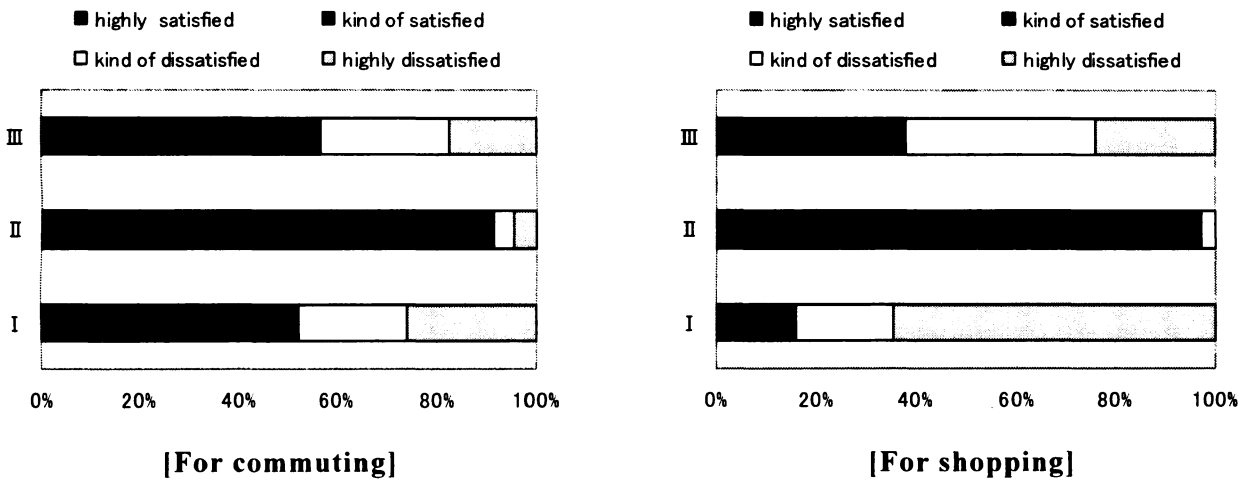


Figure-1 Evaluation for life convenience

3.2 Major transport mode and evaluation for commuting

The difference of major transport modes for commuting according to each area is distinctive as shown in Figure-2. In addition, some major findings came out of this analysis as follows.

- 1) In inconvenience areas, the rate of car use is higher than other area.
- 2) The rate of bus use is extremely low in all areas.
- 3) Even in convenient area for public transport, car use may be popular for commuting.
- 4) Bicycle may become one of typical transport modes for commuting.

On the other hand, the results of evaluation for convenience of major transport are more interesting as follows (See Figure-3).

- 1) In the area II (convenience area), the rate of dissatisfaction for rail service is the highest, nevertheless many people were satisfied with the rail service. The results of area I give us the similar trend in case of car and bicycle uses. From these results, the reason may be clearly different between in the former case and latter case. That is, in the convenient area, people demands more convenience of rail services like the possibility of express trains. On the other hand, in the area I, road facilities may not be sufficient as well as the public transport.
- 2) On the contrary, in the area III, the dissatisfaction for rail service should be remarkable. This may be due to the family structure has changed according to the alternation of generations, as mentioned above.

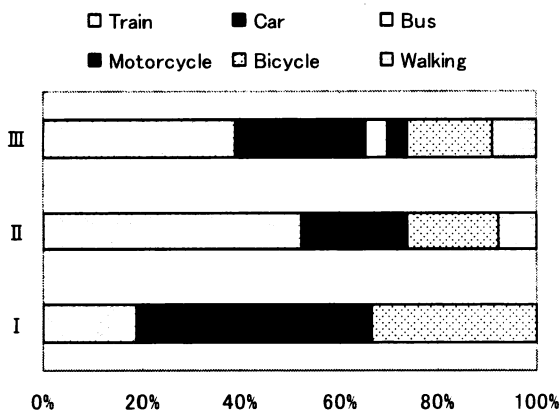


Figure-2 Modal rate for commuting

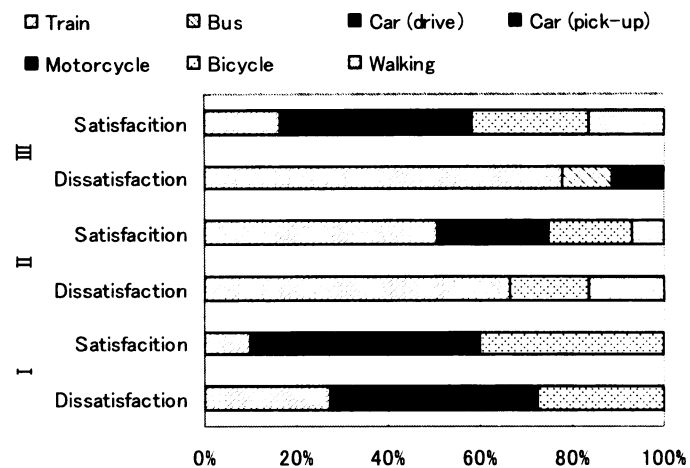


Figure-3 Evaluation for major mode

3.3 Major transport mode and evaluation for shopping

In case of shopping, available modes should be usually influenced by both the mode possession and the location of shopping facilities. In addition, shopping facilities may be located around the rail station or the town center, because many persons concentrate at their places.

Figure-4, 5 shows the place of shopping and the major mode for shopping, according to three types of areas. From these results, major findings came out as follows.

- 1) As the area II has been developed near the rail station or the bus stop, various facilities for living necessities also have been accumulated. Therefore, most of respondents went shopping to the neighborhood shops on foot or by bicycle.
- 2) On the other hand, in the area I & III, many respondents went shopping to the shops where were located far from the residential place, because the big shops like supermarkets were usually located at the specific place, in taking account of parking facility.
- 3) In the suburban area, the car use for shopping seems to be popular style. However, many of residents may do not in the last satisfy such life style, as mentioned above.
- 4) As for shopping, bicycle must be the convenient mode regardless of the difference of area pattern.

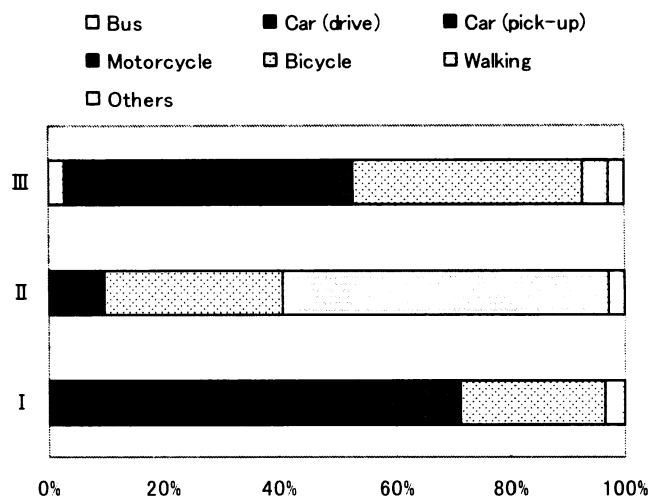
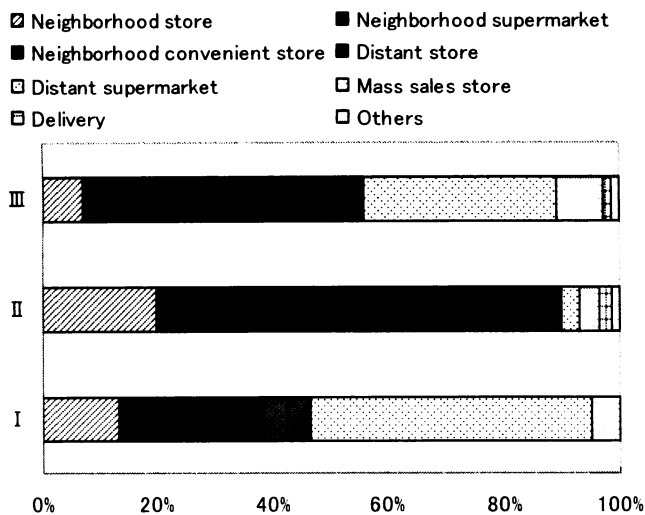


Figure-4 Shopping facilities for daily necessities Figure-5 Modal rate for shopping

Then the degree of satisfaction for the location of shop and available mode was analyzed by using the quantification theory II. A result of this analysis is shown in the Table-3.

As a result, the location of shopping facilities may have stronger influence on the evaluation of the convenience for shopping in comparison with the available modes. Especially, only the combination of shops near home and walking shows the good evaluation for convenience. Therefore, it must be easy to guess that many people in the area I & III do not have good evaluation for shopping of daily necessities. That is, in order to improve the inconvenience of mobility in these areas, it should be important to comprehensively consider the relation between the living facilities, the transport and the housing.

Table-3 Result of satisfaction for shopping by using quantification II

Item	Categories	Graph of Coefficient	Range
Travel mode	Walking	0.7603	-2.183
	Bicycle	-0.3148	
	Motorbike	-1.4225	
	Car(pick-up)	-1.0676	
	Car(drive)	-0.2417	
location of shopping facilities	Distant supermaket	-1.0724	-2.901
	Distant store	-2.5018	
	Neighborhood convenient store	-0.2854	
	Neighborhood supermarket	0.3093	
	Neighborhood store	0.3984	

center of distribution satisfaction : 0.273 correlation ratio : 0.20
dissatisfaction : -0.722

4. Conclusion

In this paper, the inconvenience areas were classified and defined according to the built-up process. For some areas selected from these, the relationship between the major transport mode and evaluation of convenience in case of commuting and shopping was analyzed by using data of questionnaire survey. As a result, some major findings came out of these analyses as follows.

- 1) The present area has developed according the past conditions such as family structure, own modes and major modes for major purpose. Therefore, the evaluation may be considered to change, if their conditions have changed.
- 2) Based on the results of questionnaire survey, the present evaluation of convenience was analyzed according to each area pattern. The evaluation of the convenient area was better than the inconvenient area where was located far from the rail station or the bus stop.
- 3) The worse evaluation in the area I & III may be due to the alternation of generations. That is, it is imaginable that the major mode has changed to other modes from automobile, or the road facilities have not been insufficient.
- 4) Especially, many respondents require the shops near home which were available on foot. In case of inconvenient areas, the convenience of bicycles is required.

From these results, it may be estimated that various areas have been developed according to the needs of each life style. However, the change of needs owing to the alternation of generation seems to become inconsistency with the urban structure. Therefore, it should be important to comprehensively consider the relation between the living facilities, the available transport and the housing, in order to improve the inconvenience of mobility in these areas. In addition, in order to improve the transport system to match the present needs of residents, more data with the passing of the years should be required.

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