STUDY ON FUNCTION OF COMPONENTS OF DYNAMIC SYSTEM OF TOURISM DEVELOPMENT IN DEVELOPED REGION
——A Case Study of Foshan in Guangdong Province

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ABSTRACT: In the forming of the Dynamic System of Tourism Development （DSTD）in developed regions from the view of supply side, the Delphi Method and the Analytical Hierarchy Process(AHP) are used to count the weight of each component of the DSTD. It has been found that the attraction subsystem is the most important one of the three subsystems at the first hierarchical level of DSTD, which means that tourist attractions are always the principal factors for regional tourism development, even in developed regions. But it is also noteworthy that the significance of the attraction subsystem is not dominant in the DSTD. At the second hierarchical level, the physical attraction subsystem rank No. 1, while the weight of the non-physical attraction subsystem is just a little larger than the weight of the hardware subsystem and that of software subsystem. And the weights of the three components in the medium subsystem are similar. The top 3 factors at the third hierarchical level are scenic spot, location and regional economic impact. The result verifies the conclusions of qualitative analysis, which depends on the market research and the study of historical date, that the most important component of the DSTD in Foshan is the impact of the developed economy. Knowing the weight of each component of the DSTD can be helpful to make out the most useful force, furthermore to determine the future orientation for regional tourism development.

KEY WORDS: developed region; dynamic system of tourism development; weight of component

Based on the literature review, previous qualitative analysis, and the market research, a dynamic system of tourism development from the view of supply side is formed for the city in developed region, which can be applied to realize which components are driving the development of regional tourism, what the functions of them are and which factor is the main force for tourism development. Foshan City is taken as a case in this paper to carry out quantitative analysis and finger out the function of each component in the Dynamic System of Tourism Development(DSTD).

## 1 DYNAMIC SYSTEM MODEL OF URBAN TOURISM DEVELOPMENT IN DEVELOPED REGION

The attraction subsystem defined in the DSTD comprises all types of tourism attraction which contact the tourists and create the travel pull directly(Fig. 1). The components of the subsystem can be the direct force and motive for the travel. The subsystem is composed of physical attraction, and non-physical attraction.

The supporting subsystem means the environment which supports the survival and development of tourism attractions and the tourism organizations that contact the tourists directly(Fig. 1). Though the tourists will not involve in the components of the support subsystem, their travel activities would be affected by the factors inevitably. The subsystem can be regarded as the environment for the whole system development, and it can also be the tourist attraction in some extent. A good eco-environment of the region can be not only the support factor to tourism development but also the attraction

Fig. 1 Dynamic system of urban tourism development in developed region
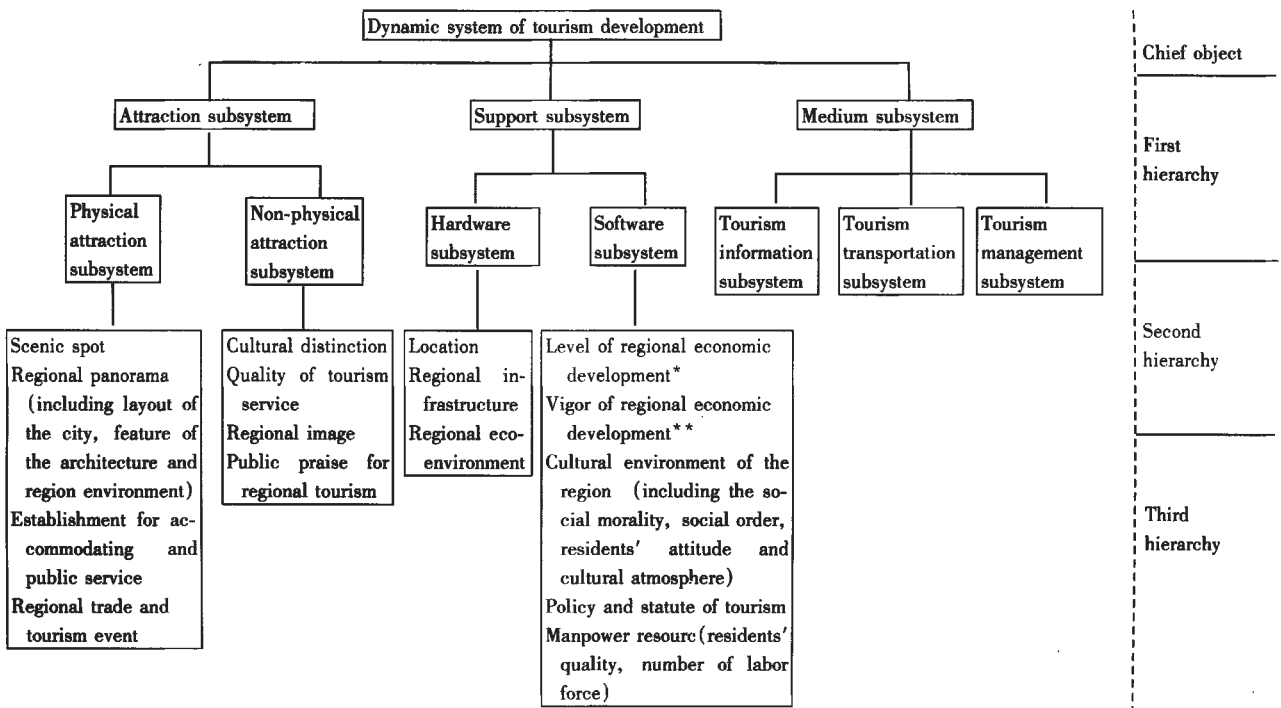
＊ The factor is defined to reflect the status quo of regional economic development, with the index of the factor including average GDP per capita, degree of urbanization and structural proportion of three industries.

＊＊ The factor is defined to reflect the capability of the region to create market opportunity, with the index of the factor including the amount of regional exportation, the amount of foreign capital actual used and the amount of retail of social consumption.

factor to the tourists, e. g. the environments of the cities such as Singapore's cities and Dalian are so good to be the tourist attractions. For the destination that attracts the tourists simply relying on the scenic spot, the function of the support subsystem is just an environment for tourism development.

The medium subsystem involves those components that link the demand side and the attractions(Fig. 1). It can ensure the performance of the travel. The components of this subsystem can not only guide the demand side, associate the supply with the demand, but also instruct the production according to the consumption.

2 RESEARCH AREA AND METHODS

2. 1 Research Area

Foshan City lies in the mid-south of Guangdong Province, the hinterland of the Zhujiang(Pearl) River Delta. Its east boundary adjoins to Guangzhou, the south boundary to Jiangmen and Zhongshan, the west part to Zhaoqing, and the north to Qingyuan. The external transportation of Foshan to Shenzhen, Zhuhai,

Hongkong and Macao is convenient. The whole area of administrative region of Foshan is 3813. 64km², and the downtown area is 77. 4km². The proportion of non-agriculture population is 43%. There are 4 cities governed by Foshan and two of them, Nanhai and Shunde, are the two of the Four Litter Tigers Cities named for their developed economy in Guangdong Province.

The GDP of Foshan in 2000 was more than 95. 7 billion yuan(RMB), and the average GDP per capita was more than 28 thousand yuan. It ranks respectively No. 3 and No. 4 in Guangdong Province. Based on the 5th population census, the population of Foshan is 5. 33 million. In terms of the GDP and the number of population, Foshan is a developed metropolitan.

In 2000, the total income of tourism of Foshan was 5. 6 billion yuan, of which the international tourism income occupied 159. 73 million US dollar, and the accommodation of tourist was 4. 83 million. They all rank No. 4 in Guangdong Province. Therefore the tourism development of Foshan is in the mature stage, and the case study can be spread to other similar regions.

2. 2 Methodology

2. 2. 1 Choice of the methods

To estimate the function of components of DSTD requires the evaluation of the importance of each component. As the indexes are difficult to be quantified, the Analytical Hierarchy Process （AHP） is used to calculate the weight of each component with the aid of some internal experts' opinions through the method called Delphi Method, which is to consult the experts through questionnaires and get their opinions of the study. These two methods have been used to calculate the weight of components in the evaluation system of the tourism attractions and that of components in the model used to distinguish the type of tourist destinations （CHEN, 1989; CHU, 1992）.

2. 2. 2 Delphi Method & Analytical Hierarchy Process

（1）Delphi Method

There are two ways to get the weight of factors in Delphi Method. One is to ask the experts to mark exactly for each factor. The other is just to ask the experts to compare the significance of the factors and mark the grade. Furthermore the original data is analyzed to get the exact weight. The second way is believed to be more credible because the result is got by logical calculation （CHU, 1992）.

（2）Analytical Hierarchy Process

The basic idea of AHP is the comparison between each two factors, which is relatively easy to be done. The final object could be reached after the whole comparison. The components of the system are classified into several regular hierarchies. The significance of those components in the same hierarchy is compared and marked. Mathematical method will be used to scale and educe the significance value of each component, which is the weight of component （CHU, 1992）.

The comparison between the components in one level is based on a principle of the upper hierarchical level. Usually numbers $1-9$ are used to scale the hierarchical significance of components （XU, 1988）.

In this paper, an improved method cited from CHU Yi-fang's Ph. D. dissertation （1992）, which is more effective for the regional analysis, is used, which is given as follows.

Step 1: Scale the weight of each factor through Delphi Method according to experts' opinions on the relative significance of each factor. The final comparative scalar of each factor can be reached by transforming the representative position that experts hold into corresponding scalar, which is given by

$$B = \frac{\sum_{i=1}^{m} n_i a_i}{m-1} \qquad (1)$$

where B is the representative position that the experts hold; m is the total number of the experts; n_i is the number of experts that hold the ith opinion; a_i is the corresponding number of the ith opinion.

It is noticeable that the numbers of the experts' opinion range from 1 to 9. Therefore, the scalar that the experts chose should not be taken as a_i.

Step 2: Range the matrix of the relative significance（Table 1）based on the final relative significance scalar A_{jk}, and $A_{kj} = 1/A_{jk}$.

Table 1 The matrix of the relative significance of factors

	A_1	A_2	A_3	…	An
A_1	1	A_{12}	A_{13}	…	$A_{1\,n}$
A_2	A_{21}	1	A_{23}	…	$A_{2\,n}$
A_3	A_{31}	A_{32}	1	…	$A_{3\,n}$
				…	
An	An_1	An_2	An_3	…	1

Step 3: Count the nth root of each row of the matrix.

$$T_j = \sqrt[n]{\prod_{k=1}^{n} A_{jk}} \cdot K \qquad (2)$$

where T_j is the nth root of row j; A_{jk} is the element in row j and line k, which means the final significance scalar gotten from the comparison of factor j and factor k.

Step 4: Educe the weight of each factor （CHU, 1992）.

$$Q_j = \frac{T_j}{\sum_{j=1}^{n} T_j} \qquad (3)$$

where Q_j is the weight of factor j.

3 RESULTS AND ANALYSIS

3. 1 Results of Delphi Method

Forty-five copies of questionnaires were sent to internal experts who major in tourism and geography （including the tourism geography and urban geography）, and the experts who work in Guangdong Tourism Bureau, Foshan Tourism Bureau and institutions of urban planning and management. Thirty-two copies were returned, in which 967 valid answers were got except for the contents that haven't been filled and the paradoxical answers. About 71% of the returned copies were finished by the scholars holding advanced title of

professional post and those who work for the government, 83% of which are specialists in tourism geography or economic geography. The results are reliable for their concentration of opinion, even though the second round of consultation has not been done for the time limitation.

3. 2 Analysis of the Results

The second way of Delphi Method was used to get the weight of the components, which is to ask the experts to compare the significance of the components and mark the comparative scalar. Then AHP was used to calculate the weight of each component.

3. 2. 1 The first hierarchical level

The weight of attraction subsystem is 0. 4258, which ranks No. 1 at the first hierarchical level. Therefore the attraction subsystem is the most important subsystem of the three subsystems in the DSTD of Foshan. The tourist attractions are always the principal factors for the regional tourism development, even in the developed region. The attraction subsystem involves not only the physical attraction, but also the non-physical attraction, which is usually ignored or neglected. The support subsystem is weighted as 0. 3173, larger than

the medium subsystem, which shows its important role in the DSTD too (Table 2).

Table 2 Weights and ranks of the components at the first hierarchical level

	Attraction subsystem	Support subsystem	Medium subsystem	Total weight
Weight	0. 4258	0. 3173	0. 2569	1
Rank	1	2	3	

3. 2. 2 The second hierarchical level

The steps of calculating the weight of factors at the second hierarchical level is consistent with that at the first hierarchical level. The physical attraction subsystem ranks No. 1 at this level. The weight of the non-physical attraction subsystem is just a little larger than the weight of the hardware subsystem and that of software subsystem. The weights of the three components in the medium subsystem (information, transportation and management) are similar (Table 3). The results show that except for the physical attraction, which is the traditional attraction, the hardware subsystem and the software subsystem also have a great effect on the regional tourism development.

In this study, the physical subsystem includes not

Table 3 Weights and ranks of the components at the second hierarchical level

	Physical attaction subsystem	Non-physical attaction subsystem	Hardware subsystem	Software subsystem	Tourism information subsystem	Tourism transportation subsystem	Tourism management subsystem	Total weight
Weight	0. 2435	0. 1823	0. 1700	0. 1473	0. 0908	0. 0877	0. 0784	1
Rank	1	2	3	4	5	6	7	

only the traditional tourism attractions(the scenic spots), but also the urban panorama, establishments for accommodating, public services, and the regional trade and tourism events. The weight of physical subsystem would decline if it contains only the traditional tourist attractions. It's obvious that the tourist attractions are rather important, but they are not the only determinant factor of the DSTD in the developed cities.

3. 2. 3 The third hierarchical level

The sequence of the components at the third hierarchical level reflects the character of tourism in the developed region most deeply (Table 4). There are 16 components at this level, the weights of which are all of small value. The rank of weights can reflect the important interrelations between components. Scenic spot is the most important factor in tourism development, which accords with the traditional idea that natural resource is the determinant and pre-determinative factor for regional

tourism development. Location ranks No. 2 in all the factors at the third hierarchical level, which shows that location can influence the urban tourism development greatly in the developed cities such as Foshan, in which high quality tourist attractions are lacking but which lies in the center of developed region and has the convenient transportation connecting with the metropolitans nearby. The sum of two economic factors which reflect the state of the regional economic development from different view, level of regional economic development and vigor of regional economic development, is 0. 0650, which ranks No. 3 in the third level, even though each of the factor does not occupy a large proportion respectively. Generally, the top 3 factors in the third hierarchical level are scenic spot, location and regional economic factors.

The regional panorama, regional trade and tourism events, establishments for accommodating and public

Table 4   Weights and ranks of the components at the third hierarchical level

	Scenic spot	Regional panorama	Establishment for accommodating and public service	Regional trade and tourism event	Cultural distinction	Quality of tourism service
Weight	0.0713	0.0609	0.0563	0.0551	0.0492	0.0461
Rank	1	3	4	5	7	9
	Regional image	Public praise of regional tourism	Location	Regional infrastructure	Regional eco-environment	Level of regional economic development
Weight	0.0440	0.0430	0.0690	0.0480	0.0530	0.0328
Rank	10	11	2	8	6	12
	Vigor of regional economic development	Cultural environment of the region	Policy and statute of tourism	Manpower resource	Total weight	
Weight	0.0322	0.0297	0.0272	0.0255	0.7431	
Rank	13	14	15	16		

services, regional eco-environment and regional infrastructure rank from No. 4 to No. 8 in the total 16 factors at the third hierarchical level. All of them are important factors in the DSTD, which are influenced by the regional economic development level more or less. From the weight of the scenic spot, it also shows that the scenic spot is not the absolutely determinant factor in tourism development, and it proves once again that the scenic spot is all-important but not determinate for the tourism development in the developed region. The results show that the tourism development in the developed regions depends on the complex dynamic system which is composed of all forcing factors.

The results show that the sum weight of scenic spot and regional panorama is 0.1322, which means that the function of the sightseeing attractions which affect the sightseeing tourists most deeply is not more than 15% for the tourism development in Foshan, while more than 85% power which forces the tourism development in Foshan is not derived from the sightseeing attractions. In 1998, the income of the scenic spot in Foshan was about 15% of the total income (Table 5), which is very closed to the weight of sightseeing attractions to the tourism development of this study. It justifies the rationality of the weight calculation to a certain extent.

Base on the rank of the weight, weight of each components of DSTD can be educed (Table 6).

4 SIGNIFICANCE OF THE STUDY ON THE WEIGHT OF COMPONENTS OF DSTD

4.1 To Verify the Result from Qualitative Analysis

Based on the market research and the analysis of the historical data of tourism development of Foshan (ZHONG, 2001), the most important character of tourism development in Foshan has been found through qualitative analysis of DSTD, which is that the developed economy has significant impacts on the tourism development.

(1) Impacts on the components of the system.

The flourishing regional economy can sustain the construction and operation for the infrastructure, eco-environment, tourism information system, tourism transportation system and tourism management system strongly, which is related to the residents' accomplishment.

(2) Impacts on the business tourism.

The flourishing economy of Foshan extends the research viewpoint from traditional "sightseeing" to other

Table 5   Turnover of the tourism sector in Foshan, 1998

	Scenic spot	Appointed shop for tourists	Hotel	Travel agency	Total
Turnover($\times 10^4$ yuan)	2978.5	7090	9000	66769	193137.5
Proportion(%)	15.16	3.67	46.60	34.57	100

Sources: Tourism Bureau of Foshan City.

types of tourism. The business trade and the image of modern city brought by the regional economic development, and the market opportunities created by the vigor

of economic development, have great impacts on the development of business tourism in Foshan.

The results from qualitative analysis on the char-

Table 6 Weight of components in dynamic system of tourism development

First class subsystem	Weight	Second class subsystem	Weight	Third class subsystem	Weight
Attraction subsystem	0. 4258	Physical attraction subsystem	0. 2435	Scenic spot	0. 0713
				Regional panorama	0. 0609
				Establishment for accommodating and public service	0. 0563
				Regional trade and tourism event	0. 0551
		Non-physical attraction subsystem	0. 1823	Cultural distinction	0. 0492
				Quality of tourism service	0. 0461
				Regional image	0. 0440
				Public praise of regional tourism	0. 0430
Support subsystem	0. 3173	Hardware subsystem	0. 1700	Surrounding of location	0. 0690
				Regional infrastructure	0. 0480
				Regional eco-environment	0. 0530
		Software subsystem	0. 1473	Level of regional economic development	0. 0328
				Vigor of regional economic development	0. 0322
				Cultural environment of the region	0. 0297
				Policy and statute of tourism	0. 0272
				Manpower resource	0. 0255
Medium subsystem	0. 2569	Tourism information subsystem	0. 0908		
		Tourism transportation subsystem	0. 0877		
		Tourism management subsystem	0. 0784		
Total	1		1		0. 7431

acters of DSTD in Foshan show that both the sightseeing and holiday tourism are the main forces for the tourism development of Foshan. The primary attractions for the short distance sightseeing and holiday tourists are the characteristic scenic spots, while the primary attractions for the long distance business tourists are the level and vigor of the urban economic development, and the market opportunities corresponding to the economy.

It is proved again that the weight of tourist attractions for sightseeing and vacationing occupies not more than 15%, which corresponding to the percentage of income of the scenic spots in the whole income of tourism in Foshan. It is obvious that the market of sightseeing tourist just works to some degree, but not the only force for the tourism development in Foshan. The weights of the factors such as location, urban economy, business trade and tourist events, etc, which impact the business tourism directly, are in the front line of the whole components of DSTD. The results also validate how important the business tourists are to the tourism development of the developed region.

The conclusions drawn from the weight analysis are coincided with those drawn from the qualitative analysis on the characters of the components of DSTD in Foshan.

Therefore the quantitative analysis testified the features of DSTD in the developed region, in such developed regions, the regional economy and systematic factors are main influence forces in DSTD.

4. 2 Comparing Study — Horizontal and Longitudinal Comparison

Though the weight calculation is based on the situation of Foshan, the conclusions and methods of this case study can be used as references to the DSTD of the cities in the developed region.

(1) Horizontal comparison.

The model of DSTD and the methodology of the dynamic study can be used to other developed regions after being improved according to their features.

The weight of the components in other developed cities can be used to compare with those of Foshan. As for the regions whose tourism development belong to other type, for example, the ones not belonging to the economy driving type but the tourist attractions driving type, the systematic methodology can also be used to analyse the system components and the weight of the components, and regional differences in the model of

DSTD can be shown. Then the comparison can be done among different type of regions, and further features of different type of region can be concluded.

(2) Longitudinal comparison.

The DSTD of different stages in one region can be compared. According to the life cycle theory, the tourism destination can be divided into different development stages. It is possible to divide the different stages of regional tourism development depending on the regional historical data of tourism. The DSTD can be used to calculate the weight of each component in different system of the corresponding development stage and to find out the driving force for tourism development in different stages. The longitudinal comparison of driving force for tourism development in one region is useful for summarizing the feature, forecasting the tendency, and strengthening the main force of regional tourism development.

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