Research on the Construction of the Common Prosperity Communication Service Index

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Abstract: With the social and economic development, communication services are increasingly closely related to common prosperity. Through a systematic review of the existing research on the common prosperity theory and the evaluation index system, this paper constructs the "Four Heights" dimension of the common prosperity measurement, which includes "high-quality development", "high-quality life", "efficient service" and "high-level sharing". Taking the field of communication service as an example, the common prosperity communication service index model is designed, and the common prosperity communication service index system is formed, which contains 4 first-level indicators, 12 second-level indicators and 12 third-level indicators. The weights of each indicator in the communication service index model are assigned by the method of hierarchical analysis. The Common Prosperity communication service index model is helpful to evaluate the progress of promoting common prosperity from the perspective of communication service development and explore the way for the cause of common prosperity of socialism with Chinese characteristics.

1. Measure of Common Prosperity

Common prosperity is the organic unity of common and rich. "Common" is used to describe the scope of the realization of affluence, which is relative to the polarization phenomenon caused by private ownership; "Affluence" is used to express the degree of abundance, as opposed to poverty. Common prosperity is the elimination of polarization and poverty based on the general prosperity. Because of their different qualities and contributions to the society, members of the society differ in the amount of wealth they possess. Therefore, common affluence is the difference of affluence on the basis of general affluence. Only by acknowledging the difference in the degree of affluence can we mobilize the enthusiasm of the people to develop the economy and provide an example for high-level affluence.

It is because of the difference of common prosperity that it is more necessary to measure common prosperity. At present, the academic community has not reached a consensus on the standard formulation and level measurement of common prosperity, but many literatures have explored it. Li shi to common prosperity index selection and evaluation standard based on all the people's standard of living and sharing degree [1], income, property and public service level of the three has a direct impact on residents' welfare and living standards of variables to measure wealth, the property income

gap, gap, different people will have access to public services differences as a proxy variable to measure degree of sharing. Liu Peilin et al. started from the connotation of common prosperity [2], constructed the overall framework of the index system according to the two dimensions of overall prosperity and the sharing degree of development achievements, and measured the sharing degree of development achievements through the three sub-dimensions of population, region and urban-rural gap. Li Jinchang and Yu Wei constructed a common prosperity index system from the aspects of simultaneous increase of economic quality and efficiency [3], coordination and balance of development, rich spiritual life, global beauty construction, social harmony and harmony, good public services, sharing, affluence and sustainability.

In general, the existing domestic evaluation studies on common prosperity have deepened the understanding of the connotation of common prosperity and enriched the index system of common prosperity. However, the selection of existing evaluation indicators also has the phenomenon of the same index setting, and there is still a big difference with some international popular evaluation value concepts. The evaluation of common prosperity still needs to overcome the following limitations: First, in terms of the evaluation content, it lacks a novel perspective, which is not of high decision-making significance for promoting the construction process of common prosperity in the new era; Second, in terms of evaluation subjects, too many evaluation subjects will consume a lot of human resources, resulting in great cost pressure, on the contrary, too few evaluation subjects lack objectivity and universality, resulting in the decline of measurement accuracy; Third, in the measurement of indicators, Gini coefficient, dispersion coefficient and other measurement indicators are only limited to the fairness of the results, the determination process is simple, and there is a certain deviation from the connotation of common prosperity.

2. The "Four Dimension" of the Measure of Common Prosperity

In order to eliminate and avoid the limitations of the existing literature, such as incomplete perspective, weak operability and controversial measurement standards, it is necessary to rethink the dimension of the measure of common prosperity. This article starts from the new era development concept to construct the four dimensions of "High-quality development" "High quality of life" "efficient service" and "high-level sharing" meet the requirements of The Times in the decisive period of common prosperity to improve the quality and efficiency of development.

High quality development is the premise of common prosperity. Improving people's quality of life is the fundamental purpose of development. Efficient governance (service) is an effective way to promote social fairness and justice, and improve people's sense of happiness and security. High level sharing is the starting point and end result of common prosperity. The four dimensions constructed in this paper are comprehensive because they carry out an equal review of the process of common prosperity from multiple perspectives, such as economic development, people's livelihood, social governance, and group security; These four dimensions classify the measure of common prosperity horizontally, and carry out vertical block measurement between each dimension, which enhances the logicality and operability of indicator evaluation and measurement, so it is feasible.

The dimension of "high-quality development" is to investigate the development of new products, new formats and new models in the new era according to the development concept of the new era, and to comprehensively and efficiently measure common prosperity from the perspective of improving quality and efficient development, combined with China's actual development process. The dimension of "high-quality life" is to meet the "three uses" requirements of "being available, affordable and well used". It aims to serve the people and realize the aspiration for a better life. From the perspective of people's livelihood, it examines the people's sense of gain, happiness and security, and comprehensively and efficiently makes a reasonable measurement of common prosperity.

The dimension of "efficient service" is aimed at the call of the times of "seeking more benefits for the people's livelihood and solving more worries about the people's livelihood". It is aimed at different social groups to investigate the well-being index of children with education, education, income from work, medical care, security for the elderly, housing, and support for the weak, so as to comprehensively and efficiently conduct a reasonable measurement of common prosperity.

The "high-level sharing" dimension is aimed at the era purpose of "development for the people, development depends on the people, and development achievements are shared by the people". It comprehensively converts the aforementioned "high-quality development", "high-quality life", and "efficient service" indexes, so as to comprehensively evaluate the sharing level of work at this stage, and comprehensively and efficiently calculate the common prosperity.

3. Communication Service Index System for Common Prosperity

With the development of social economy, communication services are increasingly closely related to common prosperity. Based on "four heights". As for the common prosperity index dimension [4], this paper constructs the common prosperity communication service index system, which helps the communication service. Measure the degree of common prosperity.

3.1 High Quality Development

This dimension takes "high-speed ubiquitous, heaven and earth integration, cloud network integration, intelligence and agility, green low-carbon, safe and controllable" as the direction, and judges the development level of high-quality services based on the information construction of communication services. This dimension is subdivided into two major indicators: 5G ubiquitous and gigabit high-speed rail [5-6].

3.1.1 5G Ubiquitous

This indicator takes 5G base station density and 5G base station number per square kilometer as the proportion of the total number of base stations. As a specific measurement indicator, the former focuses on measuring the coverage and accessibility of 5G infrastructure. It reflects the intuitive level of high-quality development of communication services; The latter emphasizes the promotion process of 5G infrastructure. Degree and utilization efficiency, which reflects the optimization degree of communication service structure.

3.1.2 Gigabit High-speed Rail

"Gigabit high-speed rail" is selected based on the per capita optical fiber length and the total number of gigabit broadband coverage. The former focuses on the intuitive sub layer of high-quality development of communication services, that is, measuring the coverage of gigabit optical network infrastructure. Rate and accessibility; The latter still emphasizes the gigabit optical network from the perspective of the optimization degree of the communication service structure. Promotion degree and utilization efficiency of infrastructure.

3.2 High-quality Life

Relative to the "high quality development" index based on the measurement of infrastructure construction to promote the high-quality development of communication services, the construction of the "high-quality life" index will point to the perspective that communication services directly promote the improvement of people's quality of life. Specifically, it is divided into three levels,

respectively is to improve the quality of personal life "enjoy life" index; to enhance the level of family intelligent life of the "Intelligence Benefits All Families" index; the "silver guardian" index that helps the elderly cross the digital divide. Each level measures communication services from the perspective of (1) being usable, (2) affordable, and (3) being well used, so as to bring more sense of gain to the people.

3.2.1 Enjoy Life

The foothold of the development of the communication service industry is to realize people's yearning for a better life, is to let hundreds of millions of people in the sharing of digital technology development results have more sense of gain. The indicators are selected as (1) per household traffic, (2) per household communication expenditure, and (3) number of 5G terminal customers.

3.2.2 Intelligence Benefits All Families

Home is a small unit under common prosperity, and ensuring that the needs of each household for a better life are met is an important criterion for measuring common prosperity. The indicators of the "Intelligence" index are selected as (1) average broadband flow per household, (2) Smart technology benefits the number of households (3) number of APP classified monthly live customers.

3.2.3 Silver Guardian

Allowing the elderly to have more sense of gain, happiness and security in the development of information technology is an inherent requirement for promoting high-quality development and achieving common prosperity. The measurement indicators include: (1) Mobile Internet Traffic per Elderly Household, (2) Elderly Household Communication Expenditure, and (3) the proportion of smart terminals for the elderly.

3.3 High Efficiency Service

The evaluation of high-efficiency services is decomposed into four indices: the "cloud Financing Hundred Industries" index that serves the intelligent real economy; the "inclusive small and Micro" index that help small micro enterprise digital; the "Smart Integration of urban-rural" index that accelerate the narrowing of urban-rural differences; the "Smart Governance Assistance" index for energizing equalization of public services. Similarly, each level measures communication services from the perspective of (1) usable (2) affordable, and (3) well-used, so as to bring more sense of gain to the people.

3.3.1 Cloud Financing Hundred Industries

As a measure of the content of the communication service industry to provide high-efficiency services for enterprises, the indicators are (1) Enterprise cloud rate (2) Single Group Information Consumption (3) average broadband bandwidth per unit.

3.3.2 Inclusive Small and Micro

Allowing small and micro enterprises to share digital dividends, relieve worries and difficulties for small and micro enterprises, and help their development is also an inherent requirement for achieving common prosperity. The indicators are (1) the number of small and micro developments, (2) the average bandwidth cost of small and micro enterprises, and (3) the average bandwidth of small and micro enterprises.

3.3.3 Smart Integration of Urban and Rural Areas

Refers to the service level of communication services in urban and rural digitalization, and the indicators are (1) the number of Internet of Things connections (2) the number of super SIM card customers (3) the number of village-level private lines (4) the average bandwidth of village-level private lines.

3.3.4 Intelligent Governance Assistance

It is measured from the two aspects of people's livelihood security and digital intelligence anti-epidemic to show the public assistance provided by communication services.

3.4 High-level Sharing

This index uses the number of communication service customers as the weight, and calculates the Gini coefficient of the aforementioned "high-quality development", "high-quality life" and "high-efficiency services" indices to construct a "high-level sharing" index and comprehensively evaluate the work of communication services.

4. Weight Assignment and Synthesis of Common Prosperity Communication Service Index

4.1 Processing of Original Data Indicators

In order to make the data more objective and intuitive, the original data should be indexed, and some data structures and data with problems should be specially processed. The indexing of raw data is essentially a process of de-dimensioning [7]. There are two main models, one is the variable basis index, the other is the fixed basis index.

The variable basis index is the ratio between the current period value and the previous period value, which can intuitively reflect the dynamic change in the short term. The formula is as follows:

$$I_t = \frac{X_t}{X_{t-1}} \tag{1}$$

However, when the observation period is more than two periods and there is a demand for trend observation in the total period, the variable basis index is no longer applicable, and the second method, fixed basis index, is adopted, that is, a certain period is selected as the machine and other periods are selected. Index is obtained by comparison with the base period. With the increase of the year, a combination of the two models should be adopted to obtain an objective and fair index calculation. In this paper, two modes are combined to calculate the index.

4.2 Weight Measurement

In order to determine the tertiary, secondary, primary index between the weight of target layer and rule layer structure relations and with contrast between importance index, this paper design the communication and common prosperity index "AHP expert consultation questionnaire", experts and practitioners to help determine the relative important degree evaluation index, experts and practitioners to help determine the relative important degree evaluation index, the questionnaire will be for detailed interpretation of the different indicators, guide the respondents Pairwise comparison and judgment of each evaluation index. The scale method is mainly used as the evaluation standard, and the comparison measurement scale is divided into nine grades, namely, equal importance, slightly strong, strong, strong, absolutely strong and the intermediate values of the above scales,

corresponding to 1, 3, 5, 7, 9 and the intermediate values of 2, 4, 6, 8 respectively. The dimensions of the questionnaire were compared six times. The scale method and the scale matrix constructed by the questionnaire are shown in Table 1 and Table 2:

Table 1: Scale method

Importance	Definition	Words to describe
1	equally important	The two elements are equally important
3	A bit better	One element acts slightly more strongly than the other
5	strong	One element is clearly stronger than the other
7	stronger	One element is stronger than the other by a large margin
9	Absolute stronger	The maximum size over which one element is stronger than another
2, 4, 6, 8	The middle of the scale above	The middle of the scale above

Note: The top left corner of the table is the criterion for comparison. For example, row i and column j indicate that under this criterion, the elements in row i compare with the j.

That's how much more important the element on the left is than the element on the top row, for example, X_i is slightly more important than Y_j, so row i and column j are three, so column j i is one/three.

The second step, according to the comparison of different levels of indicators, can constitute the judgment of short array A. Element a in row i and column j of the matri a_{ij}, (i, j=one, two, three, four) represents the result of comparing the importance of a_i with that of a_i.

In the third step, the geometric mean of each scale of each row of the judgment matrix is calculated and marked as W_i. Then it is normalized to obtain the weight coefficient Gi, the specific formula is as follows:

$$G_i = \frac{w_i}{\sum W_i} \qquad (2)$$

At the same time, in order to ensure the scientific and rigor of the index system, the consistency test of the questionnaire results should be carried out. The index CI, which is used to measure the deviation degree of the judgment matrix from the consistency, should be used, and the calculation formula is as follows:

$$CI = \frac{\lambda - n}{n - 1} \qquad (3)$$

(In the above table, λ is the maximum eigenvalue. RI is the average random consistency index)

When CI=0, it indicates that the judgment matrix has complete consistency; on the contrary, the larger the result of CI is, the worse the consistency of the judgment matrix is. At the same time, considering random errors and other factors, CR should be introduced in the consistency test as the consistency ratio. The specific formula is as follows:

$$CR = \frac{CI}{RI} \qquad (4)$$

Saaty, an American co-ordinator, pointed out that CR could be used as an index to test consistency. When CR<0.1, it indicates that the judgment matrix has satisfactory consistency. When the judgment matrix has satisfactory consistency, it indicates that the weights obtained by the above analytic

hierarchy process are correct and reasonable; otherwise, unreasonable data should be excluded. In this paper, a total of 30 expert questionnaires were issued and recovered for experts and government officials at four levels: economic, political, industrial and technical fields. The questionnaires that failed to pass the consistency test were excluded, and the weight models of first-level indicators and second-level indicators were obtained according to the above steps (see Table 2) [8-9].

Table 2: Weight measurement results of Common Prosperity Communication Service index system.

First-level index weight	First-level index weight	The secondary indicators	The weight
developmental	24%	Pan in 5G	7.03%
		Gigabit high-speed rail	6.99%
		Unlimited life	7.05%
living	22.3%	Wisely profit thousands of homes	7.55%
		Silver guard	7.34%
		Cloud melts all sectors	8.1%
service	25%	Pratt & Whitney small	7.69%
		Wisdom integrating urban and rural areas	7.87%
		Intelligence auxiliary cure	8.01%
Sharing	28.7%	High-quality development sharing index	11.08%
		High quality life sharing index	11.2%
		High performance service sharing index	10.09%

4.3 Index Synthesis

Index refers to the comprehensive relative number of various things at different times that cannot be directly summarized due to different measures. When the evaluation of each index is integrated [10], different dimensionless methods may get different evaluation structures, so it is necessary to carry out dimensionless treatment on the index to eliminate its influence.

In the calculation and synthesis of Common Prosperity communication service index, the efficiency coefficient method is adopted to carry out dimensionless treatment on each index, and its calculation formula is as follows:

$$X_i^* = \frac{x_i - x_{min}}{x_{max} - x_{min}} \tag{5}$$

That is, the value of each variable minus the minimum value of the variable divided by the difference between the maximum value and the minimum value of the variable. Where x_i^* represents the variable result after standardization, x_i represents the value of specific tertiary indicator variables, x_{min} represents the minimum value of this group of variables, and x_{max} represents the maximum value of this group of variables. The dimensionless results obtained by the extremum method are evenly distributed in the interval (0,1).

Furthermore, on the basis of standardized treatment of the third-level indicators, the index is synthesized by weighted summation. The calculation formula of the first-level indicators and second-level indicators is as follows:

$$Q_i = \sum_{i=1}^{n} x_i^* \cdot w_i \tag{6}$$

Where: Q_i is the final result of a specific first-level or second-level index, x_i^* is the standardized value of the third-level index of the first-level or second-level index; w_i is the weight of the third-level index corresponding to x_i^*; n is the number of third-level indicators corresponding to the first-

level or second-level indicators.

Finally, the final synthesis formula of the common prosperity index is [10]:

$$p = \sum_{i=1}^{N} Q_i \cdot w_i \qquad (7)$$

5. Conclusion

The research on the Common Prosperity communication service index proposed in this paper has certain practical significance for judging the level of common prosperity, constructing the social governance pattern of co-construction, co-governance and sharing, and firmly promoting common prosperity. Through the measurement of this index [10], the influence degree of communication services on common prosperity can be evaluated, so as to better monitor the contribution of communication services to common prosperity and the existing problems. The index results can be mainly applied in the following fields:

The exponential dynamic monitoring of the construction of all parts of country communication services, such as the total amount of 5G base stations and the density of base stations, can better reflect the level of local communication services, and better detect the problems in the situation of all parts of country communication services.

The measurement of common prosperity by communication services can reflect the situation that communication services help common prosperity, reflect the role of institutional policies in this field in promoting common prosperity, and provide better support for the decision-making of governments and enterprises.

Acknowledgment

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