

The Research of Service Supply and Demand Coordination for University Library Based on Coupling Coordination Analysis

Xiao Qin

Library and Information Center, City College of Dongguan University of Technology, Dongguan, Guangdong, China

xiaoq@ccdgt.edu.cn

Keywords: University Library; Coordination of Supply and Demand; Coupling Coordination

Abstract: [Purpose/significance] the paper starts with the imbalance and deviation between the supply of university library and demand of readers and then introduces the coupling coordination theory into the service supply and the reader demand subsystem of university library. It is expected to provide new ideas for the balance of supply and demand of university library and guide the library development through supply and demand ratio, coupling degree, coordination degree ect.. [Method/process] Explore the coupling mechanism and evaluation index system, construct a model and then conduct an empirical research. [Result/conclusion] Verified the effectiveness and feasibility of the coupling and coordination analysis applied to the analysis of the supply and demand balance of college library services. Put forward the path and optimization method of the university library to achieve maximum balance.

1 Introduction

The university library is the school's information resource collection and distribution center, it has an important position for the provision of information services. However, it has shown the characteristics of diversification, multi-level and individualization with the emergence of the Internet +, new media, the needs of readers. The adaptability of the service supply side of university libraries to changes in the readers' demand side is obviously lagging behind. Promoting the balance of service supply and demand is the core of university library's work. Effective and high-quality service supply must be based on the consideration and satisfaction of readers' needs, and the supply is invalid if it is not needed and recognized.

At present, the research on the supply of library services and the needs of readers mainly involves three aspects: The first one is about the improvement of library service quality on the side of the library service; The second is about the readers' demand and its changes, and its demand mining; The third is the specific research on the innovation and transformation of library services driven by readers' demand, which combines the supply of library services with the needs of readers. Among them, there are more and more literatures on the third aspect. Researchers realize the importance of combining library service supply and reader demand for research. However, these studies are specific studies. There is no research involving the evaluation and determination of the balance of supply and demand, the degree of coordination, the measurement standard and evaluation index system of the balance of supply and demand.

Based on these research backgrounds and trends, this article combines the supply of library services with the needs of readers, and focuses on the balance of supply and demand of university library services. Looking forward to providing a new solution for the healthy development of libraries.

The research on the balance between the supply and demand of library can be traced back to 1994. Early research mainly focused on the analysis of the contradiction between supply and demand of journals [1], books [2], and literature [3], as well as strategic discussions, and they were all qualitative researches, mainly descriptive discussions. In November 2015, General Secretary Xi proposed the concept of "supply-side structural reform". Many scholars focus on the reform of the

supply side in the cultural field and discuss the service and reform of university libraries. For example, Wu Weihua, Cao Jian, and Wang Yanhong drew the thought map and implementation path of the supply side reform of university libraries service[4]; Hou Jingling proposed the "public service +" logic of supply-side reform to improve the service system of public libraries[5]. These discussions are based on the supply side to alleviate the contradiction between supply and demand, without involving the evaluation and measurement of the balance and coordination degree on both sides of supply and demand, and lacking of empirical research.

The author believes that it is difficult to achieve absolute balance between the supply and demand of university library, but it is promising to promote the maximum balance between supply and demand. The service supply system of university library and the reader demand system interact and influence each other. Coupling coordination analysis studies the dynamic relationship of interdependence and coordinated development between related systems based on system theory.

Therefore, this paper introduces the theory of coupling and coordination, Starting from the matching relationship between the service provider and the demand side of university libraries, establishes a coordinated supply index system for service coupling of university libraries. Using specific data from the service supply side of university libraries and the demand side of readers for demonstration researching, verifying the relationship between supply and demand and the degree of balance, combining with the degree of coordination, and calculating the final benefits of the two can provide measurement methods and standards for the balance of supply and demand in the library, and help university library services develop better.

2 Analysis on the Coupling and Coordination Mechanism of University Library Service Supply and Reader Demand

2.1 Coupling and Coordination Theory and its Application

Coupling refers to the phenomenon in which two or more systems interact and influence each other. It belongs to the category of physics. Coupling coordination analysis researches the dynamic relationship of interdependence and coordinated development between related systems based on system theory. When two or more subsystems cooperate properly, promote each other, and evolve together, the total system utility can be maximized, which is a benign coupling; otherwise, it is a non-benign coupling. The isolated development of a single system looks good, but it may reduce the overall utility of the entire system.

At present, the coupling coordination theory is mainly used in agriculture, geography, ecology, and social economics to study the relationship between the various subsystems within the system and the overall evolution of the system. Yang Xingang and others analyzed and evaluated the "Population-Economy-Space-Environment" system of Anhui Province using the coupling and coordination analysis method[6]; Luo Yan et al. used the "Land, Population and Industry" indicator system to conduct the coupling and coordination analysis [7]. It can be seen that coupling coordination analysis is widely used in other fields, mature and can be used for reference.

In the field of libraries, a small number of scholars introduced the theory of coupling and coordination into public libraries, and their research focused on the degree of coupling and coordination between public libraries and regional economic development [8, 9]; Sui Pengfei's research focuses on the degree of coupling and coordination between public libraries and the cultural quality of the population [10].

2.2 Coupling and Coordination Mechanism of University Library Service Supply and Reader Demand

From the perspective of the library service supply system and the library reader demand system, the collection of documents, resources, space and the service system provided by the university library are the supply; The demand is the school teaching, scientific research and readers' demand for literature information resources and services [11]. The supply side can be specifically refined into five elements: resources, space, services, technical equipment, and personnel. The demand side

is based on readers, including their resource requirements and service requirements. The coupling mechanism between the university library service system and the reader demand system can be shown in the following figure:

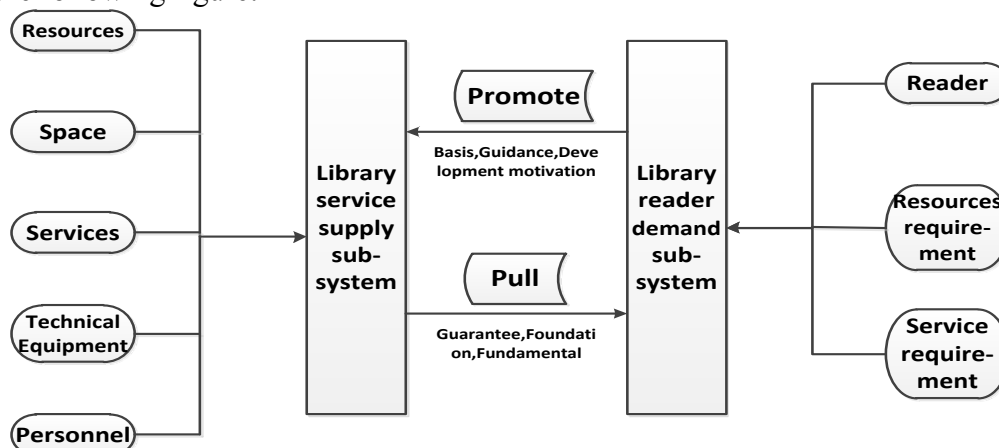


Figure 1. Coupling and coordination mechanism diagram of library service supply and reader demand

As shown in the figure above, the service supply of academic libraries is the foundation, guarantee and foundation of readers' needs. The service supply side is rich, diversified and selectable, service methods are diversified and modern, the resource structure is scientific and reasonable, and it is flexible and adaptable to readers' needs. All these can realize the pulling effect of the service supply side on the reader's demand side, thereby attracting readers which can make readers happy to demand and happy to be served.

The demand of readers promotes supply. Reader needs and their changes are the basis for the adjustment of library resources and services. Any supply-side collection resource structure optimization, human resource structure adjustment, and optimization and upgrading of service methods are all guided by readers' needs. Satisfying the needs of readers to the maximum extent, including resource needs, service needs, etc., is the fundamental driving force for library development.

The library service supply and reader demand subsystems depend on each other, restrict each other, and influence each other. The isolated development of library service supply system or a reader demand system cannot maximize the benefits and value of the library. The two are an interactive relationship that promotes each other and develops collaboratively, and this relationship can be characterized by coupling.

3 Coupling and Coordination Analysis of the Balance of Supply and Demand in University Libraries

3.1 Establishment of Indicator System

Combining the research goals of this article, following the principles of scientific system, objectiveness and comprehensiveness, hierarchy, and operability, the author determines that the library's supply and demand balance indicator system is constructed from three levels.

Target level: The total index of the data at each level of the entire index system, it can reflect the sustainable development status of the university library's supply and demand balance and sound evolution;

Criterion layer: The service supply subsystem and the reader demand subsystem are used as the criterion layer to reflect the coupling and coordination status of the supply and demand sides of the university library;

Indicator level: Refer to the theory of library science elements[12], knowledge service elements[13], library performance standards[14] and other related theories, combined with the actual situation of the library, further refine the 2 standard levels into 7 first levels indicators and 20 specific indicators (Table 1).

The theory of library elements has been proposed for more than 90 years, starting from the three elements of talents, books, and housing proposed by Mr. Du Dingyou[12], to the four elements of books, personnel, funding, and architecture, Wu Weici put forward the five-elements theory of book collection, readers, cadres, technical methods and construction equipment[15] Mr. Huang Zongzhong put forward the six elements which compose of book collection, personnel, readers, buildings and equipment, technical methods, and management [16]. Essentially, what the library provides is knowledge service, and the knowledge service element theory regards people, space, resources, and service as its basic elements[4].

Refers to the above theory, combines with the actual research of this article and selects resources, space, services, technical equipment, and personnel as the five first-level indicators on the supply side of university library. There are 13 secondary indicators under the 5 primary indicators as the core indicators of the library service supply system. The detailed 13 secondary indicators comprehensively reflect the basic conditions of the library's overall scale, resource construction, reading facilities and their spatial arrangement, and service supply capabilities and efficiency.

The demand of the library is usually regarded as the demand of readers for books and services [9]. It is quantified as a series of indicators, such as SERVQUAL[17], LibQUAL+TM[18]etc., which are composed of specific data such as the number of visitors, the number of readers and the number of books borrowed. Therefore, on the demand side of library readers, this article selects 2 first-level indicators and 7 second-level indicators based on library service groups.

Among them, the total number of readers is the basic determinant of the number of visitors to the library, while the number of visitors to the library and the number of readers who borrowed books reflect readers' utilization and recognition of the library as a space place and the library's most important collection resource.

With regard to the needs of library readers for books and services, this article starts from the main body of information needs, and selects two secondary indicators of literature borrowing and digital resource usage to reflect readers' utilization of library paper and electronic resources. The two most basic reference services of the library, including scientific and technological novelty search and document delivery are selected and their numbers are used to show the readers' demand for library services. The index system of coupled and coordinated supply is as follows:

Table 1. Service coupled and coordinated supply index system of university libraries

Target Level	Criterion Layer	First Indicator layer	Secondary Indicator Layer
Library service coupling coordinated supply	Library service supply subsystem	Resources	Total collection (ten thousand volumes)
			Newly added collection (ten thousand volumes)
			Total electronic resources (pcs)
		Space	Building area (square meters)
			Number of seats (pcs)
			Number of learning spaces (pcs)
		Services	Number of reader activities (times)
			Service time (hour/day)
		Technical equipment	Number of retrieval machines (sets)
			Number of self-check machines (sets)
	Number of network ports (a)		
	Personnel	Number of librarians (person)	
		Librarian's professional ability (person)	
	Library reader demand subsystem	Reader	Total number of readers (person)
			Number of visitors (persons)
Number of people in circulation (person)			
Resource and service requirements		Literature borrowing volume (ten thousand volumes)	
		Digital resource usage (times)	
		Technology Novelty Retrieval (times)	
		Document delivery (times)	

Note: The professional competence index of librarians in the personnel index refers to the number of librarians with the title of librarian or above;

3.2 Data Standardization

Different indicators have different dimensions and dimensional units, which will lead to incomparability between different indicator values. In order to eliminate the influence of dimensions, this article uses the range method to standardize the data. The specific formula is as follows:

$$x'_i = (x_i - \min x_i) / (\max x_i - \min x_i) \quad (1)$$

$$y'_i = (\max y_i - y_i) / (\max y_i - \min y_i) \quad (2)$$

Where x_i and y_i are the specific values of the evaluation indexes x and y ; $\max x_i$, $\min x_i$ and $\max y_i$, $\min y_i$ are the maximum and minimum values of the evaluation indexes x and y ; x'_i , y'_i are the standardized values of the evaluation indexes x and y after processing, and $0 \leq x'_i \leq 1, 0 \leq y'_i \leq 1$.

3.3 Index Calculation

Use the weighted average method to calculate the university library service supply index and reader demand index. The specific formulas are as follows:

$$f(x) = \sum_{i=1}^n a_i x'_i \quad (3)$$

$$g(y) = \sum_{i=1}^n b_i y'_i \quad (4)$$

Where $f(x)$ and $g(y)$ are the library service supply index and the library reader demand index respectively; x'_i , and y'_i are the standard values of each indicator after standardized processing; a_i and b_i are the weight of each indicator, $i=(1,2,3\dots n)$ is the number of indicators.

3.4 Construction of Coupling and Coordination Development Model

Refer to the concept of capacity coupling and use the capacity coupling coefficient model to expand the coupling degree model of the interaction of the two systems. This article mainly includes the service supply index and the reader demand index of the university library. Therefore, the coupling degree can be measured by the following formula:

$$C = 2 \left\{ \frac{f(x) \times g(y)}{[f(x) + g(y)]^2} \right\}^{\frac{1}{2}} \quad (5)$$

The degree of coupling reflects the strength of the interaction of each system, but not the coordination. Therefore, it is necessary to use the coordination degree model to better evaluate the coordination status of the two. The specific formula is as follows:

$$T = \alpha f(x) + \beta g(y) \quad (6)$$

$$D = \sqrt{C \times T} \quad (7)$$

In the formula, D represents the degree of coupling and coordination; C represents the degree of coupling and T is the comprehensive evaluation index of university library service supply-reader demand; α and β are undetermined coefficients. In actual research, the coordination and promotion

between the improvement of library service supply and the increase of library readers' demand is asymmetrical. The overall leap of library services will inevitably provide support and positive stimulus for the growth of readers' demand, and the change and increase of readers' demand will also counteract the library to a certain extent, prompting it to rationally improve and optimize its services. Therefore, the value of the undetermined coefficient is $\alpha=0.6$ and $\beta=0.4$.

3.5 Supply and Demand Balance Measurement Standard

Based on relevant research results, this paper divides the degree of coupling development into 5 types, and each type is divided into 3 basic types according to the relationship between the supply and demand of the library. See the table below for details.

Table 2. Standards for Measuring the Balance of Supply and Demand

Coupling Coordination Degree D	Coupling and Coordinated Development Type	Library Supply and Demand Index Relationship	Basic Type
$0 < D \leq 0.2$	Disorder development	$f(x) > g(y)$	Type of demand lagging
		$f(x) = g(y)$	Type of supply and demand balance
		$f(x) < g(y)$	Type of undersupply
$0.2 < D \leq 0.4$	Primary coordinated development	$f(x) > g(y)$	Type of demand lagging
		$f(x) = g(y)$	Type of supply and demand balance
		$f(x) < g(y)$	Type of undersupply
$0.4 < D \leq 0.6$	Intermediate coordinated development	$f(x) > g(y)$	Type of demand lagging
		$f(x) = g(y)$	Type of supply and demand balance
		$f(x) < g(y)$	Type of undersupply
$0.6 < D \leq 0.8$	Well coordinated development	$f(x) > g(y)$	Type of demand lagging
		$f(x) = g(y)$	Type of supply and demand balance
		$f(x) < g(y)$	Type of undersupply
$0.8 < D \leq 1$	High-quality coordinated development	$f(x) > g(y)$	Type of demand lagging
		$f(x) = g(y)$	Type of supply and demand balance
		$f(x) < g(y)$	Type of undersupply

Note: D is the degree of coupling and coordination between the library service supply system and the library reader demand system; $f(x)$ and $g(y)$ are the library service supply index and library reader demand index.

4 Empirical Analysis

4.1 Data Source

This article selects the supply and demand side of the library in 2018 (2018.1.1-2018.12.31), 2019 (2019.1.1-2019.12.31), 2020 (2020.1.1-2020.12.31) in the library of City College of Dongguan University of Technology where the author is located. The specific data of school year statistics are used for research. See Table 3 for specific data.

Table 3. Library of City College of Dongguan University of Technology supply and demand indicator statistics from 2018 to 2020

Criterion Layer	First Indicator layer	Secondary Indicator Layer	Weights	2018	2019	2020
Library service supply subsystem	Resources	Total collection (ten thousand volumes)	0.058	119.48	147.26	183.33
		Newly added inventory (ten thousand volumes)	0.047	9.49	27.78	36.07
		Total number of databases (pcs)	0.056	9	10	11
	Space	Building area (square meters)	0.030	27010	30310	30310
		Number of seats (pcs)	0.053	2100	2900	3500
		Number of learning spaces (pcs)	0.060	15	12	18
	Services	Number of reader activities (times)	0.067	6	5	10
		Service time (hour/day)	0.030	94.5	101.5	101.5
	Technical equipment	Number of retrieval machines (sets)	0.067	4	4	6
		Number of self-check machines (sets)	0.067	3	3	4
		Number of network ports (a)	0.057	926	1127	1350
	Personnel	Number of librarians (person)	0.030	21	22	22
Librarian's professional ability (person)		0.056	12	15	18	
Library reader demand subsystem	Reader	Total number of readers (person)	0.008	23126	22862	23008
		Number of visitors (persons)	0.059	89375	110370	141060
		Number of people in circulation (person)	0.058	11495	15356	22089
	Resource and service requirements	Literature borrowing volume (ten thousand volumes)	0.067	89265	90389	132528
		Digital resource usage (times)	0.067	254337	245104	289384
		Document delivery (pages)	0.065	86730	95725	131839

Note: The library does not have the qualification for scientific and technological novelty search, so it has not made statistics on this indicator in the original indicator system.

Refer to 4.2.1 for the calculation process and method of index weight.

4.2 Coupling and Coordination Evaluation Analysis

4.2.1 Calculation of Indicator Weight

First, use formula (1) and (2) to standardize the value of each index to eliminate the influence of dimensions. Then enter the standardized processing results into SPSS and use factor analysis to obtain the explained total variance and component matrix.

Using Excel, through the explained total variance and component matrix, the linear combination coefficient and the comprehensive score model coefficient are obtained. Finally, all the indicators are normalized, and the weight of each indicator is obtained. See Table 2, the weight column.

4.2.2 Coupling Coordination Degree Calculation

Using formula (3) (4) (5) (6) and (7) to calculate supply and demand index, coupling degree and coupling coordination degree. The results are shown in the following table:

Table 4. Comprehensive development level and coupling coordination degree of library service supply and reader demand subsystem

	2018	2019	2020
f(x)	0.048	0.263	0.678
g(y)	0.132	0.090	0.204
Type of development	Type of undersupply	Type of demand lagging	Type of demand lagging
D	0.270	0.411	0.641
Coordination level	Primary coordinated development	Intermediate coordinated development	Well coordinated development

The visual line chart of the library service supply index, reader demand index and coupling

coordination degree from 2018 to 2020 is shown in the figure below:

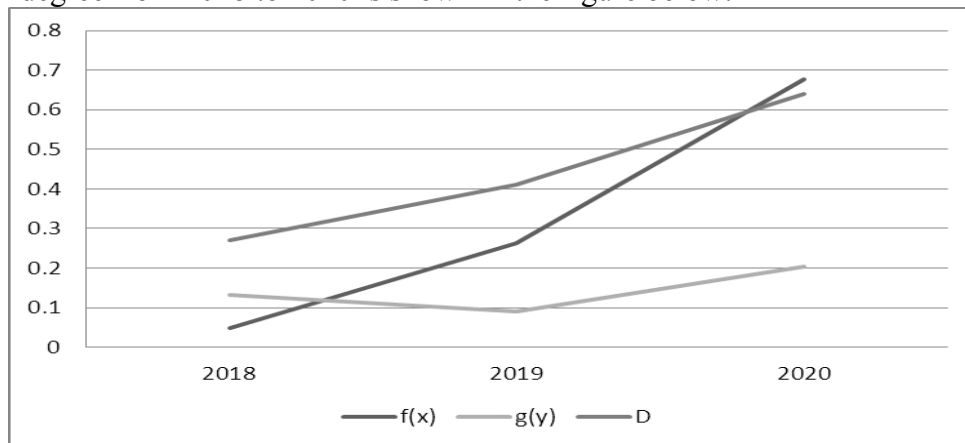


Figure 2. The comprehensive development level and coupling coordination degree of the library supply and demand system

4.3 Analysis of Empirical Results

(1) To see the comparison of library supply and demand and its comprehensive development level, From the library service supply index and reader demand index.

It can be seen that the supply and demand of the library has gradually changed from a type of insufficient supply to lagging demand in 2018-2020. This process shows that the service supply side of the library has formed a good development trend, and the service capacity of the library can basically meet the needs of readers. Thanks to the increase in resources and space investment on the service supply side of the library, and the improvement of the collection resource system, efforts to improve services. The reader demand index $g(y)$ increased overall, but the increase was not large, resulting in the lack of a highly coordinated development on both sides of the supply and demand, and the reader demand side lowered the overall effect of the entire system. In the future, the library should continue to maintain a good situation on the service supply side, and at the same time pay more attention to stimulating the demand side of readers, and integrate reader classification, reader management, reader needs and mining into the entire library development system, and drive or even lead the needs of readers.

(2) To see the key factors for the improvement of the library's balance of supply and demand, from the analysis of coupling and coordination.

From the above analysis of coupling and coordination, the main reason for the imbalance of supply and demand in our library is that the demand of readers has not achieved a coordinated increase. The demand side of readers is not strong, which involves many objective reasons, but libraries can also do something. From the perspective of demand-side weight distribution, the leading role in the reader demand system is the amount of literature borrowed and the amount of digital resources used. In the future, the library can start from both paper documents and digital resources to improve the coupling and coordination between the supply and demand.

Establish an efficient and complete user feedback response service mechanism on the reader's demand side. Specifically, readers' needs should be fully considered, collected and analyzed, combined with the library's resource usage and user feedback to build and optimize collections as the stage of resources construction. For example, reader recommendation channels can be opened, and teacher-student recommendation interviews and collaborative interviews can be implemented to innovate interview models. In terms of digital resource construction, we should actively open database recommendation channels, listen to the opinions and needs of teachers and students, and establish a scientific evaluation index system for digital resources based on indicators such as page views and downloads. Publicity and user training for paper and digital resources should be in place. At the same time, the library can use various social media platforms, such as Weibo, WeChat, etc., to provide users with inquiry and recommendation, interlibrary loan, new book recommendation, and good book recommendation, mobile reading, etc., and make access to paper and electronic

resources convenient and networked.

(3) To see the future development of the library ,from the analysis of coupling and coordination.

The coupled and coordinated development on both sides of the library's supply and demand is an important standard for the its healthy operation . In the future, the library should establish a supply and demand tracking mechanism to dynamically grasp the coupling and coordination degree of the library's supply and demand system. At the same time, it is necessary to truly understand and appreciate the coupling and coordination mechanism between the university library service supply system and the needs of readers. It is important to put this idea throughout the entire process of library operation and development.

5. Conclusions and Recommendations

5.1 Implement the "Supply and Demand System Monitoring-Supply and Demand Linkage-Supply and Demand Balance Improvement Coupling Mode" to Achieve The Maximum Balanced Development of the University Library's Supply and Demand System.

It is important to monitor the library supply and demand, grasp the development and changes of library service supply system and reader demand system, find out the cause of imbalance between supply and demand, and then respond or stimulate from the service provider or reader demand side, supply and demand linkage, and promote the balance of supply and demand.

5.2 Based on the Analysis of Coupling and Coordination, Determine the Key Factors for Improving the Balance of Supply and Demand of University Libraries, and then Break the Bottleneck.

Focus on key indicators that inhibit the coordinated development of coupling from the service supply side or the reader demand side, give priority to meeting key needs, focus on weak links, and improve the key.The service can break through the bottleneck of the coordinated development of the coupling of supply and demand of university libraries, and achieve a multiplier effect in achieving maximum balance.

5.3 Pay Attention to the Coupling and Coordination Relationship of the Supply and Demand System, Build An Interactive and Win-Win Mechanism, and Promote the Coupled and Coordinated Development of the Supply and Demand System of University Libraries.

The two sides of supply and demand cannot be separated. We should start from both sides of supply and demand. On one hand, the service supply of the library should be rich, diversified, and selectable, with diversified and modern service methods, so as to meet, drive and even lead the needs of readers to the maximum. On the other hand, it is necessary to stimulate the demand side, respond to the needs of readers, urge readers to be willing to demand and be served, and to achieve a virtuous circle of interaction between the two parties and establish a win-win mechanism.

5.4 Based on the Coupling and Coordination of the Supply and Demand System, It Provides A Basis for Decision-Making for the Future Development of University Libraries.

Based on the analysis of coupling coordination degree, we can master the history and current characteristics of both the supply and demand of library services, and also provide decision-making basis for the library to formulate resources, services, and development strategies that match the needs of readers. At the same time, it is the first time to think about and put forward the coupling and coordination standards and evaluation methods for the balance of supply and demand of university libraries, which have certain reference and reference value for other types of libraries, such as public libraries, professional libraries, and scientific libraries.

Acknowledgements

This article is one of the research results of the 2020 Young Teacher Development Fund Project of City College of Dongguan University of Technology "The Research of Service Supply and

Demand Coordination for University Library Based on Coupling Coordination Analysis" (2020QJY013R).

References

- [1] Liu Yun, Ge Jingmin. Analysis and countermeasures of the contradiction between supply and demand of journals in academic libraries [J]. Hebei Science and Technology Library, 1999(03): 101-102.
- [2] Yang Dingfang, Zhang Chunmao. Measures to alleviate the contradiction between supply and demand of books and periodicals in libraries[J]. University Library Work, 1994(02): 42-43.
- [3] Li Chengfu. The contradiction between the supply and demand of document materials in academic libraries and the countermeasures [J]. Henan Library Journal, 1996(04): 10-11.
- [4] Wu Weihua, Cao Jian, Wang Yanhong. Discussion on the Service Supply Side Reforms of University Library [J]. Modern Information, 2017, 37(02): 104-107.
- [5] Hou Jingling. The Path of Supply-side Reform in Public Library: from the Perspective of "Public Service +" [J]. Books and Information, 2018(03): 113-116.
- [6] Yang Xingang, Zhang Shouwen, Xia Yongjiu, Chen Xiaohua. Coupling Pattern Evolution of "Population-Economy-Space-Environment" in the Counties of Anhui Province [J]. Geography and Geo-Information Science, 2017, 33(02): 81-86+126+2.
- [7] Luo Yan, Sun Qunli. Analysis on the Space-Time Coupling Coordination of "Land, Population and Industry" in Border Ethnic Areas about Urbanization [J]. Taxation Economics Research, 2017, 22(06): 80-89.
- [8] Liu Jing. Study on the Coupling Coordination Between Public Libraries and Regional Economic Development [J]. New Century Library, 2018(11): 70-73+79.
- [9] Wu Weiya, Wu Weihong. Study of Coupling Coordination of Supply-Demand of Libraries Services—A Case Study of Lishui City [J]. Library Theory and Practice, 2017(01).
- [10] Sui Pengfei. Study on the Coupling Degree Between Public Library and Population Cultural Quality [J]. Library and Information Service, 2015, 59(22): 39-44.
- [11] Zheng Yong. Research on the Development Status and Innovation Mode of University Libraries Based on the Balance of Supply and Demand [J]. Library and Information Service, 2013, (S2).
- [12] Liu Guojun. Selected Works of Library Science by Liu Guojun [C]. Beijing: Bibliography Publishing House, 1988.
- [13] Zhang Yanan. Factor Analysis and Model Building of Knowledge Service of Research Library [J]. Library Work and Research, 2015(05).
- [14] ISO 11620. Information and documentation—Library performance indicators [S]. Switzerland: British Standards Institution, 2008.
- [15] Wu Weici, Dong Yan. Introduction to Library Science [M]. Beijing: Beijing Library Press, 1985.
- [16] Huang Zongzhong. Introduction to Library Science [M]. Wuhan: Wuhan University Press, 1988.
- [17] Yu Liangzhi, Wang Yazun, Hong Qiulan. SERVQUA and the Service Quality Assessment in Chinese Academic Libraries—A Quantitative Study on Utility of SERVQUAL Instrument [J]. Library and Information Service, 2005(06): 90
- [18] Shi Guohong, Chen Jie, Sha Zhenjiang, Zhu Shuyang. Research on the Building of Quality Evaluation Model of Public Library Service Based on LibQUAL+TM [J]. Library Forum, 2014, 34(02): 7-14.