



Cross-Domain Evaluation of Service Quality in Producer Services Based on SERVQUAL

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Abstract. Producer services are a critical link that supports the transformation and upgrading of manufacturing and the efficient operation of regional economies. However, existing research rarely adopts standardized measurement tools to systematically compare service quality across different subsectors of producer services. Based on the SERVQUAL scale, this paper evaluates service quality across five representative producer service domains—energy conservation and environmental services, information services, financial services, freight transport services, and warehousing and postal express services—from five dimensions (tangibility, reliability, assurance, responsiveness, and empathy). Furthermore, it analyzes the influence of firm size and evaluation subject on service quality perception. The findings are as follows: (1) Among these five domains, energy conservation and environmental services exhibit the highest service quality, while information services rank the lowest; financial services, warehousing/express services, and freight transport services fall in a middle range. (2) The five dimensions are generally balanced, with tangibility scoring the highest and reliability the lowest, which indicates that hardware and customer care perform relatively well, whereas service fulfillment stability needs improvement. (3) The service quality index exhibits a gradient pattern where “larger firm size is associated with higher quality”, yet the information services domain shows the largest size gap; in energy conservation and environmental services, medium-sized firms outperform large ones; and in warehousing/express services, small and micro firms slightly surpass medium-sized ones. (4) The ratings from three evaluation subjects follow a consistent gradient: management gives the highest, ordinary employees the middle, and chief quality officers the lowest; the largest divergence across subjects appears in the warehousing/express domain. This study shows that the overall service quality of producer services is good, but information services and the reliability dimension are prominent weaknesses. Enterprises should value the feedback from chief quality officers and frontline employees to prevent management over-optimism from masking actual service deficiencies.

Keywords: Producer services, Service quality, SERVQUAL, Firm size, Evaluation subject

1 Introduction

As a key link connecting manufacturing and the modern economic system, the service quality level of producer services directly affects the transformation and upgrading of manufacturing and the operational efficiency of regional economies. In recent years, with the reconstruction of global value chains and the penetration of the digital economy, the development of producer services toward specialization, high-end services, and intelligence has attracted much attention. Therefore, the question of how to systematically and scientifically evaluate the quality of producer services and identify its key influencing factors has become a core issue in the field of service operations management.

Extensive research has been conducted around this issue by scholars at home and abroad. From the perspective of research, early work mainly focused on quality management strategies in the process of manufacturing servitization. Mishra et al. [1] (2021) constructed a graph-theory-based quantifiable quality-enabled servitization model and applied it to the Indian automobile manufacturing industry. In addition, some studies began to focus on the matching effect between servitization and inter-organizational information technology capabilities. For example, Zhang et al. [2] (2023) found, based on survey data from Chinese manufacturing firms, that matching product-oriented services with IT reconfiguration capabilities and matching customer-oriented services with IT integration capabilities can significantly improve environmental performance.

In the field of knowledge-intensive business services (KIBS), Leal D'Avila and De Montreuil Carmona [3] (2025) used a sample of Brazilian KIBS firms to test the effects of transformational leadership and integrated marketing communication on service innovation performance and organizational performance. They found that innovation in KIBS firms is more internally driven and incremental, requiring active customer participation. Mendoza et al. [4] (2025) further distinguished the differential effects of different types of KIBS on innovation and performance. Regarding service supplier evaluation, Li et al. [5] (2025) developed a comprehensive evaluation framework covering three dimensions (service, supplier, and society), which emphasizes the importance of soft indicators such as cooperation ability, social responsibility, and domain-specific expertise. At the same time, the impact of digital transformation and artificial intelligence technology on the quality of producer services is becoming increasingly prominent. Zhu et al. [6] (2025) confirmed based on the knowledge-based view that digitalization capability indirectly promotes service innovation through customer knowledge development and knowledge integration. Lai et al. [7] (2023) pointed out from a macro perspective that the digital transformation of producer services has a positive spatial spillover effect on manufacturing technology innovation. Santos-Figueroa [8] (2024) systematically reviews SERVQUAL-based studies on industrial supply service quality (2012–2022). The review finds SERVQUAL widely used, but most studies focus on manufacturing servitization, lacking cross-domain comparisons.

The above studies provide rich theoretical perspectives and empirical evidence for understanding the quality of producer services, but several directions still need further exploration. First, most studies focus on manufacturing servitization or specific types

of knowledge-intensive services, and there is a relative lack of systematic comparative analysis across different domains within producer services. Second, regarding service quality measurement methods, existing studies either use single-dimensional performance indicators or construct evaluation systems tailored to specific contexts; few studies directly apply internationally accepted standardized measurement scales with cross-industry comparability. Third, the moderating effects of contextual factors such as firm size and evaluation subject (e.g., customers, managers, third parties) on service quality perception have not received sufficient attention.

Based on the above research gaps, this paper adopts the internationally accepted SERVQUAL scale to comprehensively measure the service quality of producer services from five dimensions: tangibility, reliability, assurance, responsiveness, and empathy. We select five representative producer service domains—energy conservation and environmental services, information services, financial services, freight transport services, and warehousing and postal express services—are selected as research objects. We also construct an evaluation model and indicator system containing these five dimensions. Through empirical data analysis, we reveal that service quality level is significantly associated with specific domains, firm size, and evaluation subjects. This study aims to fill the gaps in cross-sectoral comparison and the application of classic scales in the existing literature, providing more actionable management implications for quality improvement in producer services.

2 Model

Following the internationally accepted SERVQUAL scale for measuring service quality, we construct a service quality model suitable for this monitoring using five dimensions: tangibles, reliability, assurance, responsiveness, and empathy. **Tangibles** refers to the appearance of physical facilities, equipment, staff, and communication materials; **Reliability** means the ability to deliver promised services accurately and dependably; **Responsiveness** reflects employees’ willingness to assist customers and provide timely service; **Assurance** represents staff’s professional knowledge, politeness, and capacity to build customer trust and confidence; **Empathy** indicates the personalized care and considerate attention provided to individual customers. (see Figure 1).

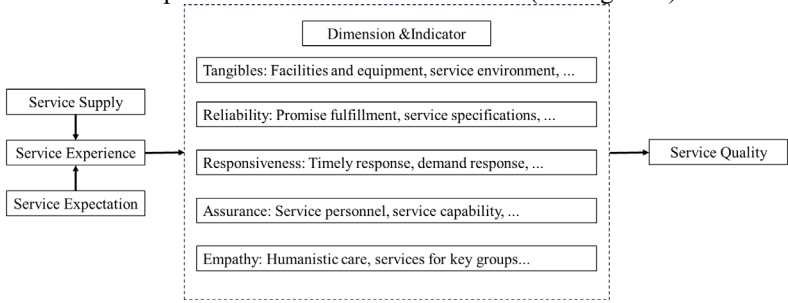


Fig. 1. Service Quality Model of Producer Services

This scheme uses the arithmetic mean method for calculating the public service quality index. Due to the exploratory nature of this cross-domain comparison, equal weights are assigned to the five dimensions without further validation via factor analysis or entropy weight method; future research may examine the contribution differences across dimensions. The public service quality index is calculated as follows:

$$Q = \frac{1}{5} \sum_{d=1}^5 D_d \tag{1}$$

Where Q represents the public service quality index score, and D_d represents the score of quality mension d (tangibility, reliability, responsiveness, assurance, and empathy).

$$D_d = \frac{1}{n_d} \sum_{i=1}^{n_d} X_{d,i} \tag{2}$$

Where $X_{d,i}$ denotes the score of the i -th survey indicator in the d -th quality dimension, and n_d denotes the number of survey indicators in the d -th quality dimension.

Considering the operability of carrying out service quality monitoring in producer services and referring to the statistical classification of producer services, five domains were selected for monitoring: energy conservation and environmental services, information services, financial services, freight transport services, and warehousing and postal express services. Following the principles of representativeness, clarity, relativity, availability, stability, and contemporaneity, we select indicators to form the producer services service quality monitoring indicator system. The system includes 5 monitoring domains, 5 monitoring dimensions, and a total of 28 monitoring indicators, as shown in Table 1.

Table 1. Monitoring indicators for producer services service quality

Domain	Quality Dimen- sion	Monitoring Indicators
Energy conservation and environmental services	Tangibles	Service carriers and resources
	Reliability	Fulfillment of service commitments
	Responsiveness	Agility and emergency response capability of service teams
	Assurance	Team professionalism and compliance
	Empathy	Attention to user needs and stakeholder interests
Information services	Tangibles	Physical or digital carriers related to the service
	Reliability	Accuracy of service content and service stability
	Responsiveness	Agility and flexibility in responding to needs
	Assurance	Professionalism and user trust
	Empathy	Attention to user personalized needs and experience
Financial services	Tangibles	Service channels and facilities; Digital technology
	Reliability	Transaction accuracy; System stability and continuity

Domain	Quality Dimension	Monitoring Indicators
Freight transport services	Responsiveness	Ability to respond to demands
	Assurance	Personnel professionalism and security safeguards
	Empathy	Customer relationship maintenance ability
	Tangibles	Quality of transport vehicles and facilities
	Reliability	Timeliness and accuracy of transport; ability to handle unexpected problems and insurance claims
Warehousing and postal express services	Responsiveness	Demand response and service flexibility
	Assurance	Supplier qualification and safety guarantees
	Empathy	Ability to meet personalized needs
	Tangibles	Quality of service facilities and tools
	Reliability	Service accuracy
	Responsiveness	Service timeliness
	Assurance	Team competence level
	Empathy	Ability to meet customer needs

3 Questionnaire Survey

Based on the SERVQUAL scale and adjusted to the B2B service characteristics of producer services, this study designed the “Producer Services Quality Survey Questionnaire”. The questionnaire consists of three parts: (1) basic information of respondents, including firm size (large, medium, small/micro) and job role (management, ordinary employee, chief quality officer); (2) service quality evaluation items based on the five SERVQUAL dimensions (Tangibles, reliability, assurance, responsiveness, and empathy), with 4-5 items per dimension, using a Likert 10-point scale (1 = very dissatisfied, 10 = very satisfied); (3) open-ended suggestions.

The survey was conducted online through professional survey platforms and industry association channels, covering the five representative producer service domains. We distributed a total of 3,500 questionnaires and received 3,232 valid responses, resulting in a valid response rate of 92.34%.

By evaluation subject: Among the valid responses, 964 were from management (29.82%), 2,208 from ordinary employees (68.32%), and 60 from chief quality officers (1.86%). The sample is dominated by ordinary employees, whose feedback reflects frontline service experience; although the number of chief quality officers is relatively small, as professional quality supervisors, their evaluations offer unique professional perspectives and strict standards, which are valuable for identifying service shortcomings.

By firm size: Large enterprises accounted for 665 responses (20.58%), medium-sized enterprises 1,023 (31.66%), and small/micro enterprises 1,544 (47.77%).

The sample covers enterprises of different sizes, with small/micro enterprises accounting for the highest proportion, which is consistent with the fact that the majority of market entities in China’s producer services are small, medium, and micro enterprises, and reflects the representativeness of small/micro enterprises in service quality perception.

By domain: Since the same respondent may evaluate multiple service domains (e.g., a firm uses both financial services and logistics services), the sample sizes for each domain are independent. The distribution is as follows: energy conservation and environmental services: 1,238; information services: 1,282; financial services: 815; freight transport services: 1,250; warehousing and postal express services: 924. The sample sizes are relatively balanced across domains; information services, energy conservation and environmental services, and freight transport services have relatively ample samples (all above 1,200), while financial services and warehousing/express services have slightly lower but still acceptable sample sizes (815 and 924 respectively), supporting cross-sectoral comparative analysis.

4 Results

After data cleaning, according to the formulas, we processed and analyzed the survey data using the Partial Least Squares dedicated analysis software (PLS-CSMC™) according to the formulas. We obtained the producer services service quality index and the service quality index results for each domain, evaluation subject, and firm size.

4.1 Overall Situation

The monitoring results show that the service quality index of producer services stands at 84.05. The service quality indices for the five domains are: energy conservation and environmental services (85.49), information services (82.52), financial services (84.28), freight transport services (83.80), and warehousing and postal express services (84.08), as shown in Table 2.

Table 2. Monitoring indicators for producer services service quality

Domain	Index	Tangibles	Reliability	Responsive- ness	Assur- ance	Empa- thy
Total	84.05	84.41	83.83	83.99	83.99	84.06
energy conservation and environmental services	85.49	85.74	85.52	85.35	85.49	85.37
information services	82.53	82.65	82.04	82.54	82.86	82.58
financial services	84.30	84.46	83.92	84.17	84.20	84.97
freight transport services	83.80	84.18	83.72	83.60	83.82	83.77
warehousing and postal express services	84.09	84.98	84.00	84.27	83.56	83.63

The overall index is 84.05. Energy conservation and environmental services continue to lead with 85.49, which reflects the positive effects of policy promotion and green transformation investment. Information services rank lowest at 82.53, making them weakest link in producer services service quality; improvements are urgently needed in digitalization capability, data security, and response speed. Financial services (84.30), warehousing/express services (84.09), and freight transport services (83.80) are close to each other, falling in the middle range. This indicates that basic producer service quality is relatively stable but lacks breakthrough highlights.

The five dimensions score between 83.83 and 84.41, showing an overall balanced pattern with a very small gap (only 0.58 points). Tangibles is the highest (84.41), followed by empathy (84.06), responsiveness and assurance are tied at 83.99, and reliability is the relatively lowest (83.83). Thus, enterprises perform relatively well in hardware facilities, visualized services, and customer care, but there is slight room for improvement in service fulfillment stability and commitment keeping ability. In the future, strengthening reliability could be prioritized to further enhance overall service quality.

4.2 Relationship with Firm Size

Overall, the service quality index for producer services exhibits a gradient pattern where “larger firm size is associated with higher quality”: large enterprises (85.27) lead over medium (84.20) and small/micro enterprises (83.29). The detailed results are shown in Figure 2.

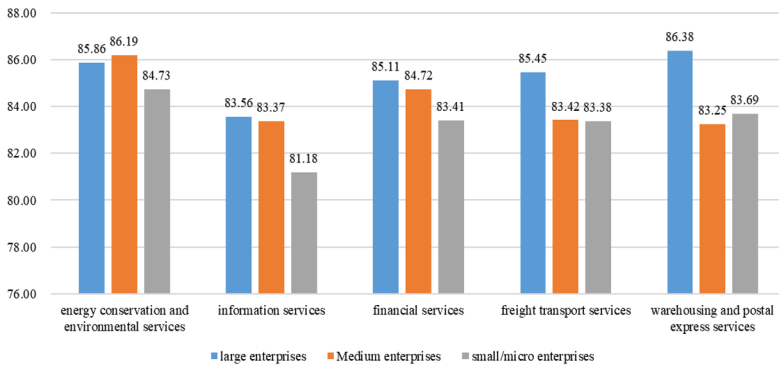


Fig. 2. Monitoring Results by Enterprise Scale

Significant differences exist across domains. Information services show the largest size gap: small/micro enterprises (81.18) differ from large enterprises (83.56) by 2.38 points, which is associated with insufficient technology investment, limited data accumulation, and lack of digital talent. In energy conservation and environmental services, medium sized enterprises (86.19) outperform large enterprises (85.86), achieving the highest value among all size domain combinations; this finding is linked to precise policy incentives, high flexibility in transformation, and strong customization capabilities. In freight transport services, large enterprises have a significant advantage, while medium and small/micro enterprises are almost on par; this difference is related to large

enterprises’ advantages in trunk networks, owned fleets, and intelligent dispatching systems. Warehousing and postal express services exhibit a unique phenomenon where small/micro enterprises (83.69) score slightly higher than medium sized enterprises (83.25), which reflects that flexibility and localized services can partly compensate for size disadvantages.

4.3 Evaluation Subjects

The scores from the three evaluation subjects show a consistent gradient: management rates highest, ordinary employees are in the middle, and chief quality officers rate the lowest. The detailed results are shown in Figure 3. This pattern indicates that management is the most optimistic about service quality, while chief quality officers, as professional quality supervisors, are the strictest. By domain, energy conservation and environmental services receive consistently high ratings from all subjects (management 87.58, chief quality officer 85.63, ordinary employee 84.58)—the absolute highest across all domains—owing to clear policies, transparent indicators, and consensus among the three parties. Warehousing and postal express services show the largest divergence among subjects (management 86.60 vs. chief quality officer 80.97, a gap of 5.63 points), with chief quality officers giving the lowest ratings, which may be due to many detail oriented quality issues. Information services, financial services, and freight transport services display similar patterns: lower scores in the eyes of chief quality officers and ordinary employees, while management is relatively more approving. This finding is related to management’s tendency to focus on overall performance and self recognition, chief quality officers’ adherence to professional standards and defect orientation, and ordinary employees’ reflection of frontline realities with some leniency. Therefore, this phenomenon suggests that enterprises should value the evaluation information from chief quality officers and employees to prevent management over optimism from masking actual service shortcomings.

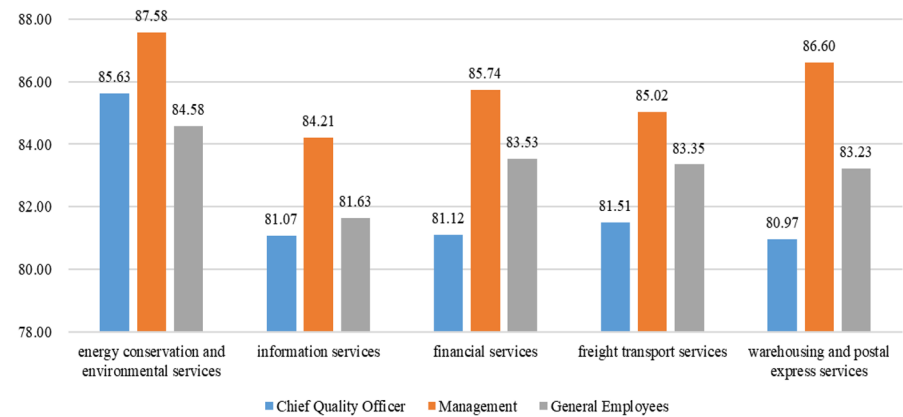


Fig. 3. Monitoring Results by Evaluation subjects

5 Conclusion

Future efforts should prioritize addressing the weaknesses in information services and improving reliability levels across all domains. Attention should be paid to the industry heterogeneity of firm size effects, and differentiated improvement pathways for small, medium, and micro enterprises should be explored. Furthermore, in light of the cognitive differences among evaluation subjects, a multi-party collaborative evaluation mechanism should be established to reduce information asymmetry and enhance the objectivity of service quality assessments.

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