Research on Measuring the Digital Development Level of China's Commercial Circulation Sub-Sectors

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Abstract. The development of the digital economy has brought huge development driving opportunities to commercial circulation enterprises. The digital development of important pillar industries of commercial circulation enterprises will help promote the transformation and upgrading of the industry, enhance industrial competitiveness, and achieve sustainable development of the industry. This article uses the entropy weight TOPSIS method to measure the development level of resource digitization, service digitization and channel digitization in the commercial and trade circulation subdivision industries. The study found that the digitalization level of the three subdivided industries of commercial circulation is gradually increasing. The digital development of the three sub-sectors of commercial circulation is uneven and there are differences. Looking at different dimensions, the three industries have different development situations in terms of resource digitization, service digitization and channel digitization. Based on the above analysis, countermeasures and suggestions are put forward for the digital transformation and upgrading of subdivided industries in the commercial circulation industry.

Keywords: Commercial circulation sub-sectors; digitalization level; entropy power TOPSIS

1 Introduction

The impact of digital transformation has spread to all aspects of economic life. The rapid development of technologies such as the Internet, big data, cloud computing and artificial intelligence has provided the industry with broader development space and innovation opportunities. The commercial circulation industry is a bridge connecting production and consumption. In the new development pattern with the domestic circulation as the main body, the digital transformation of the commercial circulation industry will provide solid support for the sustainable development of the economy. The wholesale and retail industry, transportation, warehousing and postal industry, accommodation, and catering industry are important parts of the commercial circulation industry. Their digital development will help promote the transformation and upgrading of the industry, enhance industrial competitiveness, and achieve sustainable development of the industry.

2 Literature Review

Since the digital economy has become a new driving force for my country's economic growth, the impact of the digital economy on the development of my country's commercial circulation industry has attracted widespread attention. Relevant research has carried out rich discussions on the impact of the digital economy on the development scale, efficiency, total factor productivity, etc. of the commercial circulation industry. Li Fu et al. (2020) took the urban commercial circulation industry as an example to analyze the objective problems faced by the urban commercial circulation industry such as poor transformation mechanisms and weak innovation and development capabilities and promoted the intelligent development of urban business and the construction of new urban community commerce from the perspective of digital empowerment. New models, optimization of the urban business environment and other aspects have proposed a path for digital transformation of the urban trade circulation industry[1]. Yang Haili et al. (2022) studied that compared with investment in traditional technology factors, investment in digital technology factors has a more significant effect on improving the profit margin of the commercial circulation industry, and has become the core driving force for profit growth in the commercial circulation industry. Finally, from increasing Suggestions were put forward from the perspectives of digital technology investment, digital technology service sharing, and accelerated innovation drive[2]. Jiang Wenhui et al. (2022) theoretically analyzed the positive role of the digital economy in promoting the formation of flexible supply chains in the commercial circulation industry, integrating online and offline retail model innovation, optimizing the logistics digital distribution system and supply chain financing, and proposed Suggestions include accelerating the digital transformation of the commercial circulation industry, promoting openness and cooperation in the digital field, cultivating talents suitable for the digital transformation of the commercial circulation industry, and accelerating the construction of digital infrastructure[3]. Li Yang et al. (2021) conducted an empirical study on the impact mechanism of circulation digitization on the innovative development of my country's commercial circulation industry based on my country's provincial panel data from 2015 to 2019, and further examined the technological innovations in which circulation digitalization empowers the innovative development of the commercial circulation industry. mediating effect. The study found that the digitalization of circulation has a significant role in promoting the innovative development of the commercial and trade circulation industry. Digitalization is conducive to improving circulation efficiency, smoothing circulation channels, expanding circulation scale and optimizing the circulation structure, which in turn plays a good role in promoting the innovative development of the circulation industry. Technological innovation is an important driving force for promoting the innovative development of the commercial circulation industry. The digitalization of circulation has a significant regulatory effect on the innovative development of the commercial circulation industry through the intermediary effect of technological innovation. Whether it is the digitalization of circulation or the intermediary effect of technological innovation, there are significant regional differences in the innovation and development of the commercial circulation industry, which generally manifests as a gradient decline feature in the east, middle and west[4]. Wu Ting (2023) used exploratory spatial data analysis method to measure the spatiotemporal evolution characteristics of the digitalization level of my country's circulation industry from 2010 to 2020[5]. Some scholars believe that e-commerce, digital resource elements and other aspects will have an impact on the digitalization level of the

commercial circulation industry (Duan Lianhe, 2022; Zhang Chi, 2022)[6-7].Xu Chao et al.(2023) use panel data of China's A-share listed corporations from 2010 to 2020 to empirically test the impact and mechanism of digital transformation on corporate green innovation. They find that digital transformation has a statistically significant, positive impact on corporate green innovation. Further, digital transformation is conducive to promoting corporate green innovation[8].Nadeem Kashif et al empirically test their model linking DT with different aspects of employee attitude (job satisfaction, affective commitment), psychology (self-efficacy, resilience), and job-related factors (job engagement and autonomy). The findings reveal that DT significantly affects the attitude, psychology, and job-related factors of employees in I4.0[9]. M.C. P L ,Lin K P ,Wilson C W A , et al analyzed the direct and indirect relationships between digital transformation and sustainable development[10].

To sum up, the existing research is basically an empirical analysis of the digital index system and level of the commercial circulation industry, and there are relatively few measurements of the digital level of the commercial circulation sub-sectors, and the constraints on the commercial circulation sub-sectors have not yet been studied carry out. Therefore, based on the time series data of my country's commercial circulation industry from 2013 to 2021, this article constructs a digital level indicator system for the commercial circulation subdivided industries, and uses the entropy weight TOPSIS model and the hindrance degree model to conduct empirical research on the commercial circulation subdivided industries, with a view to providing insights into the commercial circulation subdivided industries. Provide countermeasures and suggestions for the digital development of industry segments.

3 Measurement and Methods of Digital Transformation Level in Commercial Circulation Sub-Industries

3.1 Principles for measuring digital transformation level

To objectively measure the digital transformation and upgrading of the commercial and trade circulation industry, it also covers all dimensions of the digital transformation and upgrading process. Therefore, the construction of a measurement system for the digital transformation level of the commercial circulation industry follows the following principles:

First, the principle of scientific comprehensiveness. We insist on studying the path of digital transformation and upgrading of the commercial circulation industry in a scientific and comprehensive manner, and always adhere to the principle of objectivity. In the process of building the measurement system, we select comprehensive indicators and use scientific methods and accurate data to verify the measurement results.

The second is the goal-oriented principle. After understanding the development of digital transformation and upgrading of the commercial circulation industry and combining the characteristics of the commercial circulation industry to measure the digital transformation and upgrading capabilities, relevant indicators covering digitalization, economic development, green development, and innovation capabilities were selected.

The third is the principle of comparability and operability. When ensuring that the indicator data is available, when integrating the data, the statistical caliber of the data needs to be

consistent. Only in this way can the measurement results be comparable, and the final measurement method must be ensured to be feasible.

3.2 Selection of indicators for digital level measurement

The measurement standards for the digital transformation and upgrading of the business circulation industry need to cover many aspects such as digital capabilities, number of enterprises, fixed investment and industry added value proportion. This article establishes a measurement system from three aspects: resource digitization, industry service digitization, and industry channel digitization in the commercial and trade circulation industry subdivisions.

3.3 Selection of methods for measuring digital transformation level

To objectively measure the digitalization level of the commercial and trade circulation industry subdivisions, this article uses objective methods to weight each indicator, so the direct weight method is finally used to calculate the weight of each indicator. Since there is a quantitative index system for measuring the level of digital transformation and upgrading of subdivided industries in the commercial circulation industry, the distance method of superior and inferior solutions was chosen for measurement, thereby calculating more scientific and objective results. The TOPSIS model was finally determined to comprehensively measure the digital transformation and upgrading capabilities of my country's commercial and trade circulation sub-sectors from 2013 to 2021.

3.4 Direct right TOPSIS model

The entropy weight TOPSIS model is a multi-criteria decision-making method that is used to evaluate the comprehensive performance of candidate solutions, and then sort and select according to the determined weights. Using the entropy weight TOPSIS method can avoid biases in subjective judgments and expert opinions, incorporate uncertainty factors into multi-criteria decision-making, and automatically determine weights by calculating the entropy value of indicators. The direct weight method has no subjective consciousness in the measurement calculation. The size of the weight is completely determined by the coefficient of variation of the data, so it can greatly reduce the measurement error caused by subjective factors. The TOPSIS method can also be called the ideal ranking method. Its principle is to measure the relative distance between the positive ideal solution and the negative ideal solution. The positive ideal solution is the optimal solution, and the negative ideal solution is the worst solution. Then they are sorted according to relative distance, and finally the measurement results are obtained.

The construction of the TOPSIS model is divided into the following steps.

Construct a measurement matrix for the digital transformation and upgrading capabilities of subdivided industries in the commercial circulation industry:

Suppose there are M measurement objects M=(M1,M2...,Mm), and each measurement object has N measurement indicators N=(N1,N2...,Nn), where M=3, N=9, then establish the measure matrix X:

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix} \tag{1}$$

Among them, Xij represents the value of the j indicator under the I measurement object.

Standardization of the measurement matrix for digital transformation and upgrading capabilities of the commercial circulation industry:

Since the units of the selected measurement indicators are different, to make the measurement results more accurate, the indicators are calculated using non-dimensionless quantification. At the same time, because some directions in the constructed measurement system are positive and some are negative, different calculation formulas are used for positive and negative indicators respectively. The specific methods are as follows.

Positive indicators:

$$V_{ij} = \frac{x_{ij} - \min(x_{ij})}{\max(x_i) - \min(x_j)} \tag{2}$$

Negative indicators:

$$V_{ij} = \frac{\max(x_{ij}) - x_{ij}}{\max(x_i) - \min(x_j)} \tag{3}$$

The dimensionless matrix V:

$$V = \begin{bmatrix} v_{11} & v_{12} & \cdots & v_{1n} \\ v_{21} & v_{22} & \cdots & v_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ v_{m1} & v_{m2} & \cdots & v_{mn} \end{bmatrix} \tag{4}$$

Determination of the weight of measurement indicators:

This paper uses the entropy weight method to determine the weight, the standardized value of the j indicator of the I measurement object:

$$P_{ij} = \frac{V_{ij}}{\sum_{i=1}^{m} V_{ij}} \tag{5}$$

Calculate the entropy value of the j measurement index:

$$e_j = -K \sum_{n}^{m} Pi_j \ln(P_{ij}) \tag{6}$$

Among them: $K = \frac{1}{\ln m}, 0 \leq e \leq 1$.

Calculate the difference coefficient of the j measurement index:

$$D_j = 1 - e_j \tag{7}.$$

Calculate the weight of the j indicator:

$$W_j = \frac{D_j}{\sum_{j=1}^{n} D_j} \tag{8}$$

Construct a weighted indicator normalization matrix:

Multiply the dimensionless index normalization matrix V with the weight vector W = (W1, W2,...,Wn) assigned by the entropy weight method to obtain the weighted index normalization matrix B:

$$B = \begin{bmatrix} b_{11} & b_{12} & \cdots & b_{1n} \\ b_{21} & b_{22} & \cdots & b_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ b_{m1} & b_{m2} & \cdots & b_{mn} \end{bmatrix} \qquad (9)$$

Calculate the optimal and worst solutions for the evaluation index:

Optimal solution vector:

$$y^+ = (a_1^+, a_2^+, \ldots, a_n^+) \qquad (10)$$

Worst solution vector:

$$y^- = (a_1^-, a_2^-, \ldots, a_n^-) \qquad (11)$$

Among them: $a_i^+ = \max(a_i)$, $a_i^+ = \max(a_i)$,i is a positive integer.

Obtain the index normalized vector and the distances d_i^+ and d_i^- between the optimal solution and the worst node:

$$d_i^+ = \sqrt{\sum_{j=1}^{m} (a_j^+ - a_j)^2} \qquad (12)$$

$$d_i^- = \sqrt{\sum_{j=1}^{m} (a_j^- - a_j)^2} \qquad (13)$$

The relative closeness D between the index vector and the optimal solution is obtained, and this value is used to represent the index evaluation value r_i :

$$D = \frac{d_i^-}{d_i^- + d_i^+} = r_i \qquad (14)$$

The larger the value of r_i, the better the comprehensive value of the indicator; conversely, the worse the comprehensive value of the indicator.

3.5 Indicator system construction and data sources

3.5.1 Basis for selecting indicators

Referring to relevant literature (Wu Ting, 2023), based on comprehensiveness, scientific and data availability, an indicator system for the digitalization level of the commercial circulation sub-industry was constructed, as shown in Table 1:

Table 1. Construction of digital level indicator system for commercial circulation subdivision industries.

Target layer	Criterion layer	Indicator layer	Unit	Weights	Expected changes
Digitalization on level of commercial circulation sub-sectors	Digitization of resources in trade and circulation subdivision industries（0.452）	employed population	Thousands of people	0.01	+
		Number of companies	indivual	0.04	+
		fixed investment	Billion(RMB)	0.02	+
		Industry value added share	%	0.02	+
	Digitization of services in the commercial and circulation subdivision industries（0.258）	e-commerce sales	Billion(RMB)	0.37	+
		E-commerce purchases	Billion(RMB)	0.37	+
	Digitization of channels in commercial circulation subdivisions（0.289）	Number of computers used per 100 people	tower	0.02	+
		Number of websites per 100 companies	indivual	0.01	+
		Proportion of enterprises with e-commerce transaction activities	%	0.13	+

The level of digitalization of resources in the commercial circulation subdivision industry is characterized by the number of employees, the number of enterprises, fixed investment, and the proportion of industry added value. The number of employees can reflect the industry's demand for labor and its ability to absorb labor. Industries with a higher level of digitalization tend to provide more employment opportunities. The number of companies can reflect the degree of competition and market openness in the industry. Industries with a higher level of digitalization usually attract more companies to participate, promoting competition and innovation in the market. Fixed investment refers to funds used to purchase equipment, buildings, and other fixed assets. Industries with a higher level of digitalization tend to upgrade their technical equipment and introduce more advanced digital technologies and facilities to improve efficiency and service quality. The proportion of industry added value can reflect the contribution of the industry to the entire economy. Industries with a higher level of digitalization are usually able to create value with higher added value and play a role in promoting economic growth.

The level of service digitization in the commercial circulation sub-industry is characterized by e-commerce sales and e-commerce purchases. E-commerce sales and e-commerce purchases are transactions and purchasing activities completed on digital platforms, which can directly reflect the extent and effect of the industry's use of digital channels. The indicator of e-commerce procurement volume reflects the degree of digitalization of enterprises in procurement, that is, the scale and effectiveness of procurement activities using digital channels.

The digitalization of commercial circulation sub-industry channels is represented by the number of computers used by every 100 people, the number of websites owned by every 100 companies, and the proportion of companies with e-commerce transaction activities. The number of computers used per 100 people reflects the popularity of computers used by enterprises and employees and is an indicator of the popularity of digital equipment. The number of websites per 100 enterprises shows the extent to which enterprises conduct online business and disseminate information by establishing and managing websites. The proportion of enterprises with e-commerce transactions reflects the proportion of enterprises conducting transactions on digital channels. A higher proportion of companies with e-commerce

transactions means that more companies choose to use e-commerce platforms for sales and transactions, further promoting the application and expansion of digital channels.

3.5.2 Data Sources

The digital level evaluation index system for the commercial circulation subdivision industry established in this article involves 3 subsystems and a total of 9 indicators, covering my country's time series data from 2013 to 2021. All data in the indicator system comes from the China Statistical Yearbook(2013-2021);China's Foreign Economic and Trade Statistical Yearbook; (2013-2021) and China's Tertiary Industry Statistical Yearbook.

The empirical measurement of the digitalization level of China's commercial circulation sub-sectors has the following characteristics, as shown in Figure 1:

1.From 2013 to 2021, the digitalization level of the three sub-sectors of commercial circulation has gradually increased. Among them, the digitalization level of the wholesale and retail industry gradually increased from 0.091 in 2013 to 0.253, with an average annual growth rate of 12%. The digitalization level of the transportation, warehousing and postal industry gradually increased from 0.101 in 2013 to 0.734, with an average annual growth rate of 15%. The digitalization level of the accommodation and catering industry has gradually increased from 0.204 in 2013 to 0.734, with an average annual growth rate of 15%. The reason for the continuous improvement of the digitalization level of the commercial circulation industry subdivisions may be policy support. Since the 18th National Congress of the Communist Party of China, our country has introduced a series of policies and measures to encourage and support the development of the commercial circulation industry, strengthened the supervision of the commercial circulation market, and standardized the competitive market. order and promote the healthy development of industrial standards. The report of the 20th National Congress of the Communist Party of China proposed to "accelerate the development of the digital economy and promote the deep integration of the digital economy and the real economy, providing policy support for the continuous improvement of the digital level of the commercial circulation sub-sector.

2.From 2013 to 2021, the digital development of the three sub-sectors of commercial circulation was uneven and there were differences. Specifically, the overall digitalization score of the accommodation and catering industry is the highest, with scores ranging from 0.204 to 0.734. The comprehensive digitalization score of the wholesale and retail industry is low, with scores ranging from 0.091 to 0.253. The development of transportation, warehousing and postal industries is somewhere in between. time, the score ranges from 0.101 to 0.734. The reasons for these differences may be related to the characteristics, needs and development stage of the industry. Different industries face different challenges and opportunities in digital transformation. The accommodation and catering industry has the highest overall digital score. This industry has an urgent need for the application of digital technologies, such as online booking, ordering and delivery. Consumers have high demand for digital services, which is conducive to promoting the digital transformation of enterprises. The overall digitalization score of the wholesale and retail industry is relatively low, which may be due to the large scale and dense store density of this industry, which makes digital transformation more difficult. In addition, traditional business models and concepts may also cause certain obstacles, leading to slower progress in digital transformation. However, it

should be noted that the comprehensive digital score in this industry also has a gradually increasing trend, which means that the industry is increasing its investment and efforts in digital transformation. The transportation, warehousing and postal industries have a combined digital score somewhere in between. The characteristics of this industry include the demand for logistics, transportation, and warehousing management, as well as the digital upgrade of express delivery and postal services.
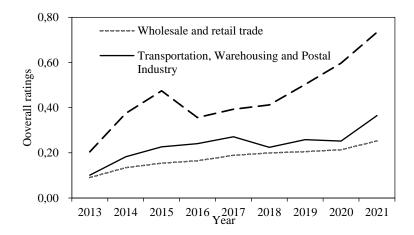

Fig. 1 Comprehensive digital development level of three sub-sectors from 2013 to 2021.

3.Looking at different dimensions, the development of the three industries in terms of resource digitization, Year

service digitization and channel digitization is different. As shown in Table 2, the wholesale and retail industry has developed more prominently in service digitization, while the accommodation and catering industries have developed more prominently in resource digitization. The development of transportation, warehousing and postal industries is relatively balanced in the three aspects. Specifically, during the study period, in the wholesale and retail industry, the digitalization of resources and channels showed fluctuating growth, and the digitalization of services continued to grow; in the transportation, warehousing and postal industries, the digitalization of resources began to decline after 2017, and the digitalization of services and channels showed fluctuating growth. The three dimensions of the accommodation and catering industries are in a state of continuous growth. These results reflect the characteristics and trends of digital transformation in the three industries segmented by commercial circulation. First of all, the wholesale and retail industries have made outstanding progress in the digitalization of services. This may be because the wholesale and retail industry is paying more attention to improving customer experience and sales services during the digital transformation process, and has improved marketing methods, customer management, and after-sales services through digital technology, thereby promoting the development of service digitalization. Secondly, the accommodation and catering industries have made significant progress in resource digitization. This is related to the fact that the industry pays more attention to using online platforms to improve resource utilization efficiency in digital transformation. For example, in the accommodation industry, room

information can be uniformly managed and optimally distributed through online booking platforms. In the catering industry, menus, orders, delivery, and other links can also be managed and coordinated through digital tools to improve efficiency and user experience. Finally, the development of transportation, warehousing and postal industries in the three dimensions is relatively balanced. This means that the industry pays attention to the development of resource digitization, service digitization and channel digitization at the same time during the digital transformation process. Therefore, for the digital transformation of different industries, it is necessary to formulate corresponding strategies and measures to give full play to the advantages and characteristics of each industry and promote high-quality digital development.

Table 2. Comprehensive development level of digitalization in three sub-sectors and three dimensions from 2013 to 2021

Year	Wholesale and retail trade			Transportation, Warehousing and Postal Industry			Accommodation and catering industry		
	Digitization of resources	Service digitalization	Channel digitization	Digitization of resources	Service digitalization	Channel digitization	Digitization of resources	Service digitalization	Channel digitization
2013	0.051	0.001	0.040	0.039	0.001	0.062	0.117	0.001	0.088
2014	0.068	0.013	0.053	0.075	0.017	0.090	0.169	0.035	0.171
2015	0.078	0.022	0.054	0.083	0.025	0.119	0.216	0.077	0.181
2016	0.077	0.029	0.059	0.093	0.025	0.123	0.112	0.066	0.179
2017	0.084	0.040	0.385	0.104	0.037	0.130	0.150	0.079	0.165
2018	0.095	0.054	0.050	0.073	0.047	0.104	0.176	0.094	0.142
2019	0.078	0.072	0.054	0.069	0.088	0.102	0.228	0.158	0.117
2020	0.077	0.087	0.050	0.071	0.085	0.095	0.267	0.199	0.131
2021	0.101	0.107	0.045	0.064	0.199	0.103	0.376	0.249	0.109

4 Conclusion

Based on the time series data of my country's commercial circulation industry from 2013 to 2021, this article measures the digitalization level of the commercial circulation sub-industry and analyzes its constraints. The results show that the comprehensive development of digitalization in the three sub-industries is gradually increasing, with an average annual the growth rate is between 12% and 15%, but there are also differences between the three sub-sectors. The level of digital development in the accommodation and catering industries is the highest, ranging from 0.204 to 0.734, while the level of digitalization in the wholesale and retail industries is relatively low, ranging from 0.091 to 0.253. The level of digital development in the transportation, warehousing and postal industries is in the middle, ranging from 0.101 to 0.734.

Considering that the comprehensive digital development of the three industries is gradually increasing, it is recommended to continue to promote digital transformation and improve the level of digital development.
In the wholesale and retail industries, obstacles can be reduced by further promoting e-commerce platforms and improving e-commerce related indicators.
In the transportation, warehousing and postal industries, as well as the accommodation and catering industries, resource digitization and website construction can be strengthened to improve the level of digitization. At the same time, strengthen policy support: formulate and

improve digital economic policies, encourage, and guide enterprises to accelerate digital transformation, and provide financial, taxation and talent support.

References

[1]   Li Fu, Wang Xiangrong. Digital transformation strategy for the trade and circulation industry in small and medium-sized cities[J]. China Opening Journal,2020(06):83-90.

[2]   Yang Haili, Cao Tingbing. Research on the impact of digital technology factor input on the profit margin of the commercial circulation industry[J]. Journal of Zhengzhou University of Aeronautics,2022,40(01):56-62.

[3]   Jiang Wenhui; He Xuehan. Analysis of paths to improve the efficiency of the commercial circulation industry under the digital economy[J]. Journal of Inner Mongolia Minzu University(Social Sciences),2022,48(03):69-75.

[4]   Mendez-Picazo María-Teresa and Galindo-Martin Miguel-Angel and Perez-Pujol Rafael-Sergio. Direct and indirect effects of digital transformation on sustainable development in pre- and post-pandemic periods[J]. Technological Forecasting & Social Change, 2024, 200 : 123139-.

[5]   Wu Ting. Measurement of digitalization level of my country's circulation industry and analysis of spatial and temporal evolution characteristics[J]. Business & Economy,2023(12):106-109.

[6]   Duan Lianhe. The relationship between digital element resource endowment and the expansion and quality improvement of the commercial circulation industry-analysis based on provincial panel data[J]. Journal of Commercial Economics,2022(17):29-32.

[7]   Zhang Chi. The impact of cross-border e-commerce development on the digital transformation of the commercial circulation industry[J].Journal of Commercial Economics,2022(24):150-153.

[8]   Xu Chao and Sun Guanglin and Kong Tao. The impact of digital transformation on enterprise green innovation[J]. International Review of Economics and Finance, 2023, 90 : 1-12.

[9]   Nadeem Kashif et al. Digital transformation and industry 4.0 employees: Empirical evidence from top digital nations[J]. Technology in Society, 2024, 76 : 102434-.

[10]   M.C. P L ,Lin K P ,Wilson C W A , et al.Digital menus innovation diffusion and transformation process of consumer behavior[J].Journal of Hospitality and Tourism Technology,2023,14(5):732-761.