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Research on the Performance Strategy Choice of Low-carbon Operation of Tourism hotels from the Perspective of Network Management

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Abstract

The application of performance strategy selection in the low-carbon operation of hotels has gradually improved the operation level and made low-carbon operation management the focus of tourism hotel research. Due to the complexity of the process of low-carbon operation, the traditional performance strategy selection method cannot solve the problems of large data volume and complex data structure, and the operational performance management effect is poor. Therefore, this paper analyzes the selection of operational performance strategies from the perspective of network management. Wireless internet technology and low-carbon evaluation system are used to set the parameters of strategy selection, and the operational performance strategy is transformed. Then, the low-carbon operation effect is verified according to the performance evaluation system, and the parameters of the operational performance strategy are finally obtained. The results of strategy selection show that from the perspective of network management, the selection accuracy of low-carbon operational performance strategies of tourism hotels is greatly improved, which can meet the needs of actual operation strategies.

Keywords: Network Management, Tourism Hotels, Low- carbon, Operation Performance

1. Introduction

Global warming has become a serious concern to the entire world as the adverse impacts on the biotic and abiotic environment, which are aggravated by industrial and human behaviours. The hotels and lodging industry comprises of anthropogenic activities, which are now imposing a big environmental pressure. Hotels are increasingly acting as the chief mode of accommodation, and food has witnessed rampant growth in recent years. This trend is further accelerated by the development of international tourism. The governments are also trying to attract more revenue to their countries, and this has substantially caused a great change in the tourism and hotel industry. The notion of hotel management activities has been transformed due to these activities. The surge in user numbers has escalated concerns about energy consumption, especially due to their preference for energy-intensive activities. This trend is contributing to significant carbon dioxide emissions globally [1]. In China, this issue is particularly acute. Research indicates that in Beijing, hotels, especially those with star ratings, are among the most energy-consuming buildings, surpassing even shopping malls and commercial complexes. These high-end hotels, while offering superior comfort, luxury, and service, also result in higher energy and water consumption.This leads to the increased emission of huge amounts of greenhouse gases that harm the environment. They are now emanating as primary contributors that degrade the environment, especially in the tourism hotel and lodging industry.

The extensive practice of a low-carbon business strategy greatly increases the operating cost of tourism hotels, so hotels attach great importance to the choice of a low-carbon business performance strategy. However, in the process of strategy selection [2], there are problems of inaccurate selection and many aspects which seriously affect the development of low-carbon operation of hotels. How to effectively select performance strategies and improve operational performance is the focus of tourism hotels at present [3]. The survey results show that low-carbon operations accounted for 12% of tourism hotels in 2010 and 67% in 2022, while the low-carbon operational performance of hotels has not been significantly improved, indicating that the low-carbon operational performance of tourism hotels needs to be improved. The operational performance mentioned in this work is the profit and the brand established by the hotels. At present, the low-carbon operational performance of tourism hotels is shown in Figure 1. It can be noted that there is evidently a need for improvement in the low-carbon performance of tourism hotels [4].

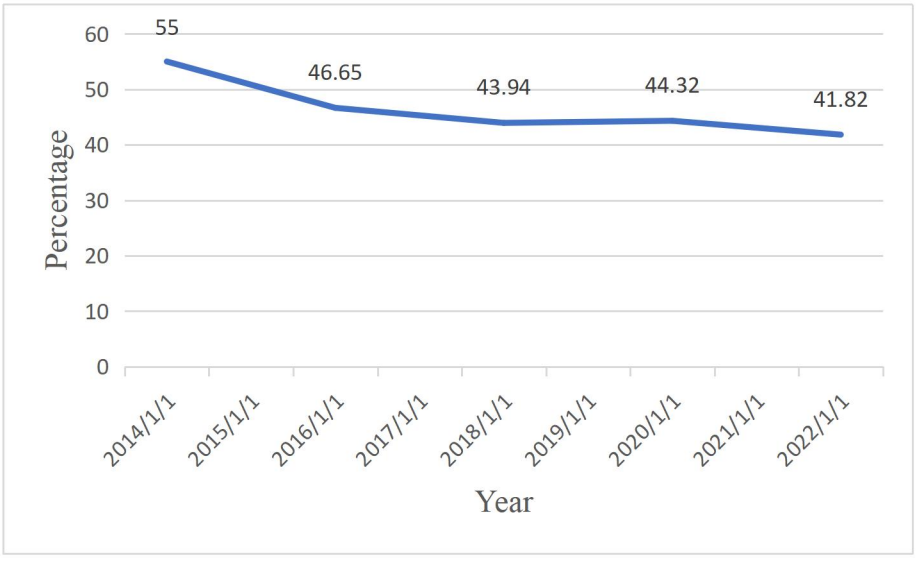

Figure 1. Low-Carbon Operational Performance of Tourism Hotels (Unit: %)

It is evident that carbon footprint is the major driver of human-made climate change. This will eventually affect other factors such as urban air pollution, acidification of the ocean, hazardous acid rain, melting glaciers etc. The sad truth is hospitality sector is making the very slightest effort to mitigate the environmental impact caused by its carbon footprints. Sustainable measures like utilizing renewable energy sources, adopting environmentally friendly practices, using eco-friendly amenities, and developing the construction of eco-friendly buildings are some of the important ways to

incorporate the commitment of tourism hotels towards establishing and fostering environmental responsibility. These practices can even rejuvenate the environment and retain the ecology.

The studies reveal the existence of significant knowledge gaps in understanding the environmental impacts and carbon footprints of tourism hotels. These gaps are due to the limited scope of the environmental impact assessments, driven by the unavailability and scarcity of data. Infrequent data access, poor quality of data and scarcity of data have eventually led to the development of and application of streamlined and simplified approaches towards improving the environmental impact of carbon footprints of tourism hotels. It can be noted that such approaches primarily focus on either a single or a small count of impacts. Building small bricks be these environmentally friendly deeds will help in developing a holistic, multi-impact approach and assessment.

Another major hurdle in this research is the dimensions and robustness of tourism hotel operations. These operations may be either active or passive, direct or indirect. The latent, hidden, indirect or embodied impacts on the environment are very difficult to assess. However, they are chief contributors towards the construction, operation and maintenance of the tourism hotel and lodgings. Maintenance of tourism hotel buildings, their operational and reserved infrastructures, provisioning and maintaining the guest facilities and other related amenities like in-room décor, furniture, fittings, bathrooms, sanitary fixtures, electric equipment and electronic components come at very high costs. These generally impact the environment in a much indirect manner, but their contribution towards carbon footprint is enormous. However, very little analysis and empirical research has been done in this domain which establishes the true magnitude of these impacts and compares it against that of hotel operations.

The adoption of low-carbon design principles is increasingly recognized as a best practice and is garnering significant attention. In the realm of tourism, particularly in hotels and similar structures, the implementation of these eco-friendly design concepts is becoming crucial for sustainable development. This is especially true in densely populated tourist areas. Focusing on environmental preservation, resource conservation, and the potential for reuse, these design strategies are vital. Merging architectural design with low-carbon principles involves optimizing resource use, which can yield substantial benefits.Further, these activities will prevent or at least slow down the degradation of the environment. On the other hand, low-carbon, environmentally friendly design ideas should meet the requirements of the tourism hotels without compromising the act of green life, environmental protection, energy conservation, reduction in emission etc.

In the construction of tourism hotels and accommodations, materials, consumables, and networking elements are integral. Their role is pivotal in shaping the low-carbon footprint and environmental sustainability of these establishments. Moreover, these components are essential in characterizing and enforcing low-carbon environmental standards in the tourism sector. Creating and assessing new design methods for fostering low-carbon environmental protection along with technologies is the greatest challenge faced by the world. Deploying contemporary technologies in the process of reducing the carbon footprints of tourism hotels can be leveraged by integrating the eco-friendly practices of recycling as well as the optimal reuse of available resources. This will eventually minimize the degradation and damage caused to the natural environment by human-intensive activities like tourism.

Not all the low carbon measures can be implemented in all tourism hotels. There are a few predominant factors that contribute to and ease the process of reducing carbon emissions. The level of economic development, the intensity of population, government intervention and local policies, along with the education level of customers, hotel owners and other stakeholders involved in tourism-related activities, play a vital role in imparting and enforcing low-carbon tourism in hotels [5]. The factors are described as follows:

- Economic Development Indicator: The Gross Domestic Product (GDP) is a crucial measure of a region's economic progress. Areas with advanced economic development often show a stronger dedication to environmental conservation, influencing overall productivity levels. Notably, regions with robust economic growth, especially those with a focus on tourism, tend to have a more balanced and stable industrial framework.They pay more attention to investments in eco-friendly practices and

green development. Nevertheless, the economically underprivileged regions may focus only on economic growth, not heeding attention to green practices. This will cause more damage to the environment as the investment made to pollution control will be very less.

- Population Density: This aspect relates directly to the number of people residing in a given area. It serves as a measure of urban expansion. A surge in population typically leads to increased energy consumption, potentially hindering advancements in productivity, especially from a green energy perspective. Conversely, high population density can also encourage more efficient resource utilization, enhancing revenue generation while maintaining environmental sustainability.
- Government intervention: Any measure taken to protect the environment will not be successful without the support of the government. As governments are the policymakers and supplier of public goods, it has great influence and impact on economic development as well as environmental protection. Nevertheless, proper government intervention ensures that the market order on one side and on the other side, it can also regulate productive behaviour. But it has to be noted that excessive intervention by the government will not encourage fair competition among the tourism hotels in the market, which eventually declines the production and revenue from tourism.
- Education level: Despite the efforts taken by tourist hotels, governments and other agencies to maintain sustainability, the reachability of good eco-friendly practices in network management can be cherished only by educating the individuals. Education eases the usage and deployment of high-quality and high-level human resources by skillful and optimal usage. This impedes revenue through a cleaner production process. This also ensures that processes are done in order and regulated well.

Network management belongs to a management mode of LAN, Wireless Internet, 4G network, Broadband access networks and IEEE 802.11 [6], which uses the network conditions in the hotel for efficient data transmission, reduces the power of transmitting equipment, and improves network transmission speed and accuracy to meet the needs of low-carbon operation [7]. Based on this, this paper analyzes the low-carbon operational performance of tourism hotels from the perspective of network management, simplifies the data volume and transmission process in the hotel operation process, and improves the efficiency and accuracy of network transmission, as shown in Figure 2.

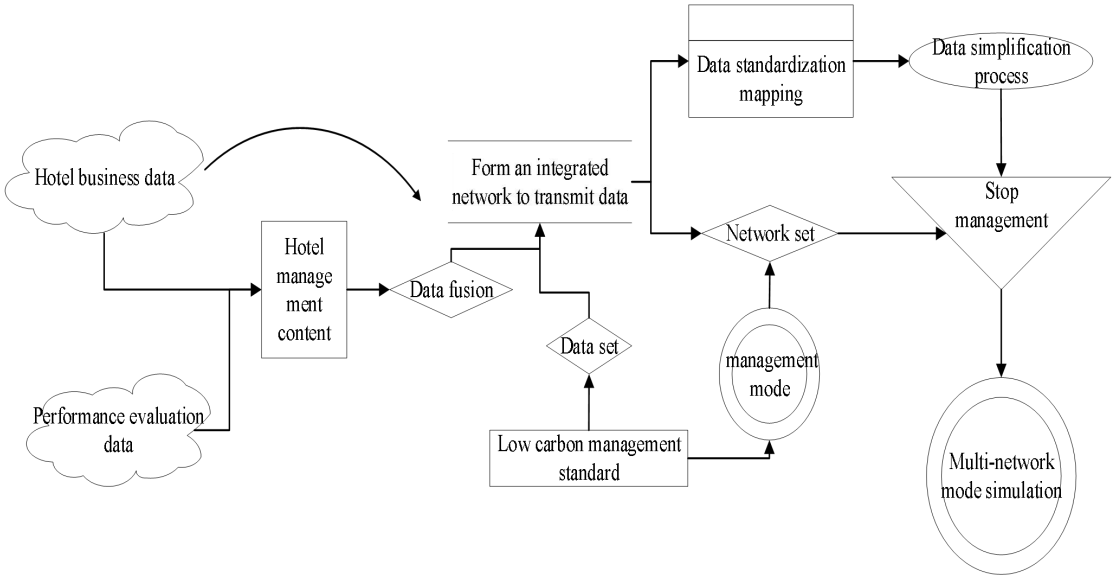

Figure 2. Transmission of Low-Carbon Operation Data of Hotels from the Perspective of Network Management

The network management technology has high network management efficiency and quantitative data transmission, which can select and integrate low-carbon performance strategies, wireless Internet, 4G network, broadband access networks and IEEE 802.11. At the same time, an in-depth iteration of the low-carbon performance strategy is carried out to compare the content of the performance strategy [8], low-carbon optimization effect, and integrity of wireless Internet, 4G network, broadband access networks and IEEE 802.11 [9]. Some scholars have conducted relevant theoretical research and found that network management technology can improve the accuracy of low-carbon performance strategies [10], but there is a problem of ambiguity in wireless Internet, 4G networks, broadband access networks and IEEE 802.11, and it is necessary to integrate low-carbon performance evaluation

standards to complete the selection of operational performance strategies [11]. When establishing clear standards for evaluating low-carbon performance, it's crucial to refine the performance both pre- and post-implementation, ensuring the strategy's soundness and precision [12]. Concurrently, integrating these standards with low-carbon operational guidelines is essential to validate the effectiveness of operational performance strategies. The range of applicability for network management is detailed in Table 1.

Table 1. Scope of Application of Network Management

Method	Scope of Application	Advantage
Union with an intelligent approach	Massive data Research of hotels, tourist areas, Internet, large servers and so on	Process complex and diverse wireless internet data, process a large amount of 4G network data at a time, and efficiently process unstructured data to simplify the processing process.
Joint with statistical methods	Large and medium-sized enterprises, annual statistics, local data	Simplified processing of complex wireless internet data, large single data processing, unstructured data processing
Joint with human computing	Within departments, institutions, special businesses, etc	Simple one-way wireless internet data, the amount of data processed at a time is small, and it is impossible to process unstructured 4G network data, mainly processing qualitative data

Table 1 illustrates that the former approach to network management was capable of initially filtering the operational data of tourist hotels. However, issues like network congestion and delayed information were prevalent [13]. Consequently, this study opts for a strategy focusing on operational performance, utilizing resources such as wireless internet, 4G networks, broadband access, and IEEE 802.11 standards. This approach establishes an efficient network management system and configures the transmission parameters accordingly.

2. Related Concepts

2.1 Hotel Low-carbon Operational Performance on Wireless Internet, 4G Network

Low-carbon operational performance requires optimizing resources such as channels, transmission power of wireless Internet, 4G network [14], and transmission volume according to low-carbon standards to reduce the amount of 4G network data transmission in the operation process of wireless Internet. Firstly, the rough set theory is used to standardize and map the operation data of tourism hotels [12] and the correlation of different operation data, as well as the transmission rate, security, and stability of broadband access networks. Then, sift through the massive amounts of operational data to identify key values and look for performance indicators that correspond to them. The network management technology can select the operation 4G network data, channel, and transmission frequency in the transmission and build a performance strategy collection and policy class. The specific results are shown in Figure 3.

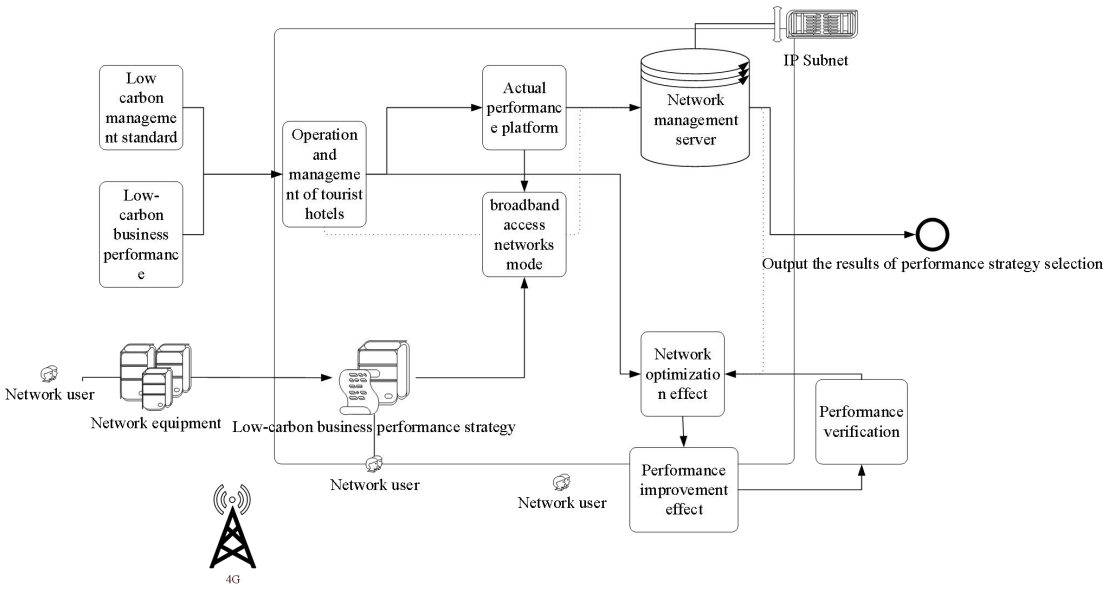

Figure 3. Research Process of Low-Carbon Operation Data

In order to analyze more accurately, the operation data in the network management transmission should be screened, the hotel network environment and the hotel low-carbon optimization effect standards should be set [13], and the results are as follows.

Collection of hotel operation 4G network data: hotel operation is x_i , policy is x_j , broadband access networks frequency is given as Equation (1):

$$\text{Access network frequency}=\frac{x_i\ x_j}{\sum \vec{x_i}\ \vec{x_j}} \tag{1}$$

Where the network management transmission function is $\text{int}(x_i \cdot x_j)$, the collection ratio is expressed as Equation (2):

$$\text{Collection ratio}=\frac{x_i}{\sum x_i \cdot x_j} \tag{2}$$

The transmission of hotel operation data is shown in Equation (3):

$$\text{int}(x_i \cdot x_j)=[x_i \to x_j]\cdot\frac{x_i}{\sum x_i \cdot x_j} \tag{3}$$

The process of writing a program for network management is as follows:

```
IF (broadband access networks=data)
{
  set x =1 : 100;
  for ( lm<x) Do
    {
      x = x+y;
      y = y+1;
```

```
    }
else z=x+y
}
```

Network management: the IEEE 802.11 is $f(y_i \to x_i)$, the low-carbon standard is $s\tan(\sum x \neq y|0.8)$, the network management strategy set is set , and the implementation process of network management is shown in Equation (4):

$$f(y_i \to x_i) = \frac{s\tan(\cdot) \cdot x_i}{0.8} \tag{4}$$

The specific code-writing process is as follows:

```
IF (in IEEE 802.11=int y)
{
 For( x =<m)
  y = y+1;
 else
   y= y;
sum(y);
  else put( x,y)
}
```

The code checks the parameter y to be a part of IEEE 802.11. If it is not matched, the y value is incremented.

Selection of low-carbon operational performance strategy: The low-carbon performance strategy is y_i , the low-carbon selection function is $cha(y)$, the low-carbon operational performance fitting function is $u(y \cdot cha)$, and the selection process of low-carbon Operational Performance strategy is shown in Equation (5):

$$u(y) = \frac{y_i \cdot cha}{f(\cdot) \cdot \text{int}(\cdot)} \tag{5}$$

3. Methodology

3.1 Signal Correlation between Operational Performance Strategy and Network Management

There is a certain correlation between performance strategy and wireless Internet management, and the performance strategy and performance content are complex, so it is necessary to standardize the low-carbon performance strategy [13] [15] and determine the 4G network transmission frequency value and weight of wireless Internet. In addition, wireless Internet congestion and delay inhibit the implementation of performance strategies, so it is necessary to analyze the correlation of strategies to realize the comprehensive selection of low-carbon performance strategies, and the specific selection process is shown in Figure 4.

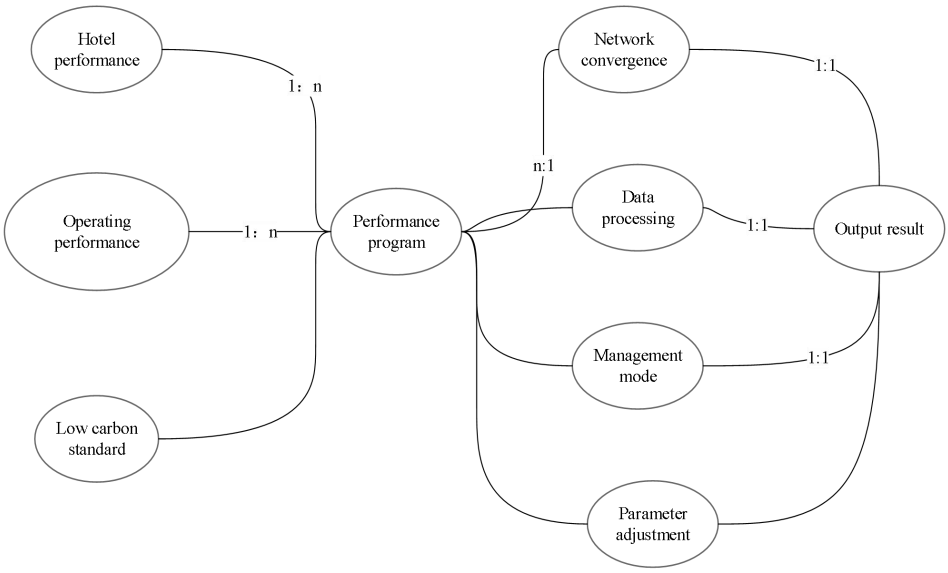

Figure 4. Selection Process of Low-Carbon Performance Strategy on Wireless Internet

The outcomes depicted in Figure 4's strategy selection reveal that during the analysis of performance strategy frequency values, it's important to categorize low-carbon performance strategies and choose appropriate corresponding approaches. Table 2 shows the Research results of setting the channel, transmission range, and low-carbon operation effect of the policy.

Table 2. Low-Carbon Operating Results of Performance Strategies

Type / Policy Number Combination	Hotel Network Transmission Volume	Wireless Internet Transmission Frequency	4G-Network Channel	Broadband Access Networks Policy Classification	4G-Network Transmission Volume
(24, 14)	75.25	79.21	68.93	55.02	735.25
(32, 37)	65.97	88.73	51.57	87.63	625.97
(43, 25)	59.56	69.74	67.86	76.43	519.56
(11, 1)	50.25	64.40	77.33	86.75	250.25
(9, 7)	63.94	75.42	79.89	63.71	163.94
(13, 8)	88.67	73.97	72.00	66.97	388.67
(41, 32)	65.69	85.96	52.74	75.89	265.69
(27, 45)	55.49	84.16	59.06	78.09	155.49
(42, 5)	68.51	67.35	88.02	61.98	268.51
(19, 10)	58.97	71.94	52.66	73.06	158.97
(9, 26)	57.97	58.29	74.67	87.01	557.97
(32, 21)	77.73	72.43	51.70	70.35	277.73
(11, 43)	50.47	57.09	83.45	58.46	520.47
(33, 9)	82.56	83.04	59.11	59.65	832.56

From the research of tourism strategy points in Table 2, the 4G network transmission volume, wireless Internet transmission frequency, 4G network channel, strategy classification, and 4G network transmission requirements are reasonable, and the collection results of low-carbon operation data of tourism hotels are better. The operational data in Table 2 is standardized, and the results are shown in Table 3.

Table 3. Transmission Requirements for Low-Carbon Performance Strategies

Initial Data On The Low-Carbon Performance Of Tourism		**Wireless Internet Normalized Data**		**4G Network Data Bias**
Low Carbon Standards	Performance	Low-Carbon Operations	Performance	
0.64	0.59	0.64	0.79	0.2
0.75	0.58	0.75	0.72	0.14
0.53	0.52	0.53	0.73	0.21
0.90	0.54	0.90	0.78	0.24
0.58	0.50	0.58	0.71	0.21
0.50	0.52	0.50	0.71	0.19
0.59	0.54	0.59	0.77	0.23
0.89	0.59	0.89	0.71	0.12
0.74	0.50	0.74	0.71	0.21
0.69	0.52	0.69	0.77	0.25
0.74	0.57	0.74	0.76	0.19
0.87	0.54	0.87	0.72	0.18
0.89	0.58	0.89	0.71	0.13

According to the operation data in Table 3, the low-carbon operation and performance standardization of network management receiving operation data is better, and the deviation is within 0.25. Among them, the low-carbon operation and performance of 4G network data received from the perspective of network management have good stability, indicating that network management can realize the standardized processing of low-carbon performance strategies. There are also small differences between the amount of hotel operation data and the amount of 4G network transmission, indicating that the stability and security of sending and receiving operational performance wireless Internet data are better.

3.2 Strategy Research based on 4G Network Management Technology

There are three main types of low-carbon operational performance data processing of 4G network management technology, namely the mapping of low-carbon operation data, the selection of performance strategies, and the verification of performance strategies. The mathematical description of the above three treatments is as follows.

The treatment of a low-carbon operational performance strategy in a 4G network is shown in Equation (6):

$$fa(x)\begin{cases}\int_{i=1}^{n}\operatorname{sum}\sum\overline{x}_{ij},x_{ij}\in n\\ \sum\vec{x}_{ij},x_{ij}=\geq\left|x_{ij}\right|\\ x_{ij}\cdot\xi_{ij},x_{ij}\neq\xi_{ij}\end{cases}\tag{6}$$

From Equation (6), policy selection based on network management technology can be made, and the results are shown in Table 4.

Table 4. Low-Carbon Performance Strategy Selection of Networked Management Technology

Policy Requirements	**4G Network Data Policy Requirements**	**Broadband Access Networks Transport Policy Requirements**	**Broadband Access Networks Policy Adjustment Frequency**

(1, 3)	58.48	64.74	1
(1, 2)	60.96	59.87	4
(2, 1)	58.30	59.00	7
(1, 3)	57.45	59.61	2
(3, 2)	61.18	58.69	6
(3, 2)	59.89	55.40	5
(2, 1)	58.74	52.58	9
(2, 3)	57.85	66.00	9
(2, 1)	63.67	64.67	6
(1, 2)	56.57	61.29	1
(1, 3)	62.06	58.08	4
(3, 2)	62.11	61.22	2
(1, 2)	62.26	57.17	3

Note: 1 stands for WIFI, 2 stands for broadband access networks, and 3 stands for 4G

Analysis of network management technology choices presented in Table 4 shows that the criteria for selecting content and structure in operational data through random sampling exceed 50%. This suggests that the policy demands from a network management perspective are significant. With the selection frequency of operational data being under 10, it points to issues in the low-carbon operational data, such as the absence of characteristic values and anomalies. However, the compliance of operational data status also indirectly reflects the security of the ultra-broadband access network environment.

4. Results and Discussion

4.1 Network Environment for Operating Data Transmission

This paper is based on the 4G network environment of the tourist hotel, combined with the transmission bandwidth of 5~10Gpics. The transmission mode is wireless Internet, broadband access networks, 4G network, and other transmission methods, transmission equipment: 3 servers, 6 signal boosters, 12 routers and repeaters. The transmission content includes video, text, web pages, pictures and other multimedia content, the protocol is TCP/IP, the system is a window system, and the initial information of the network environment is shown in Table 5.

Table 5. Environment of Low-Carbon Operational Performance of Tourism Hotels

Parameter	**Hardware Aspects**	**Software-Wise**	**4G Network Delay Time**
Network Resource Configuration	3 Servers, 4 Clients, 6 Routers, 10 Receivers	Windows System, Firewall, Firewall, Antivirus, Broadband Access Networks	0.36
Perfect Performance System	1 Server, 1 Client, 3 Routers, 3 Receivers	Windows System, SQL Database, Firewall	0.50
Stable Transmission	3 Servers, 4 Clients, 6 Routers, 10 Receivers	Windows System, Wireless Internet Switching Software	0.34
Transfer Efficiency	3 Servers, 4 Clients, 6 Routers, 10 Receivers	Wind Systems, Firewall, Broadband Access Networks	0.24
Low Carbon Standards	Hotels, National And International Low-Carbon Operation Standards	Windows System, Client, Broadband Access Networks	0.36

The low-carbon operational performance data in Table 5 were tested to obtain the corresponding strategy selection results, as shown in Figure 5.

Low carbon standard = 0.45, WIFI transmission, not optimized by network strategy

Low carbon standard = 0.45, WIFI transmission, network strategy optimization

Figure 5. Transfer Results before and after Policy Optimization

It can be seen from Figure 5 that under different strategies, the effect of 4G network management is also different, and finally a better policy selection result is obtained, indicating that the network management technology can optimize the strategy selection, and the specific policy selection results are shown in Table 6.

Table 6. Overview of Performance Strategy Selection based on Networked Management Technology

Performance Strategy Content	**Broadband Access Networks Policy Refinement**	**Form of 4G Network Transmission**	**Conformity**
Channel	ASDL	Wireless, Broadband Access Networks, 4G, etc	89.58
	Optical Fiber		83.64
Transmission Frequency	Low Frequency		85.37
	Intermediate Frequency		85.55
	High Frequency		86.19
4G Network Tuning	Wireless Internet→ Broadband Access Networks		84.01
	Broadband Access Networks → 4G		90.02
Resource Consumption	20% Or Less		85.81

4.2 Degree of Selection of Operational Performance Strategies

The degree of selection is an important indicator of strategy selection, which can deeply analyze the low-carbon optimization effect of low-carbon performance strategies, and the specific research results are shown in Table 7.

Table 7. Policy Selection based on Network Management Technology

Research Method	**Content**	**Index**	**Broadband Access Networks Policy Selection Rationality**	**The Amount of Broadband Access Networks Policy Adjustment**
	Policy Structure	Data Type	89.42	4.50

Networked Management Technology		Mode Of Broadband Access Networks	83.64	5.22
		Low-Carbon Performance System	80.02	3.41
	Policy Time	Data Transmission	84.20	5.68
		Network Latency	80.82	4.62
		Data Conditioning	84.72	3.35
	Policy Level	IEEE 802.11	84.43	5.24
		4G Network	81.93	5.87
		Wireless Internet	81.30	3.58
		Hybrid Network	85.17	3.82
		Random Network	88.68	5.69
Past Network Management Methods	Policy Structure	Data Type	82.47	4.68
		Mode Of Broadband Access Networks	84.08	5.39
		Low-Carbon Performance System	87.21	5.16
	Policy Time	Data Transmission	86.31	5.72
		Network Latency	85.36	4.02
		Data Conditioning	82.13	3.56
	Policy Level	IEEE 802.11	88.92	3.49
		4G Network	87.95	5.71
		Wireless Internet	89.95	3.99
		Hybrid Network	84.98	3.61
		Random Network	82.71	4.35
Median=7.262				
Fit = 0.852				
Dispersion = 7.623				

The adjustment process of policy selection in Table 7 is shown in Figure 6.

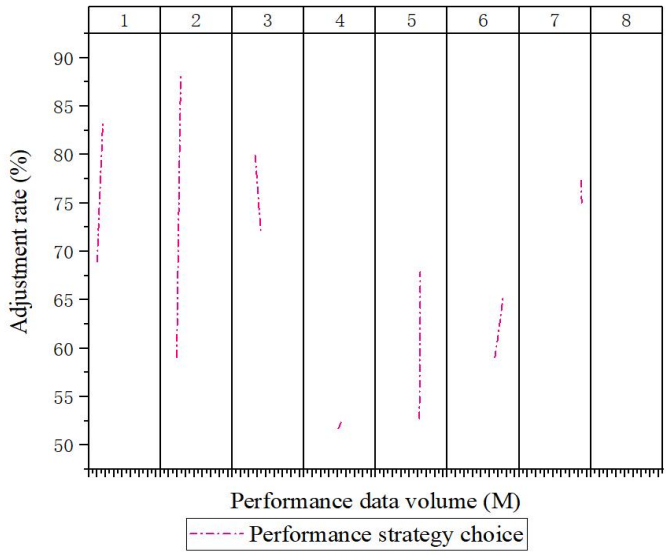

Figure 6. Adjustment Process of Performance Strategy Selection

According to Figure 6 , the proposed method significantly enhances the strategy adjustment for operational data transmission. In the context of transmitting low-carbon performance strategies, the strategy adjustment rate for operational data exceeds 70%. This notable improvement is attributed to several key factors: the integration of various network models, policy shifts in transmission volume, decreased server load, and enhanced channel efficiency.

4.3 Low-Carbon Optimization Effect Of Operational Performance Strategy

The judgment of low-carbon optimization effect based on network management technology includes power consumption, resource utilization, management process, network occupancy time, and standby time, analysing the factual results of different indicators. The specific results are shown in Table 8.

Table 8. Low-Carbon Optimization Effect of Transmitting Operational Data in Low-Carbon Performance Strategy [Unit: %].

Method	Power Consumption	Resource Utilization	Manage Processes	Network Occupancy Time	Standby Time
Networked Management Technology	80.06	81.03	88.46	89.82	89.99
	80.46	80.32	87.52	89.65	80.37
Past Network Management Methods	78.84	78.85	77.84	80.53	80.62
	71.64	78.85	80.40	79.73	81.12
Mean = 72.62					
X2=8.231					
P<0.011					

The low-carbon optimization effect of the operation data in Table 8 is shown in Figure 7.

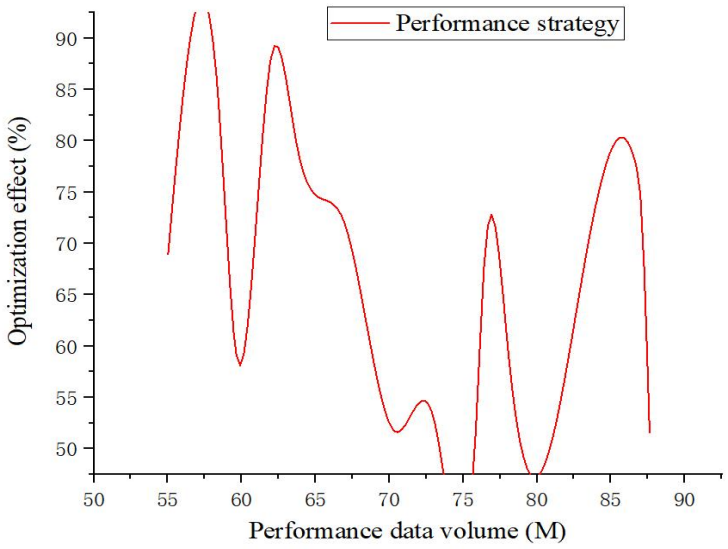

Figure 7. Research of Low-Carbon Optimization Effect Based on Network Management Technology

Figure 7 shows that the association process of broadband access networks and the absence of duplicate strategy selection indicate that the network management technology has high accuracy in selecting low-carbon performance strategies. In addition, the 4G network management technology

realizes the efficient use of network resources and reduces the complexity of broadband access networks to ensure operational performance strategies and effective implementation [16].The observed outcomes primarily stem from the effective optimization of 4G network resources through advanced network management techniques. This optimization streamlines the selection of low-carbon performance strategies and enhances the overall rationality of strategies for low-carbon operational performance.

4.4 Transmission Security of Operational Performance Strategies

Safety is the guarantee of low-carbon performance strategy selection, and the feature points should be analyzed in multiple frames and compared with the external interference results, and the specific results are shown in Figure 8.

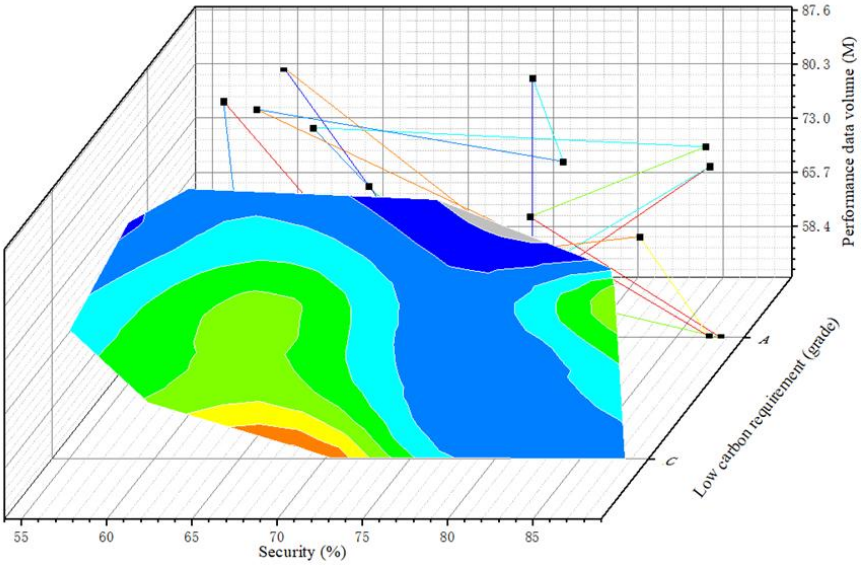

Figure 8. Security of Hotel Operation Data in 4G Network

As can be seen from Figure 8, transmission security is concentrated in 89%, with key low-carbon performance strategies and external interference points at the centre. The 4G network data in the graph shifts from any point to a central point, indicating the gradual improvement of safety and the shift in the focus of low-carbon performance strategies [17]. The results in Figure 8 show that the network management technology can use 4G network resources and select the choice of low-carbon operational performance strategy for hotels. The results in Figure 8 are compared below, as shown in Table 9.

Table 9. Safety Summary of Low-Carbon Performance Strategies

Method	Content	Before Testing	After Testing	Comprehensive Results of 4G Network	Deviation	Concentration
Networked Management Technology	Network Resources	50.24	79.34	79.83	1.29	88.11
	Operational Data	51.86	79.71	78.17	2.31	87.34
	Performance Strategy	51.20	80.19	79.43	2.67	80.93
Past Network Management Methods	Network	50.64	79.97	80.25	7.86	79.30
	Operational Data	51.47	80.76	80.48	7.76	60.61
	Performance Strategy	50.00	80.39	80.15	7.71	60.22
Mean = 8.62						

X2=4.231
P<0.021
Median=7.92

Compared with the previous network management methods, the results of the network management technology test are better, and the calculation results of the network management technology meet the actual requirements under the requirements of low-carbon performance. In terms of effectiveness, network management technology integrates network resources, simplifies low-carbon performance strategies, simplifies data wireless internet transmission processes, and enhances 4G data anti-interference capabilities.

4.5 Accuracy of transmission of tourist hotel operation data

In order to verify the low-carbon optimization effect of 4G networked management technology, the accurate judgment of performance strategy is shown in Figure 9.

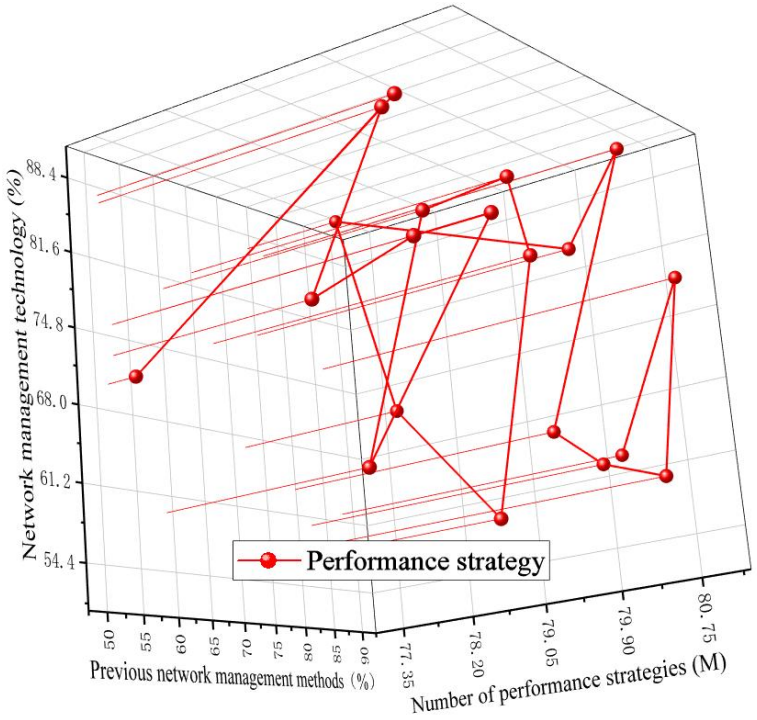

Figure 9. Selection Accuracy of Performance Strategy

It can be seen from Figure 9 that the performance strategy selection based on network management technology is highly accurate, better than the previous network management methods, and the low-carbon performance strategy is high. The low deviation indicates that the 4G network management technology achieves the accurate selection of low-carbon performance strategies, and the detailed results are shown in Table 10.

Table 10. Accuracy of Low-Carbon Operation Strategy Selection

Policy Content	**Low-Carbon Operations**		**Wireless Internet**	
	Networked Management Technology	Past Network Management Methods	Networked Management Technology	Past Network Management Methods
Data Fusion Policies	79.56	79.42	81.08	82.94
Network Switching Policy	80.17	77.97	78.59	80.11
Transport Zone Adjustment Policy	79.82	79.37	81.13	80.20

Inefficient Operational Policies	80.89	82.03	78.94	78.58
Run Policies Efficiently	81.94	81.44	80.83	78.90
Defense Strategy	77.97	81.38	78.90	80.51
Proactively Identify Policies	79.18	81.18	81.07	80.56
Indirect Optimization Strategy	80.69	81.03	80.95	78.59
Other Strategies	80.70	80.47	81.39	80.98

Table 10 reveals that, in the context of process accuracy, the variation in accuracy for the current network management technology is markedly less compared to traditional methods. Furthermore, this technology demonstrates superior performance in several areas, including the adjustment of wireless internet transmission zones, the optimization of operational strategies, and the enhancement of defense mechanisms, outperforming previous network management approaches. The reason is that 4G network management technology uses network convergence methods to improve the accuracy of low-carbon performance strategy selection, and verify low-carbon operation standards, continuously simplify 4G network management schemes, and reduce them. The influence of external interference on the wireless internet transmission result, thereby improving the accuracy of the transmission.

4.6 Few Best Practices for Low Carbon Hotels

The following are few initiatives that could bring a change in reducing the carbon emissions form hotels:

- Emphasize the importance of energy saving and environmental safeguarding, guiding properties towards sustainable, low-carbon growth.
- Proactively explore and adopt low-carbon practices and technologies, including experiences in retrofitting, for practical implementation.
- Create new low carbon practices
- Foster low-Carbon Managerial Activities that focusses on creating sustainable practices in tourism hotels
- Focus on personal norms, as they have a direct and positive impact on fostering low-carbon behaviors among employees in star-rated hotels.
- Adopting a strategic approach that influences the low-carbon behavioral patterns of staff in star-rated hotels.
- The perception of behavioral control directly and positively influences the low-carbon actions of employees in star-rated hotels.
- In star-rated hotels, the focus is significantly on the consumer, as their attitudes are crucial for the hotel's survival. This focus is closely linked to repeat business, positive referrals, and maintaining guest loyalty.
- To attract and retain guests who favor low-carbon operations, hoteliers are increasingly committed to a range of sustainable practices. These include sourcing eco-friendly products, conserving energy and water, and implementing waste recycling programs, catering to the needs of environmentally conscious guests.
- It's important to recognize that tourism hotels are often commended for their low-carbon corporate culture and eco-friendly brand image.
- Hotel operators should implement a system of rewards or penalties for employees based on their adherence to and performance in low-carbon practices.
- Implementing low energy-efficient facilities is a key step. Undertaking energy-saving renovations represents a significant milestone in the development of low-carbon hotels.
- Offering ongoing training for hotel staff is essential to disseminate knowledge about low-

carbon practices within the tourism hotel industry.

- Replacing disposable toiletries like prepackaged toothbrushes, toothpaste, shampoo, soap, combs, and slippers with eco-friendly, reusable alternatives is a sustainable practice.
- Condition of road rally, campaigns and other monumental activities which will popularize the low-carbon publicity activities.
- Also putting up banners and slogans in the context of environmental protection along with energy-saving reminders in the guests' rooms can also bring the change.
- Hoteliers can participate and organize voluntary activities about low-carbon practices and development with peer enterprises.
- Staff can be held responsible for controlling emissions and foster environmental protection
- Carbon accounting as well as maintaining inventory is also an important step in initiating the strategies for mitigating the Greenhouse gas emissions.

The tourism hotel industry must undergo transformation in the banner of low-carbon tourism involves the integration of multiple heterogeneous contemporary technologies. Any measure adopted or any new practice will pose a great challenge to the entire tourism hotel industry chain. This necessitates the active participation of network technologies through intelligent reform measure incorporated in the tourism hotel industry chain. This promotes the iteration as well as the upgrading of all the supporting services. By realizing the growth of the tourism hotel revenue, it is quintessential to explore and expand new profitable ventures by harnessing new networking technologies.

5. Conclusion

Aiming at the low-carbon operation of tourism hotels, this paper proposes a 4G network management technology, which uses the network management method to improve the low-carbon operation data and hotels of hotels standards should be optimized, and network resources should be reasonably allocated to improve the effect of low-carbon performance strategy selection. The results show that compared with the previous network management methods, the performance strategy based on 4G network management technology is superior in terms of accuracy, security, and selection. The main reasons for the above problems are that the 4G network management technology, wireless Internet, broadband access networks and IEEE 802.11 reduce the amount of operation data, adjust the performance strategy according to the hotel's network resources, and simplify the strategy selection process, thereby enhancing the anti-interference ability in the management process and ensuring the security of data transmission.

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