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Optimization of B2C E-commerce Enterprise Value Chain Based on Cloud Computing

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Abstract: The rapid development of e-commerce has led B2C e-commerce enterprises to face increasingly fierce market competition and constantly changing customer demands. Due to the limitations of traditional Information Technology (IT) infrastructure, enterprises have deficiencies in operational efficiency and market response speed. Therefore, this article uses cloud computing technology to optimize the value chain of B2C e-commerce enterprises, in order to improve their operational efficiency and market competitiveness. By utilizing the powerful data storage and processing capabilities of cloud computing platforms, we collect a large amount of operational data from Amazon in areas such as marketing, order processing, and logistics delivery. We then use the data analysis tools of cloud computing platforms to conduct in-depth analysis on the collected data. Through big data technology, consumer behavior patterns can be identified, market trends can be predicted, inventory management strategies can be optimized, and order processing efficiency can be improved. Based on the results of the above data analysis, a value chain optimization model is constructed using the computing power of cloud computing platforms. The optimization model is applied to actual operations and the implementation effect is monitored in real-time through the cloud computing platform. Research has found that compared to traditional information technology infrastructure, cloud computing technology exhibits significant advantages in multiple key performance indicators. In terms of cost savings, cloud computing technology has achieved an overall cost savings of up to $822000. In terms of efficiency improvement, cloud computing technology can increase efficiency by up to 36.8%, and it has significant advantages in energy efficiency and carbon footprint reduction. With the continuous development of cloud computing technology, it is expected to play a more critical role in the field of e-commerce.

1. Introduction

E-commerce has become an important aspect of today's global economic development, and it is changing the pattern of the world economy. With the rapid development and popularization of Internet technology, e-commerce platform has become the most important link between consumers and enterprises, which has played a huge role in promoting the effective circulation of goods and

services. Especially on B2C e-commerce platforms, the direct sales method between merchants and customers can not only provide customers with a convenient shopping experience, but also open up greater business opportunities for merchants. However, with the rapid development of e-commerce, the operating costs of enterprises are becoming increasingly high, market competition is becoming more intense, and customer demands are changing faster and faster. Faced with this new challenge, B2C e-commerce enterprises need to continuously innovate and optimize in order to improve operational efficiency, reduce costs, and enhance market competitiveness. Cloud computing is a new computing model based on the network, which can provide enterprises with on-demand scalable computing resources and services, effectively reducing the investment and operating costs of enterprise IT construction. At the same time, the scalability, high availability, and disaster recovery capabilities of cloud computing will provide strong technical support for e-commerce enterprises to cope with market changes and achieve business growth.

This article takes Amazon as the research object in e-commerce enterprises, focusing on the core issue of optimizing the value chain of e-commerce enterprises through cloud computing to improve their operational efficiency and market competitiveness, uses cloud computing technology to reduce operating costs, improve profit margins, and maintain service quality. While maintaining cost-effectiveness, providing personalized consumer experience, optimizing supply chain processes, reducing inventory costs, and improving response speed. Through these studies, a new perspective and approach will be provided for B2C e-commerce enterprises to address the challenges and opportunities in the current e-commerce field. This article first analyzes the challenges in the current B2C e-commerce field and the development trends of cloud computing technology. Secondly, this article selects Amazon as the case study object, collects and analyzes its data and practices in cloud computing applications, and evaluates the application effect of cloud computing technology in various links of Amazon's value chain. Finally, based on the research results, this article proposes strategies and suggestions for optimizing the value chain of B2C e-commerce enterprises through cloud computing.

2. Related Works

In today's e-commerce environment, utilizing cloud computing for supply chain management has become a good development direction. Chang et al.'s research mainly focused on e-commerce platforms, studying the funding and distribution contracts under e-commerce platforms. By establishing mathematical models, they analyzed how all parties in the supply chain can improve overall efficiency through cooperation, while considering the integration of capital flow and logistics [1]. He J used an improved bacterial foraging algorithm to construct a new collaboration and optimization model for fresh e-commerce supply chains, optimizing the supply chain coordination of fresh e-commerce platforms and improving efficiency and response speed [2]. Pu W et al. incorporated geographical factors into e-commerce supply chains, studied their multi-level spatiotemporal correlation optimization problems, and proposed strategies to enhance supply chain resilience [3]. Chu L conducted optimization research on cross-border e-commerce supply chains based on blockchain technology, exploring the potential of blockchain in improving supply chain transparency, security, and efficiency [4]. Zhang H et al. analyzed various risks in cross-border e-commerce supply chains and designed corresponding preventive measures to maintain a balance between supply chain resilience and supply chain vulnerability in cross-border e-commerce supply chains [5]. Rathnasiri et al. studied a small-scale e-commerce enterprise operation model based on cost sharing contracts to optimize the operation of small-scale e-commerce supply chains [6]. Febransyah et al. measured the supply chain competitiveness of Indonesia's e-commerce industry through empirical research, revealing the role of supply chain management in enhancing

e-commerce competitiveness [7]. Hu X proposed a system layout planning method based on genetic algorithm for optimizing the layout of e-commerce warehouses, which can improve the space utilization and operational efficiency of warehouses [8]. Wangsa I D took agricultural products as the research object and established an optimization model for agricultural e-commerce logistics and distribution based on carbon, food and other factors, emphasizing the importance of considering environmental impact in supply chain management [9]. Fan Z et al. studied how cross-border e-commerce platforms empower small and medium-sized enterprises, using China's practice as an example to demonstrate the role of e-commerce platforms in promoting the internationalization of small and medium-sized enterprises [10].

The existing research is too focused on a specific link and technology in the supply chain, lacking in-depth analysis of the integration effect of cloud computing in the entire B2C e-commerce industry chain. Further exploration is needed on the widespread and adaptable application of cloud computing technology in B2C e-commerce enterprises of different scales and types, as well as its systematic assessment of environmental sustainability impact. In response to these research gaps, this article aims to comprehensively analyze the application of cloud computing technology in optimizing the value chain of B2C e-commerce enterprises, conduct systematic research on the value chain of e-commerce enterprises under cloud computing, construct a comprehensive e-commerce cloud platform, evaluate e-commerce enterprises to reduce operating costs, improve profitability, provide personalized customer service, and optimize supply chain processes, so that e-commerce enterprises can respond to new opportunities and challenges.

3. Methods

3.1. Theoretical Basis

Service oriented architecture is a design pattern that divides different functional modules of an application into several separate business units, which are accessed and reused over a network [11]. The architecture of cloud computing is based on the principles of SOA, which employs a hierarchical business model to support it. Infrastructure as a Service (IaaS) provides basic computing resources such as servers, storage, and networks to enterprises, while Platform as a Service (PaaS) is a comprehensive software development and operation platform that includes database services, development tools, and system operating environments. Software as a Service (SaaS) provides users with applications or services accessed through the Internet, without the need to install and maintain software locally [12].

3.2. Cloud Computing Platform Architecture Design

With the rise of e-commerce, B2C has gradually become an indispensable part of the retail industry and has had a huge impact worldwide. This article first adopts an empirical research approach to study the role of cloud computing in the operational efficiency and cost structure of e-commerce enterprises. By collecting and analyzing a large amount of operational data, utilizing statistical analysis and other methods, the impact of cloud computing on enterprise operations is revealed. Data analysis not only focuses on cost savings and profit margin improvement, but also on key indicators such as service quality and customer satisfaction. The research on cloud computing platform architecture is crucial for building an efficient, flexible, and scalable B2C e-commerce system. Figure 1 shows the architecture design of the cloud computing platform:

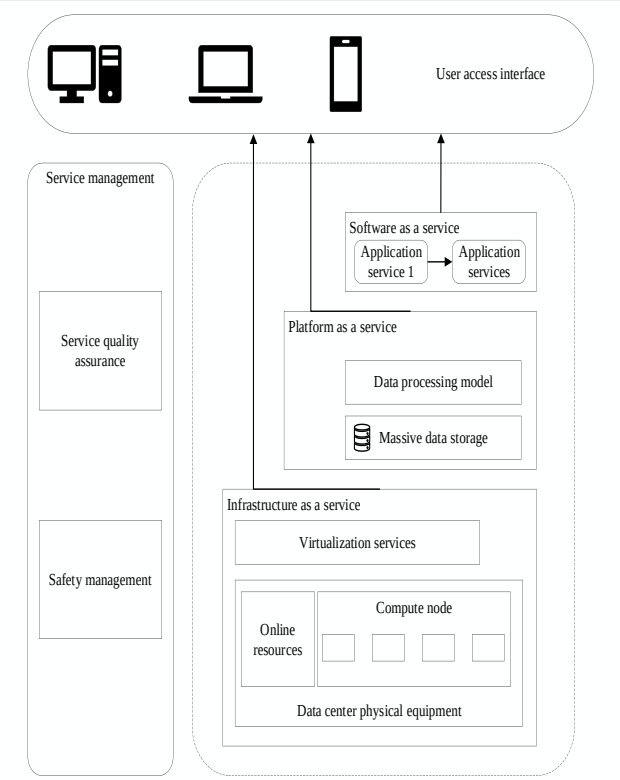

Figure 1: Cloud computing platform architecture

This design is based on Service Oriented Architecture (SOA), which enables rapid business development and scalability to meet market requirements and technological advancements. At the infrastructure as a service layer, cloud computing provides enterprises with basic computing resources such as servers, storage, and networks. By adopting virtual technology, multiple users can share the same device while ensuring their independence and security. The advantage of IaaS lies in its flexibility, which enables enterprises to flexibly expand and streamline resources, achieving the goal of reducing costs and improving management levels. The platform-as-a-service layer provides more advanced services on top of IaaS, including a comprehensive platform for software development and execution. PaaS environment provides support for database services, development tools, runtime environment, and other aspects to help developers focus on software development without the need for maintenance of basic software and hardware. This business model can accelerate the entry of new products into the market and reduce the threshold for technological research and development. The software as a service layer is a service model that directly faces the end user. Enterprises provide some applications and services through Internet access, without the need to install and maintain software locally. Users can access the required services from any location and device. For B2C e-commerce enterprises, it can help them quickly respond to market changes, bring personalized product experiences to customers, and lay out services globally.

These three layers of service models form the platform architecture of cloud computing, which provides comprehensive support for enterprises from basic computing resources to advanced application services through collaborative work. Through this design, cloud computing platforms not only improve resource utilization efficiency, but also have strong elasticity and scalability, allowing enterprises to quickly respond to market changes and continuously reform and develop.

3.3. Key Technology Applications of Cloud Computing

Cloud computing is an effective way for e-commerce enterprises to achieve business management and enhance market competitiveness. Virtualization is the key to cloud computing, which enables flexible configuration of various virtual machines in the network by establishing multiple virtual machines on a single entity [13]. This method can not only improve hardware utilization, but also simplify IT infrastructure. In e-commerce, virtual technology can quickly configure new online stores or businesses while ensuring the independence and security of each business, thereby bringing scalable and low-cost operating environments to enterprises. With the widespread use of big data, e-commerce enterprises are able to collect and analyze vast amounts of user behavior data, transaction records, and interaction data. Enterprises can conduct in-depth mining of products to improve product recommendation algorithms, enhance consumer experience, and achieve more accurate marketing strategies. API management is another important cloud computing technology that enables seamless integration of various applications and services [14-15]. With the continuous development of artificial intelligence and machine learning, the e-commerce industry is undergoing tremendous changes. This method can achieve a series of complex decisions such as price optimization, inventory management, and prediction of customer behavior.

By integrating the above core technologies, e-commerce enterprises can establish a highly automated and intelligent operational system, which not only improves work efficiency and responsiveness, but also brings consumers a richer and more personalized consumption experience.

3.4. Value Chain Optimization Strategy

The introduction of cloud computing has effectively optimized every part of the enterprise's value chain. Cloud computing has the characteristics of flexibility and scalability, enabling enterprises to quickly and flexibly configure various resources and businesses they need. In the product development stage, with the help of cloud computing technology, enterprises can achieve rapid research and testing faster, greatly reducing the cycle of new products from concept to market, and can quickly iterate and integrate, thereby accelerating the process of technological innovation in enterprises. In terms of marketing, through the mining of big data, enterprises can deeply explore users' consumption habits and market trends, thereby forming more accurate and personalized marketing plans, achieving advertising placement and market promotion for enterprises, and improving their conversion efficiency and customer loyalty.

In e-commerce enterprises, order processing and distribution are important components of supply chain management, and adopting cloud computing methods can effectively improve the efficiency of supply chain management. The use of cloud computing technology can make the production process of enterprises more automated and intelligent, reduce human errors, and improve production efficiency. Customer service is the final link in the enterprise value chain, which directly affects the customer's feelings and the brand image of the enterprise. Through the application programming interface (API) support of cloud computing, enterprises can easily integrate third-party services such as payment gateways, social media, and customer relationship management (CRM) with software. This integration not only enhances the automation level of the business process, but also provides customers with a perfect shopping experience.

4. Results and Discussion

4.1. Experimental Design

In the experimental design section of this article, we will focus on Amazon and study how it

utilizes cloud services to realize its B2C e-commerce value chain. We will collect some important data that Amazon needs when using cloud computing, including server usage, storage requirements, bandwidth usage, and cost-effectiveness. This article analyzes the relationship between AWS (Amazon Web Services) services and Amazon's business needs, particularly its support for online sales, inventory management, logistics delivery, and customer service. This article collects and compares key data on cost and efficiency between traditional methods and cloud computing, verifies the economic benefits brought by cloud computing using statistical methods, and explores its potential impact on the environment. Through in-depth communication with industry experts, we have gained a better understanding of the advantages and challenges of cloud computing technology in practical applications. We will also evaluate the role of cloud computing technology in improving user experience, including access speed, personalized services, and customer support.

4.2. Supply Chain Optimization and Personalized Services

Improving the efficiency of inventory management, fast delivery, and accurate demand forecasting are the most important issues in the entire supply chain. By analyzing and processing a large amount of information, enterprises can dynamically monitor it and use intelligent prediction tools to optimize inventory levels. Amazon uses Amazon Web Services' data analytics services to deeply analyze past sales data, seasonal changes, and future market trends, in order to maximize inventory allocation and replenishment. In addition, the scalable computing resources provided by cloud computing support the dynamic response of enterprises to different business needs, achieving effective utilization of various resources they need, and thus achieving optimal configuration of the entire supply chain system. During busy business hours, the ability to quickly expand computing and storage resources ensures the efficiency and accuracy of instructions, while preventing delays caused by excessive load. In the field of personalized services, with the development of cloud computing, enterprises can collect and analyze massive amounts of user information, including browsing behavior, shopping records, and user feedback. New methods such as artificial intelligence and machine learning in cloud computing can provide users with more personalized services. By learning from this data, enterprises can automatically optimize customer behavior and respond promptly to customer requirements.

4.3. Cost Benefit Analysis

Traditional e-commerce enterprises typically rely on methods such as inventory management optimization, logistics network design, customer relationship management, and marketing optimization to optimize their value chain. In future research, the cost-effectiveness of cloud computing technology and these methods will be compared. Through a detailed analysis of cost, efficiency improvement, and flexibility, it will reveal how cloud computing technology brings more significant economic benefits and operational efficiency to enterprises. Table 1 shows the cost data for different methods:

Table 1: Cost evaluation

Optimization areas	Traditional	Cloud computing	Difference
Inventory Management ($)	583300	353200	230100
Logistics network design ($)	785900	634700	151200
Customer relationship management ($)	384900	172900	212000
Marketing optimization ($)	459600	230900	228700
Total ($)	2213700	1391700	822000

The data in Table 1 shows that the cost of traditional methods in inventory management is

significantly higher than that of cloud computing methods. The cost of traditional methods in inventory management is $583300, while the application of cloud computing technology reduces this cost to $353200. Cloud computing technology has achieved a cost savings of approximately $230100 in inventory management. In the process of customer relationship management and marketing optimization, cloud computing has also saved at least $200000 in costs. Overall, cloud computing has saved $822000 in total costs compared to traditional methods. By adopting cloud computing technology, enterprises can reduce costs in value chain optimization. In addition, data on the efficiency improvement of different methods were also collected, as shown in Figure 2:

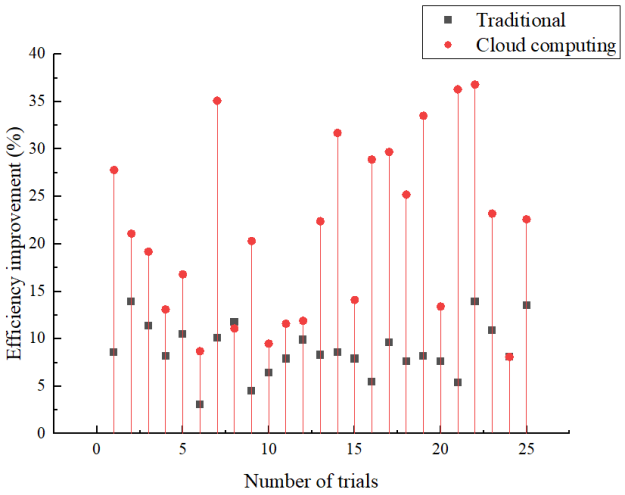

Figure 2: Efficiency improvement

In terms of minimum efficiency improvement, traditional methods have a rate of 3.1%, while cloud computing has a rate of 8.1%. When observing the maximum efficiency improvement, traditional methods achieve a maximum of 13.9%, while cloud computing reaches as high as 36.8%. From the minimum to the maximum range, the efficiency improvement of traditional methods fluctuates slightly, ranging from 3.1% to 13.9%. Cloud computing technology has significant advantages in improving the operational efficiency of e-commerce enterprises. Figure 3 shows the flexibility assessment data:

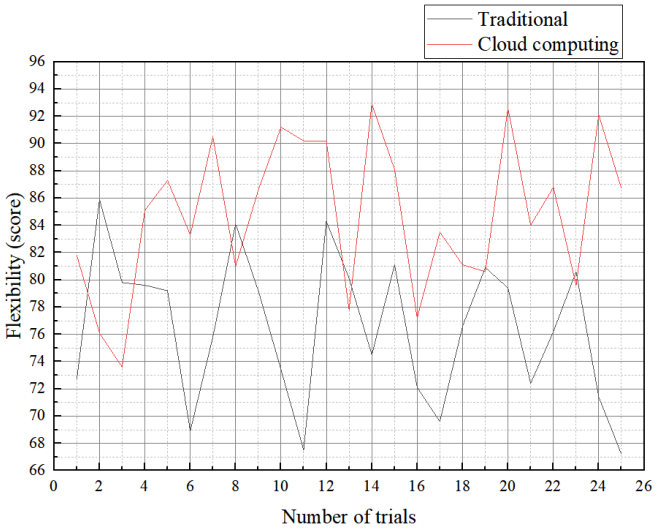

Figure 3: Flexibility assessment

From the data in Figure 3, it can be observed that overall, cloud computing has higher flexibility.

Although in some cases, it may have lower flexibility than traditional methods, in most cases, it has more advantages. In terms of the lowest flexibility score, traditional methods scored 67.2 points, while cloud computing scored 73.6 points. Cloud computing technology has significant advantages in improving the operational flexibility of e-commerce enterprises.

4.4. Environmental Impact Assessment

When conducting in-depth analysis of the environmental impact of e-commerce enterprises, special attention was paid to the quantitative benefits brought by cloud computing technology compared to traditional IT infrastructure. This study reveals the advantages of cloud computing in energy efficiency, carbon footprint reduction, and hardware waste disposal by collecting and comparing key performance indicators. Table 2 shows the specific quantitative data of traditional methods and cloud computing in terms of user scale expansion, introduction of small and medium-sized enterprises, logistics distribution, and energy efficiency, and demonstrates the specific impact of different methods through comprehensive environmental impact assessment data:

Table 2: Environmental impact assessment

Assessment areas	Traditional	Cloud computing	Difference
User scale expansion (%)	21.8	50.5	-28.7
Introduction of small and medium-sized enterprises (%)	5.7	20.4	-14.7
Logistics distribution (km/order)	5.3	3.2	2.1
Energy efficiency (kWh/order)	1.58	0.84	0.74
Environmental impact rating (score)	63.5	84.9	-21.4

Cloud computing technology has shown significant advantages in expanding user base. Under traditional methods, user scale expansion is 21.8%, while cloud computing technology can support up to 50.5% expansion, with a difference of -28.7%. In addition, cloud computing has greatly promoted the participation of small and medium-sized enterprises in their introduction, increasing from 5.7% in traditional methods to 20.4%. In addition, in logistics distribution, cloud computing technology reduces the logistics distance per order from 5.3 kilometers to 3.2 kilometers by optimizing distribution routes and reducing transportation distances, and lowers the energy consumption per order from 1.58 kWh to 0.84 kWh, with a difference of 0.74 kWh. Taking into account all the factors mentioned above, the environmental impact score of cloud computing technology is 84.9 points, far higher than the 63.5 points of traditional methods. This score reflects the comprehensive advantages of cloud computing in reducing environmental impact.

4.5. Discussion

Cloud computing provides unprecedented development opportunities for enterprises, but also raises some new questions for them. Due to the adoption of cloud computing, enterprises have significantly reduced their investment in IT equipment and greatly improved the effectiveness of business operations. However, due to the excessive reliance of enterprises on cloud service providers, their operations will also be greatly impacted when failures occur. Cloud computing providers are facing challenges in terms of data leakage and information security while adopting advanced security measures. In order to ensure that enterprises can fully utilize cloud computing resources and effectively improve work efficiency, it is urgent for enterprises to carry out targeted risk control. Enterprises need to develop corresponding risk management strategies to ensure that they can properly respond to potential risks while enjoying the convenience and efficiency improvements brought by cloud computing.

5. Conclusion

Cloud computing technology has shown significant advantages in multiple key areas, not only significantly reducing IT infrastructure investment for enterprises, but also significantly improving operational efficiency and market response speed. At the same time, it has also demonstrated its unique advantages in terms of environmental impact. It provides a comprehensive and systematic perspective for B2C e-commerce enterprises to evaluate the potential and actual benefits of cloud computing technology in value chain optimization. However, research mainly focuses on the theoretical advantages and short-term benefits of cloud computing technology, lacking consideration for its long-term benefits and risks. With the continuous development and application of cloud computing technology, future research can conduct long-term tracking studies on the mechanism of cloud computing optimizing the enterprise value chain in different periods, thereby improving the efficiency and effectiveness of value chain operation.

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