Journal of Intelligent & Fuzzy Systems 40 (2021) 5807–5817
DOI:10.3233/JIFS-189420
IOS Press

Bank customer loyalty under the background of internet finance and multimedia technology

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Abstract. In recent years, Internet finance has developed rapidly in China, and has attracted more and more attention. With the rise of a variety of online payment, the development of traditional commercial banks has been seriously hindered, a large number of customer resources have been lost and reduced customer loyalty. Therefore, this paper studies how to improve customer loyalty in the context of Internet Finance and multimedia technology. First of all, based on multimedia technology and fuzzy concept, this paper designs and implements the bank customer management system based on multimedia technology and fuzzy concept; secondly, it constructs the corresponding evaluation index system, and designs the relevant functions of the system according to the specific needs of customers; finally, the system is implemented by using spring open-source framework system, web, JSP, EAI and database technology. In the test phase, in order to test the performance of the designed customer management system, this paper constructs a test system. Through the customer experience of using the system and the performance of the new and old management system for comparative analysis of satisfaction, analysis of the advantages of this management system.

Keywords: Multimedia, internet finance, customer loyalty

1. Introduction

As a product of the combination of the Internet and the financial industry, Internet finance has quietly integrated into our daily lives. Online banking, third-party payment, e-commerce platforms, P2P financing, and other financial services are rapidly developing [1]. Internet finasince is an emerging field that combines the traditional financial industry with the spirit of the Internet. The difference between Internet finance and traditional finance is not only the use of different media in financial services, but more importantly, Internet mobile terminals have higher transparency, better cooperation, and lower intermediate costs than traditional financial service tools. And the advantage of easier operation. The "Alipay" that uses bank cards for payment can be easily purchased online, remittance, asset management, and various features of Alipay's fast payment are well received by dealers and customers. With the increase in the number of Internet financial customers, the development of traditional commercial banks has been threatened [2, 3].

For the financial industry, the most important resource is customer resources. The richness of customer resources is directly related to the sales of products and operating profits of financial institutions. For the banking industry, dependence on

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customers is higher. The rise of Internet finance has made the banking industry increasingly pay more attention to customer loyalty [4].

Domestic and foreign research shows that the development of a new customer is 4 to 5 times the cost of maintaining an old customer. Therefore, reducing customer churn and improving customer loyalty are important ways for commercial banks to continue to develop and increase profits [5]. The loyalty of bank customers has great value for commercial banks: loyal customers will continue to conduct business in commercial banks, increase bank deposits, loans, and intermediary business income, and bring relatively stable profits to commercial banks; loyal customers can reduce Bank's business operating costs and marketing costs; loyal customers help reduce the risk of bank customer complaints; loyal customers can improve the success rate of new products or services listed on the bank; loyal customers help banks to establish a good social image [6].

In the face of the impact of Internet finance on the loyalty of commercial banks, how to improve the loyalty of bank customers is a major issue related to the development of modern commercial banks. This paper will design and implement a bank customer relationship management system based on multimedia technology, improve customer service level, product quality and improve marketing methods through the customer management system, so as to improve the satisfaction of new and old customers, thereby enhancing customer loyalty and making commercial banks the development is more stable.

Multimedia is a kind of media that communicates and spreads human-computer interactive information that combines two or more media and plays a pipeline role in the process of information transmission. There are many kinds of texts, images, graphics, animations, audio and video images, etc. With the continuous development of information technology, multimedia is connected with the network to form a more powerful technology called multimedia network technology [7]. It consists of multimedia terminals, also called multimedia computers, multimedia access networks, multimedia transmission backbone networks, and software that can satisfy multimedia networked applications. With the development of multimedia technology and network technology, the future development of the network to the multimedia direction has become the trend of the times [8].

Multimedia technology has the characteristics of integration, interactivity and comprehensiveness. Integration means that multimedia technology can deal with sound, picture and text at the same time. Interactivity refers to the interaction between users and computers. Each user is not only a consumer of information but also a provider of information. Comprehensiveness is reflected in the fact that multimedia technology can integrate various media into an organic whole, cooperate with each other synchronously, and display various actual information and changes in real-time [9]. Because of the large amount and uncertainty of bank data, in the analysis of data, how to realize the accurate analysis of data must be handled with the help of fuzzy theory tools in mathematical tools. The fuzzy comprehensive evaluation method is used to analyze the collected customer information, effectively analyze the customer demand, realize the accurate positioning of the customer demand, so as to improve the customer's favor to the bank and improve customer loyalty.

The basic functions of the multimedia server: 1. Transmitting the media data to the client in response to the request of the client; 2. Processing the newly received real-time broadcast data in time while responding to the broadcast, and encoding the same [10]. 3. It can provide other additional features, such as digital rights management (DRM), interstitial ads, split or mirror the flow of other servers, and multicast [11, 12].

Multimedia server construction requires the RTP/RTCP protocol. Real-Time Transport Protocol (RTP): A transport protocol for multimedia data streams over the Internet [13]. RTP is defined to operate in one-to-one or one-to-many transmissions. The purpose is to provide timely information and stream synchronization. A typical application of RTP is based on UDP, but it can also work on other protocols such as TCP or ATM [14]. RTP itself only guarantees the transmission of real-time data. It does not provide a reliable transport mechanism for transmitting packets in sequence, nor does it provide flow control or congestion control [15]. It relies on RTCP to provide these services.

Real-Time Transport Control Protocol (RTCP): Responsible for managing transmission quality to exchange control information between current application processes. During the RTP session, each participant periodically transmits RTCP packets containing statistics such as the number of packets that have been sent, and the number of packets that have been lost. Therefore, the server can use this information to dynamically change the transmission rate or even change. Payload type. RTP and

RTCP work together to optimize transmission efficiency with efficient feedback and minimal overhead, making it ideal for delivering real-time data on the network.

Based on the above realistic background, the purpose of this paper is to design and implement a bank customer management system based on multimedia technology, in order to improve customer satisfaction with banking products and services and indirectly enhance customer loyalty. The system design uses a spring open-source framework system and uses Web, JSP, EAI, and database to implement the system.

2. The theoretical basis of bank customer loyalty

In the market economy environment, customer loyalty is based on customer satisfaction, that is, customer satisfaction can only be discussed when customer satisfaction is satisfied, and customer loyalty is more concerned with customer attitude [16]. This attitude is very strong. Communication, so loyal customers are potential communicators of the company, which have a profound impact on the development and long-term interests of the company; while customer satisfaction is more important to the actual behavior of the stock customers, dissatisfied customers will generate complaints or off-grid Behavior has a greater impact on the current interests of the company.

Customer management is a new management mechanism designed to improve the relationship between the company and its customers. It is implemented in the areas related to customers such as marketing, sales, service, and technical support. With the customer management system, companies can collect, track, and analyze each customer's information to know what kind of customers need what goods, while also observing and analyzing the impact of customer behavior on corporate earnings, making the relationship between the company and the customer and the company. Profits are optimized.

2.1. Customer-centric management theory

With the customer center being the core of modern enterprise management, banks are more dependent on customers. Under the huge impact of Internet finance on the traditional banking industry, banks should focus on customers and strive to maintain relationships with customers. Improve customer loyalty and achieve integration of business philosophy, development strategy, and business model [17]. The customer-centric management philosophy can be summarized as follows:

(1) Management connotation of "process"

The bank customer management model includes the collection and collection of customer interest information, the specific design and development of the sales plan, the sales process, and the tracking service after the end of sales. Therefore, it can be seen that the management model pays great attention to the sales process involving various links. In other words, the sales result is directly determined by the sales process. The various planning of the sales process, such as the weekly plan, the monthly plan, the annual plan, the market requirements, and the customer's needs are directly related to the final sales results and the final economic benefits of the company [18].

(2) Management connotation of "customer status"

"Customer first" is an unchanging business philosophy. Because customers are the foundation for a company to survive, a company that can focus on customer needs and develops marketing plans based on customer needs can certainly stand firm in the market. The customer management system provides a good foundation for customer-oriented operation. The system can effectively analyze customer information, obtain the latest thinking trends and demand directions of customers according to customer behavior [19], and finally provide good communication channels for enterprises, and then promote the production of products suitable for customers [20]. New products of taste, thus achieving a range of customers and expanding new customers.

(3) Management connotation of "customer satisfaction"

Customer satisfaction here can be understood from two aspects: first, behavioral, business and customer exchanges and transactions, the customer will make an evaluation of the service level of the enterprise, this evaluation can be seen Customer satisfaction in behavior; Second, the economic aspect mainly refers to the satisfaction of products that can be listed on the enterprise [21].

(4) Management connotation of "customer cost"

Enterprise customers are also classified. Some customers can bring economic benefits to the enterprise, while others can't. This needs to be treated differently. This is the existing value of the customer management system. The system can effectively classify customers. And to design professional services

according to different levels, such targeted processes can ensure customer satisfaction and product satisfaction in the customer's mind [22, 23].

2.2. Indicator design

The construction of the evaluation index system is the first step to evaluate customer loyalty. The collection of customer loyalty data depends on the indicator system. The design of the indicator system is reasonable to ensure the validity of the collected data. Therefore, the construction process of the indicator system should be cautious. The customer loyalty evaluation index system designed in this paper consists of three levels: comprehensive index layer, basic indicator layer, and factor indicator layer.

(1) Comprehensive indicator layer (level one indicator layer). It is a general indicator that reflects the overall situation. This paper studies customer loyalty, so the primary indicator is expressed in terms of customer loyalty.
(2) Basic indicator layer (secondary indicator layer). An indicator used to reflect the component of customer loyalty. After screening, the following two indicators will be established for products and services.
(3) Element indicator layer (level 3 indicator layer). It is used to reflect the composition of basic indicators and strives to make all indicators meet the requirements of customer loyalty assessment, and finally determines 7 indicators as factor indicators. Among them, there are three three-level indicators for financial product types, financial product returns, and financial product risk under the secondary indicators of products [24]. Under the service level indicators, the bank's employee service attitude, whether the customer complaints are handled in a timely manner, the employee's business speed, and other additional services are four levels of indicators.

2.2.1. Product

1. Is the variety of Internet financial products rich? A single financial product can no longer meet the needs of customers. Only by providing a wide range of online and offline financial products can we increase customer loyalty and gain a competitive advantage in a fiercely competitive environment.
2. Whether the income of Internet financial products is considerable. Customers choose to buy online financial products in order to preserve and increase the value of their assets. The higher the income, the greater the chances of customers choosing so that online financial products with considerable revenues can meet the needs of customers.
3. Risk of internet financial products. When customers choose Internet financial products, they are more concerned about whether the revenue and risk of the products are directly proportional. Customers need to choose the right product based on their risk tolerance [25].

2.2.2. Service

1. Bank staff service attitude. The service attitude of bank employees directly determines the customer experience in the process of banking business and is the key factor determining customer loyalty.
2. Whether to handle customer complaints in a timely manner. The data shows that more than 90% of dissatisfied customers never complain, but choose to "leak" directly. Complaints are the hope of customers to improve their banks and are a sign of trust in banks. Through customer complaints, banks can also identify problems and improve themselves to increase customer loyalty.
3. Employees work efficiency. If the bank's employees are highly professional and skilled, and the speed of handling the business for customers is high, the quality can be greatly improved, and the efficiency of banking operations can be greatly improved, and the waiting time of customers can be reduced. When the customer waits for a short time, the customer service experience will rise and the customer will choose to be loyal to the bank.
4. Other additional services. Whether there is free drinking water, emergency rescue boxes, convenience boxes and spare umbrellas at the bank outlets, whether there are spare reading glasses for filling the singles, whether there are special passages for the disabled at the bank entrances, etc. These are the additional services that banks should have. The details reflect whether the bank is dedicated to serving its customers, thereby enhancing customer loyalty.

3. Design of bank customer management system based on multimedia technology

The competitiveness of the banking industry is mainly as follows: 1. Customer loyalty: retaining existing customers while increasing new customers while improving customer loyalty; 2. Business value: fully understanding customer needs, business innovation, and developing markets. Thereby generating greater commercial value; 3, operating costs: to reduce operating costs on the premise of maintaining operational quality [26]. Based on the above principles, the demand of commercial banks for bank customer management systems can be summarized as functional requirements and non-functional requirements [27].

3.1. Functional requirements analysis

3.1.1. Customer information management

The client is the main body of the bank to carry out various business developments. Therefore, the commercial bank customer relationship management system needs to have customer management functions; customer management needs to manage the customer's basic information, and timely and accurately understand the information of old customers and new customers.

3.1.2. Financial product management

Financial products are the basis for banks to conduct customer marketing and are one of the main ways for banks to make profits. Therefore, banks must comprehensively manage the flow of financial products, the benefits and risks, and the flow of financial products. With the integration of Internet technology and banking services, the scale of the banking business is constantly expanding. Banks need to continuously release new financial products to meet the needs of customers. At the same time, banks can also maintain financial product information according to actual conditions.

3.1.3. Customer service management

The customer service of the management system can provide consulting services, collect customer opinions, and handle complaints and after-sales services. The commercial bank customer management system designed in this paper builds a knowledge base of consulting information. The knowledgebase can organize and manage all kinds of problems that customers may encounter, and through continuous updating, form a complete knowledge base of customer service information consultation. Provide online consultation services and consultation on the way of sales of related financial products.

3.2. Non-functional requirements

The non-functional requirements of the commercial bank customer management system based on multimedia technology designed in this paper are mainly analyzed from two aspects: ease of use and compatibility.

3.2.1. Ease of use

The commercial bank customer relationship management system needs to have a simple, atmospheric and friendly interface design, which can visually display the main content of the commercial bank customer relationship management system to the user; all the functions of the system only need the user to click three times to enter the related operations. Interface; users do not need to have professional computer knowledge, it is a simple training week, you can understand and operate the system, and quickly master the use of the system [28]. The commercial bank customer relationship management system can provide a good interface experience for system administrators and users. The business personnel and customers can complete the system operates quickly and easily according to the system prompts; and in the interface design of each function of the system, each information should be extracted. The common factor is to provide a uniform interface style interface, which is convenient for users' operation; the system's function design is continuously optimized. It is convenient for users to quickly familiarize themselves with the functions and operational procedures of the system.

3.2.2. Compatibility

The system platform should conform to the openness principle and be compatible with hardware, software, and application software. The commercial bank customer relationship management system should be able to adapt to different environments. Requirements can be run on different operating platforms that different users may use, and users can access them through different browsers.

3.3. Analysis of the Implementation Process of a customer management system based on multimedia

The implementation of the customer management system designed in this paper is divided into three phases:

The first stage is the cleaning and sorting of data: the bank's previous data divided by business, through the extraction and cleaning, centralized sorting of customer basic information;

The second stage is the integration of discrete systems [29]: the processing flow of the original business system of the bank is integrated into a processing method centered on the customer management system;

The third stage is to form a business model centered on the customer management system designed by multimedia technology in the whole banking system: to complete the management system designed by this paper and the traditional management system of the bank.

4. Implementation of bank customer management system based on multimedia

4.1. System overall architecture design

The basic structure of the system uses a three-tier structure with the spring open-source framework as the basic framework. In the specific structure processing, JSP technology, Hibernate data, DAO method, and 3DES encryption algorithm and MD5 data digest algorithm are adopted respectively. JSP technology is used for the design of the user interface layer. The main function is to develop the software front-end interface. The Hibernate data object persistence technology is used to design and develop the data access layer of the system. The main function of the DAO method is to use the data. The system business layer is isolated from the database access layer. In order to effectively protect the security of the system data, the necessary security processing is also carried out on the data. The security processing is mainly done by the 3DES encryption algorithm and the MD5 data digest algorithm.

During the development of the system, the system was split and split into several interrelated sub-projects, and these sub-projects were developed separately. This has obvious advantages over the traditional method of developing the entire system as a separate project, mainly in the following aspects: Splitting and developing the system enables the customer to select the project according to their own situation and needs. The customer can select the required sub-project or all the sub-projects instead of only selecting one option directly from the whole system. The choice is more flexible, and it can also provide customers with personalized services, which can add and modify the sub-projects of the system according to the actual usage of the customer. Due to the characteristics of this development method, the developed module can be repeatedly used and can be applied to other systems that require the function of the module.

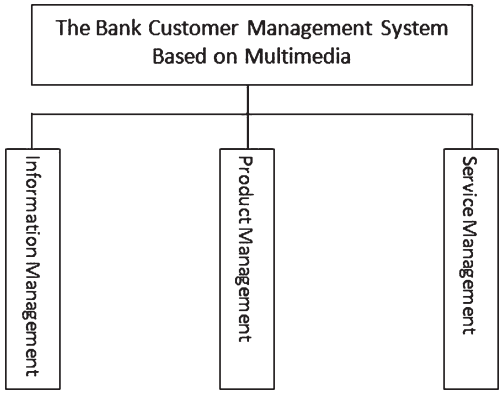

Fig. 1. System function architecture diagram.

4.2. System functional architecture design

According to system requirements analysis, the commercial bank customer management system based on multimedia technology includes customer information management, financial product management, customer service management, and other functions; the functional management system diagram of the customer management system designed in this paper is shown in Fig. 1.

4.3. Related technology introduction

1. Web technology

The Web is a data-sharing platform. This platform is widely used along with the Internet. This platform allows information data to be distributed according to a certain state, and can also promote various information interactions. It can effectively shield the differences between platforms [30]. The characteristics of the Web-based Internet computing model are as follows:

(1) The ability to integrate information can be independent of time and region.

The convenience and efficiency that Web technology brings to people are incomparable. People can use this technology to get timely and timely information about what has happened and is happening around the world.

(2) Efficient and quick elimination of environmental and platform differences

This effect is mainly due to the fact that Web technology can use HTML to express information according to certain rules [31]. This expression is more uniform so that environmental differences and geographical differences can be minimized. Information compatibility in this mode. It has also increased accordingly, speeding up the speed of information dissemination.

(3) Openness

The openness of the Web system is well understood and is a prominent feature. Any information can be published in the system if people are willing to do so 32].

(4) Diversification of multimedia expression capabilities

The information in the Web system is presented to you in a variety of modes, such as text, video, pictures, etc. [33].

2, JSP technology

JSP technology is mainly used to develop web pages. It can use the C# language to implement the plug-in function code and process user dynamic requests in the HTML source code to form a JSP file. The JSP language has many advantages over other technologies. The specific performance of JSP can be used across platforms, can be used in a variety of operating systems; with platform-independent features, there is a feature that can run everywhere, and the JSP language is easy to learn, scalable and powerful. Flexibility [34].

3. EAI technology

EAI is actually enterprise application integration. It can be seen as a combination of various software, processes, standards, and various hardware. This process involves multiple levels of the enterprise. The final result is that it can be used between enterprises. Communication and collaboration are more harmonious, and the obstacles in the process of connecting enterprises are weakened [35]. Specifically, the way EAI is integrated is divided into the following:

(1) Business Process Integration: The integration of business processes requires the enterprise to understand and manage the information of various businesses so that it can effectively find ways to reduce the cost of the enterprise and improve the economic benefits of the enterprise. This is also the purpose of business process integration, which involves the entire process of production, sales, and post-service [36].

(2) Data integration: Data integration is a process that closely surrounds data. In this process, it is first necessary to determine which data needs to be integrated, after screening and then form a database, then build the data model, and finally, organize and identify the data. Then you can form the final directory with the index. The data formed by this data integration process is relatively complete and practical and can be released and shared for everyone [37].

(3) Platform integration: The fundamental of platform integration is to weaken the differences between platforms so that the differences between the structure, software and hardware of the system platform are weakened as much as possible, and a good platform for communication between platforms is built [38].

4. Database technology

MYSQL database is open source code, so many people can carry out their own personalized modification and development under the permission of the General Public License. MySQL is very popular because of its fast speed and reliable performance, so many people are not. It is used in the case of processing transactions, so for many developers, the MYSQL database is the best choice for system development [39].

4.4. Database Design

4.3.1 Conceptual structure design of the database

The functional design of the multimedia customer-based banking customer management system involves many information entities, including customer information, business data, financial products, consulting services, and other entities. This paper designs the system based on the design of the bank customer management system entity framework. The logical structure of the database, the structure design of each data table of the system are as follows.

(1) Customer basic information form

The customer basic information table is mainly used to store the customer basic information of the

customer management system. The basic structure is shown as follows.

Column Name	Data Type	Is Empty	Main/ Foreign key	Remarks
Client_ id	Int(4)	Not null	Main key	Client number
Client_ name	Varchar(50)	Not null		Client's name
Client_ kind	Bit(1)	Not null		Customer type
Client_ add	Varchar(50)	Not null		Mailing address
Client_ phone	Varchar(50)	Not null		Telephone number
Client_ idcard	Varchar(50)	Not null		Id number
Client_ office	Varchar(50)	Not null		Customer information
Client_ email	Varchar(50)	Not null		E-mail

(2) The financial product information sheet is mainly used to store detailed information on financial products issued by banks, including product code, product name, product type, product details, and product status. The table structure is shown as follows.

Field Name	Data Type	Length	Description	Remarks
Product_ no	Int	11	Product code	Main key
Product_ name	Varchar	128	Product name	Not null
Roduct_ type	Varchar	8	Product type	Not null
Create_ time	Timestamp	5	Creation time	Not null
Product_ detail	Varchar	500	Product details	Not null
Product_ price	Decimal	10	Product price	Not null
Product_ status	Varchar	8	Product status	Not null
Limited	Varchar	500	Restriction description	Free

4.5. *Evaluation system realization effect chart*

The management system designed in this paper will review, judge, and confirm the identity of the user before the customer enters. After the system is confirmed, the customer can enter the system's first interface and use the functions in the system. After entering the bank customer management system website, the login interface is displayed first. The login interface designed in this paper is shown in Fig. 2 If the customer enters the system for the first time, they need to complete the registration before they can log in. The customer needs to fill in the username and password when logging in.

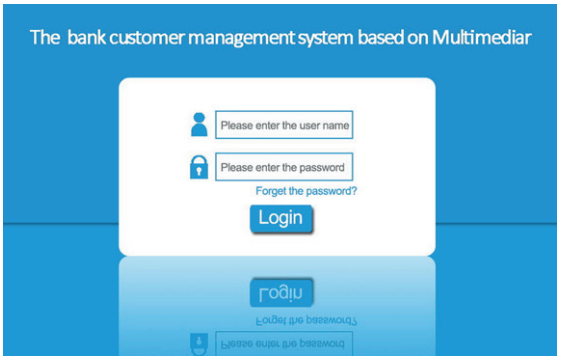

Fig. 2. Customer login interface.

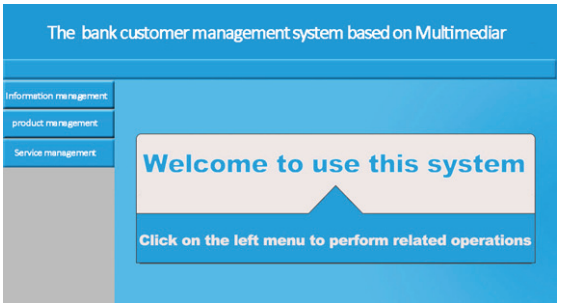

Fig. 3. Home page interface.

After logging in, you can enter the home page interface, as shown in Fig. 3 As can be seen from the figure, the system includes functions such as customer information management, financial product management, and customer service management. Resource subsystem, information management subsystem, evaluation subsystem, and discussion subsystem. The customer information management includes the record of the basic information such as the customer's name, address and evidence number; the financial product management is mainly used to store the detailed information of the financial products issued by the bank, including the product code, product name, product type, product details. And product status, etc.; customer service management mainly provides online consulting services and complaint handling services.

In addition, this article also introduces the customer information addition interface and financial

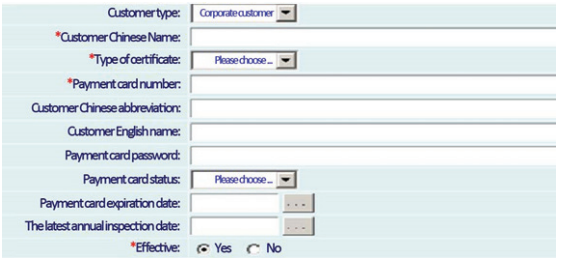

Fig. 4. The financial product search interface.

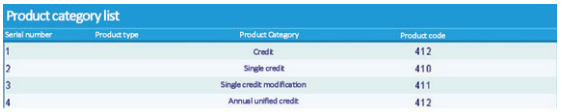

Fig. 5. The financial product search interface.

product search interface. The customer information interface can add new customer-related information. The product search interface can search related financial products according to needs. The customer information adding interface and product search interface is shown in Figs. 4 and 5.

5. System function test and analysis

In order to better test the performance of the multimedia-based bank customer management system, this paper deploys the test environment according to the operating conditions of the system when building the test system, and deploys the system on the database server. The purpose of testing the customer management system is first to test whether the system meets the user's needs, including the customer's functional requirements and non-functional requirements of the system, verifying that the design is reasonable and whether the customer can be satisfied; then the management system designed in this paper is The customer relationship management system created by the traditional commercial bank compares and analyzes the customer's satisfaction degree to explain the advantages of the multimedia-based customer management system and enhance the customer's loyalty, to achieve the service-oriented thinking, whether to enhance the customer's loyalty, etc. To analyze the advantages of this management system.

First of all, this paper conducts a customer experience survey on financial product management,

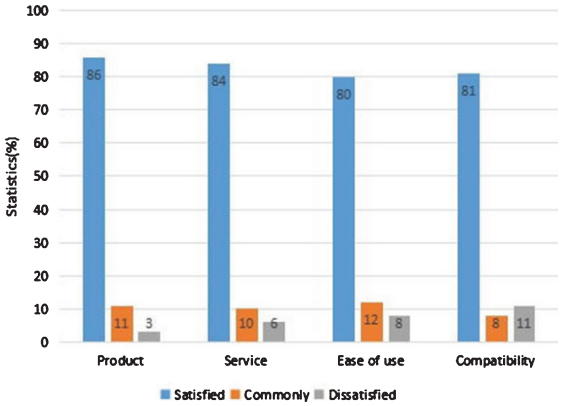

Fig. 6. Customer experience survey results.

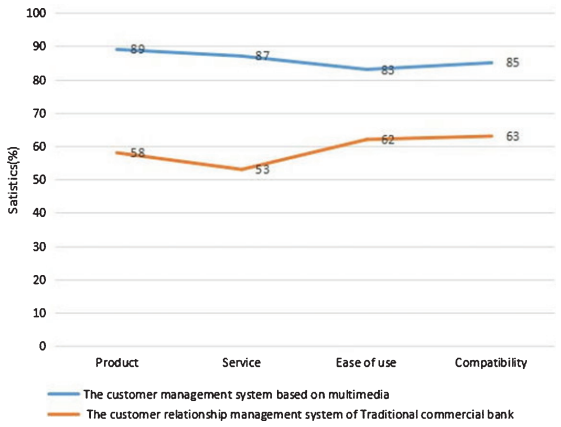

Fig. 7. Comparison of customer satisfaction between new and old customer management systems.

customer service management functions, ease of use, and compatibility of the customer management system. 100 customers from the bank's business operations are randomly selected as the survey objects, and 100 respondents pass the mobile phone. Clients, PCs, and bank outlets understand and log in to the system. The results of 100 users are shown in Fig. 6.

In addition, by comparing the customer's satisfaction with the system function, ease of use, and system compatibility of the customer-based relationship management system designed by the multimedia-based customer management system and the traditional commercial bank, the multimedia-based customers designed in this paper are found. The advantages of the management system. The customer's satisfaction with the new and old customer management system is shown in Fig. 7.

6. Conclusion

With the rapid development of Internet technology, Internet finance has emerged as a new type of financial model in China. The booming Internet finance has rapidly entered the financial market and seized the financial business. This has had a great impact on the development of traditional commercial banks. Resource loss is serious. With the continuous development of Internet finance, the customer management of traditional banks cannot meet the needs of customers for financial products and service levels. Based on this, this paper designs and implements a multimedia-based banking customer management system. The bank customer management system designed in this paper is based on the theory of customer-centered management and designs the corresponding index system. According to specific needs, customer information management, product management, and service management functions are designed. Finally, the spring open-source framework system is used, and the Web is used. Technology implementation systems such as JSP, EAI, and databases. In order to test the performance of the multimedia-based bank customer management system designed in this paper, a test system was set up. Through the experience survey of 100 random bank customers and the performance comparison between the old and new management systems, the test system is satisfied. The customer's needs, verify the design is reasonable, analyze the advantages of this management system.

Acknowledgments

This work was supported by the High-Level Talents Research Fund Project (2019gcky05) and the Education and Teaching reform of Chongqing Institute of Engineering (Grant No. JY2018205)

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