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Department of Management and Administration

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TASK

TO MASTER THESIS

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1. Title Improving business process management based on benchmarking principles

Supervisor: Anna KRAMARENKO, PhD (Economics), Associate professor

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3. List of issues that need to be developed

1. To study the theoretical approaches to business process management

2. Analyze the business process management in ZY Bank

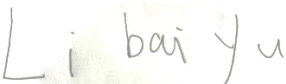
3. Develop the recommendations for optimizing business process management in ZY


Bank

4. Work plan

№	Stages of work
1	Approval of the thesis content
2	Preparation of the thesis' first section
3	Completion of the first section according to the supervisor recommendations. Writing the thesis' second section
4	Completing of the second section according to the supervisor recommendations. Preparation of the thesis' third section
5	Completing of the third section according to the supervisor recommendations. Preparation of a report for a scientific conference with a presentation of the main results of the thesis
6	Writing of the introduction, conclusions of the thesis. Making references list
7	Submission of the thesis to the Department of Management and Administration

5. Date of assignment issue October 17, 2023

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INTRODUCTION

Relevance of the study. In the current landscape of economic development in China, characterized by fierce market competition and the imperative to address deep-rooted contradictions and challenges, the vitality of science and technology innovation enterprises stands out as crucial. These enterprises not only drive economic structural adjustments and mode transformations but also play a pivotal role in promoting economic transformation and upgrading. However, their sustained development heavily relies on financial support, especially from banking institutions. Therefore, understanding and optimizing the financial support system for these enterprises is of paramount importance to ensure their continued growth and contribution to the socioeconomic landscape.

Goal of the research is to develop and refine the financial support system for science and technology innovation enterprises, focusing on the operations of ZY Bank in Henan Province. The completion of this thesis is aimed at substantiating a systematic process optimization model tailored to the unique attributes of science and technology innovation enterprises.

Research objectives:

- to define main aspects in the research on business process management;
- to identify research status of business process management;
- to review the current status of ZY Bank's science and technology

innovation financial business process;

- to identify existing problems in the business processing processes of ZY Bank;
- to clarify the basic goals of business process management in ZY Bank;
- to systematize principles to improving the business process management of financial institutions;
- to develop practical recommendations for process optimization solutions based on the unique attributes of science and technology innovation enterprises to improve business processing efficiency.

The object of the research is the financial support system for science and technology innovation enterprises, with a specific focus on ZY Bank's operations in Henan Province. This includes an in-depth examination of the processes involved in providing financial services to science and technology innovation enterprises.

The subject of the research encompasses the theoretical, methodological, and organizational aspects of management, particularly concerning the optimization of financial support processes for science and technology innovation enterprises.

Research methods:

1. Literature Research Method: Review and analyze relevant research results both domestically and internationally, focusing on process management and optimization theory, customer management theory, and enterprise life cycle theory.

2. Questionnaire Survey Method: Conduct questionnaire surveys on both customers of science and technology innovation enterprises and relevant staff

involved in the financial business processes. This will provide insights into existing problems and inefficiencies in business processing.

Practical significance:

- optimization of ZY Bank's financial support system for science and technology innovation enterprises;
- contribution to the development and enrichment of financial business processes in city commercial banks;
- provision of practical reference for improving the bank's own management and enhancing its competitiveness in supporting science and technology innovation.

SECTION 1

THEORETICAL BASIS FOR BUSINESS PROCESS MANAGEMENT

1.1 Key theoretical approaches to business process management

ECRS process optimization theory consists of the first letters of the four words Eliminate, Combine, Rearrange, and Simplify. It is the four major principles in industrial engineering. Its original intention is the production process should be optimized to reduce unnecessary waste, while achieving higher efficiency and achieving the best results. Its optimization theory is also applicable to the business processes of financial enterprises. When the market environment changes, resulting in new problems constantly arising under the traditional function-centered management model, it requires the reshaping of business processes and fundamental reflection. Business process, reflect on the business process from the problem, reflect on the business process from the design, make corresponding changes in every aspect of the process to adapt to the business itself. Process optimization is also a detailed form and specific process of the value chain, which is achieved through the continuous decomposition of management objectives [13].

To maintain the achievement of its own management functions and further realize the competitive advantage of management. The same is true for the management process of the banking industry. Paul Allen explained the bank process

transformation theory in 1994, that is: the banking industry is similar to manufacturing enterprises. To continuously maintain the competitive vitality of enterprises, they must focus on Shape the bank's current business processes and optimize process links. Abandon the previous thinking concept of traditional banks' dominance, strengthen customer-centeredness, carry out process reengineering around their needs, and implement differentiated strategies for different customer groups; at the same time, the bank's development strategy is adjusted to take information technology as the leading role and information technology as the leading factor. [22] Technological innovation is the guarantee, and the ultimate goal is to maximize profits.

Common process optimization related methods mainly include price fishbone analysis, benchmarking, Pareto method, etc. Fishbone diagram, also known as cause-and-effect analysis method, can analyze the source of the problem in the diagnostic business process, and can find the main causes in the process, and then find out the main causes of the defects that may be caused. In this way, we can dig layer by layer to finally find the solution to the problem. [38]

The cost analysis method is to analyze and evaluate the process cost and output value, find room for optimization, improve the company's ability to control the value of existing processes, and enhance the process value-added space. The benchmark method establishes benchmark enterprises for process design and reengineering, in short, most of the optimization procedures are similar. The basic method is:

- 1) Investigate the original process and understand the operating status of the process through questionnaires, expert interviews, walk-through testing, etc.;

2) Sort out the process, focusing on target customers, find out the problems and deficiencies at the execution level around the organizational structure, functional departments, staffing, etc. [45];

3) Analyze the process, evaluate the process according to different theories and research methods, and discover the causes of the problems;

4) Optimize the process, first of all clarify the optimization goals and principles, conduct a multi-level and all-round operation of the process elements, and formulate optimization measures, reshape or rebuild processes, simplify or merge processes, etc., based on the causes of problems; build “the chain of authority” and the “chain of responsibility” are outlined in the horizontal dimension, and power and responsibility are optimized in different dimensions [8];

5) Supporting safeguard measures are provided to guarantee the process from the aspects of product chain services, organizational structure, human resources, etc.

Customer relationship management theory comes from the United States. On the one hand, it focuses on integrating all customer resources of the company to achieve comprehensive management of customer-facing activities. It specializes in collecting contact information between customers and companies from “Enterprise Resource Planning (ERP)”. An evolution process from activity “contact management” to return visits to customers for “customer care”, while collecting customer data to form complete data. [67]

Analysis system, Gartner Group proposed the concept of “Customer Relationship Management” (CRM) based on Internet technology in 1999, which provides enterprises with a comprehensive management perspective and allows

enterprises to have better customer communication capabilities so that companies and customers can understand each other and influence each other's behavior, thereby enhancing customer loyalty and attracting new customers, and ultimately achieving a win-win situation that maximizes the interests of companies and customers. The core idea of CRM is «customer-centric». That is, by meeting the personalized needs of customers and improving customer satisfaction, we create value for customers while maintaining customer loyalty, ensuring that the company has a stable source of income, thereby improving profitability and competitiveness, sustainable development, and ultimately a win-win management model for customers and enterprises. [43]

Enterprise life cycle theory. American management scientist Paul Hersey conducted deduction and research on the basis of the classic enterprise life cycle theory, comparing an enterprise to an organism and dividing it into four stages, namely: start-up period, growth period, maturity period and decline period. Most companies have a similar life cycle, a dynamic trend from establishment to growth to decline to bankruptcy. [26] The life cycle standards for scientific and technological innovation enterprises are not very clear, because the research and development work of most scientific and technological innovation enterprises involves materials engineering, fluid mechanics, information engineering and other disciplines, and their applications are also dedicated to high-precision technologies. This uncertainty has blurred the definition standards of the four stages of the enterprise life cycle. For example, in the start-up period, the product innovation period is longer and there is even great uncertainty. Cutting-edge R&D equipment

and excellent technical talents are the core technologies of scientific and technological innovation enterprises. [15] The basis for innovation is one of the core competitiveness of enterprises in the market. When technology leaks occur in scientific and technological innovation companies or core technical personnel leave, the company's core competitiveness and competitive advantage over peers will be instantly lost, which will have a greater impact on the company's business development. For example, in the growth period of a company, operations in a very good situation, due to technological updates or product iterations in the market, companies quickly enter into trouble or even go bankrupt.

In terms of financing needs, the banking industry, as a financial services industry, serves customers and manages their life cycle is an important part of its operations. However, science and technology small and medium-sized enterprises mainly focus on human resources and front-end technology development and application. They have a low proportion of fixed assets and have difficulty making profits for many months or even years. [35] That is, the capital investment is large and the operating income is not significant. In addition, enterprises emphasize research and development but neglect management, and the management and financial systems are not rigorously formulated and implemented. It is difficult for the financial data provided to city commercial banks to pass the standards set by banks, and there is no sufficient and effective collateral as collateral guarantee, making corporate financing difficult. Commercial banks tend to ignore the impact of talent and technology on the operations of science and technology innovation enterprises, and pay more attention to whether the company's financial data meets

bank loan standards. [31] This has also resulted in many high-quality science and technology innovation companies being unable to obtain financial support from banks.

The specific characteristics are shown in Table 1.1 below.

Table 1.1 – Financial needs on the different stages of bank’s life cycle

PERIOD	FINANCING NEEDS
Seed stage	Relies on shareholder investment, own resources or government special subsidies, and the amount of capital required is small
Start-up stage	Shareholder investment, own resources, government special subsidies, and equity financing require a large amount of capital
Growth stage	Financial institution debt financing, capital market bonds, and equity financing require a huge amount of capital
Mature stage	The financing channels are relatively rich, covering various types of financing products, and reaching the maximum value
Decline stage	Financial institutions and investment institutions gradually withdraw, and enterprises cannot accept various financing channels and have difficulty obtaining funds. The amount of capital required is small

Source: developed by the author

Fully understanding the life cycle of customers and making reasonable judgments on customers are of great significance to bank operations. Generally speaking, the life cycle of scientific and technological innovation enterprises can be

basically divided into five stages: seed stage, start-up stage, growth stage, maturity stage, and decline stage. [48] However, the capital needs are different, and the characteristics of each stage are different.

1.2 Research status of business process management in China

Domestic research on business processes is relatively late, but it has achieved certain results. Liu Jianyi analyzed the functions of enterprise management systems and designed a “management business spatio-temporal flow chart”, and equipped managers on this basis. Rui Mingjie and Qian Pingfan pointed out that enterprise reengineering takes enterprise processes as the object of transformation, starting from customer needs, and recombining the elements of enterprise processes to achieve process redesign, improvement and operation. [41] Mei Shaozu constructed a theory of enterprise process management, including process design, optimization, implementation, monitoring, launch, etc. [42] Clarify what value the process should create for service objects, conduct research and analyze existing problems on this basis, and design the personnel and resource allocation and key control points of the process design. Luo Jiahua and Erlanqing proposed the evaluation process method, using multi-level generalized fuzzy comprehensive evaluation theory to help enterprises solve problems in process design. [40] Zhao Tao proposed a mature model of business process management, the model is designed from four aspects:

indicator weight, evaluation index system, evaluation method, and optimization criteria, and the original management process of the enterprise is evaluated and analyzed, and targeted process design optimization suggestions are proposed. [7] In addition, Cui Liang suggested that simplifying the credit business process requirements and improving the standardization and standardization of business process operations will double the efficiency of the credit process, thereby cultivating an ecological environment for better credit processes. Yuan Xiuxing also studied from the perspective of specific process operations, most traditional credit processes run in a single line. [66] Once any link in the middle is blocked, the process may be forced to stop. The approval model with manual intervention is greatly affected by human subjective factors, and there will be large differences in risk preferences for approval.

According to the above research on process optimization theory at home and abroad, today's process optimization research has made great progress and development. Many scholars focus their research perspectives on the identification, optimization, and evaluation of the process itself, or stop at promoting foreign research. In terms of theory and method, there is a lack of in-depth explanations on specific issues of daily management of enterprises, especially the financial industry, and some literature lacks the implementation process from overall planning to arrangement.

1.3 Research status of business process management in foreign countries

Since the 1970s, the economic growth of Western countries has been slow, market competition has become increasingly fierce, and enterprises are facing a survival crisis. In this context, only by changing existing working methods and management concepts can they stand out and develop in the fierce competition. Process is the main axis that connects many business areas in the daily operation of enterprise management and plays a decisive role. However, their work has different priorities, different arrangements at each level, unclear departmental functions, and poor coordination. The company's internal management process needs to be improved urgently. In the early 1990s, Michael Hammer and James A. Champy first proposed the idea of process optimization (BPR) to transform the original process without making qualitative changes and breaking through constraints. [23] That is to say, while not making major changes to the original enterprise structure, it only conducts a fundamental rethinking and thorough redesign of business processes. To significantly improve key performance indicators such as enterprise costs, quality, efficiency, and services, which can enable enterprises to adapt to customers, changes, and competition as much as possible. At this point, BPR research and discussion are booming, and theoretical research and practical attempts are in the ascendant.

Professor Don Schultz studied IMC (Integrated Marketing Communication Theory) and proposed the SIVA (Solution, Information, Value, Access) theory that considers IMC from the customer perspective and solves consumer needs as the center. [59] It is a business process optimization theory that focuses on consumer

needs, evaluates customer value, and meets consumer needs.

Marrow Hazell believes that BPR achieves the purpose of simplifying procedures. The purpose of reducing costs, improving quality and enhancing flexibility. [25]

Stephen Cho points to four keywords for BPR: fundamental, thorough, dramatic and business process. Colin believes that business process management question is a strategic management tool for analyzing organizational performance. [10] Krajewski Ritzman believes from the value chain perspective that a process is a set of activities that utilize one or more outputs. Each process is the basic unit that ultimately produces the enterprise value chain, and emphasizes cross-functional coordination with customers and suppliers interactive relationship. [56]

Hakim proposed that in the process of business process reengineering, if there are multiple optimization process alternatives, standardized models can be used to identify them to calculate the impact of the optimization process on the target, measure the impact through data, and then help the enterprise decision-making layer to analyze multiple optimization processes. Select the business process with the best reengineering target among the alternatives. [24]

Niraj Kumar, RRK Sharma believe that the key success factors of business process reengineering include the scope, efficiency, change resistance of the implementation project by implementing the corresponding business process reengineering to adapt to organizational strategic changes. [34]

Conclusions to Section 1

Business process management reflects on the business process from the problem and from the design. Common process optimization related methods mainly include price fishbone analysis, benchmarking, Pareto method. The basic methods are investigation the original process and understanding the operating status; sorting out the process, focusing on target customers; optimization the processbased in the certain goals and principles; supporting safeguard measures.

Recently . the competitiveness, sustainable development, and ultimately a win-win management model for customers and enterprises. The banking industry, as a financial services industry, serves customers and manages their life cycle is an important part of its operations.

SECTION 2

ANALYSIS OF CURRENT SITUATION OF ZY BANK'S TECHNOLOGICAL INNOVATION FINANCIAL BUSINESS PROCESS

2.1 Analysis of the background of ZY Bank's science and innovation financial business

Regarding the broad definition of science and technology innovation finance, Zhao Changwen, former vice president of Sichuan University, pointed out: science and technology innovation finance is a series of financial instruments, financial systems, financial policies and financial services that promote the development of science and technology, the transformation of achievements and the development of high-tech industries. [68] Innovative arrangements are a system composed of various entities such as governments, enterprises, markets, and social intermediaries that provide financial resources for scientific and technological innovation activities, as well as their behavioral activities in the process of scientific and technological innovation financing. It is the national scientific and technological innovation system and an important part of the financial system. The broad service customer base of science and technology finance includes all aspects of scientific and technological innovation, such as national strategic scientific and technological strength, strategic emerging industries and high-tech industries, university scientific

research institutes, technology-based small and medium-sized enterprises, high-tech enterprises, and specialized new enterprises. Science and technology innovation enterprises represented by the above-mentioned institutions or enterprises, as well as relevant scientific and technological talents from the above-mentioned institutions or enterprises.

The science and technology innovation financial business provides financial support to enterprises related to science and technology innovation-related industries and industries. Products, systems, policies, processes, etc. are safeguard measures to serve the development of science and technology innovation finance important part of the system. [53] The main scope of scientific and technological innovation financial support is the enterprise-based scientific and technological innovation carrier, collectively referred to as scientific and technological innovation enterprises. The more representative ones among science and technology innovation enterprises are technology-based small and medium-sized enterprises, high-tech enterprises, “specialized, special and new” small and medium-sized enterprises, specialized, special and new small giant enterprises, etc. They are established through certain government departments such as science and technology, industry and information technology, etc. Those identified by the standards are labeled with scientific and technological innovation attributes, and the list will be dynamically identified in batches and continuously updated on a rolling basis.

For example, technology-based small and medium-sized enterprises must meet the requirements of:

- (1) domestic enterprises in China;

(2) number of employees ≤ 500 , operating income ≤ 200 million yuan, total assets ≤ 200 million yuan;

(3) production of products and services that are not prohibited by the state, restriction and elimination categories;

(4) the enterprise operates normally and has no credit risk behavior;

(5) the scientific and technological index is not less than 60 points and the score of scientific and technological personnel must not be 0 (including the proportion of scientific and technological personnel, the proportion of R&D investment and the transformation of scientific and technological achievements three indicators). [70]

Specialized and new small and medium-sized enterprises must meet the following four conditions at the same time:

(1) Engaged in specific market segments for more than 2 years.

(2) The total R&D expenses in the previous year reached more than 1 million yuan (inclusive), and the total operating income proportion shall not be less than 3%.

(3) The total operating income in the previous year reached more than 10 million yuan, or less than 10 million yuan, but the total new equity financing (the amount paid by qualified institutional investors) in the past two years has reached more than 20 million yuan. [63]

(4) The evaluation score reaches 60 points or more or meets one of the following conditions:

– Received provincial science and technology awards in the past three years, and ranked among the top three award-winning units; or received national science and technology awards, and was in the top three Ranked in the top five among the

award-winning units.

– The average total R&D expenses in the past two years are more than 10 million yuan. The total new equity financing (the amount paid by qualified institutional investors) in the past two years is more than 60 million yuan.

– Entering the market in the past three years “Maker China” Small and Medium Enterprise Innovation and Entrepreneurship Competition List of Top 500 National Enterprises. [55]

As of the end of June 2022, there were a total of 20,652 scientific and innovative enterprises in Henan Province, mainly including 18,000 technological small and medium-sized enterprises, 8,500 high-tech enterprises, 2,200 specialized and special new enterprises, and 169 leading enterprises, with key listing reserves there are 403 enterprises. The market capacity is vast and there are many business opportunities. The market capacity of different types of scientific and technological innovation enterprises is shown in Table 2.1.

Table 2.1 - The market capacity of different types of scientific and technological innovation enterprises

No.	Target Customer Type	Market Size
1	Science and technology SMEs	17,990
2	High-tech enterprises	8,548
3	“Specialized, Small, and Unique” enterprises	2,226
4	Leading enterprises	169
5	Key potential listed enterprises	403
6	Proposed listed enterprises (science and technology type)	60

No.	Target Customer Type	Market Size
7	Listed companies (science and technology type)	74
8	Manufacturing single champion demonstration enterprises	19
9	Technology innovation demonstration enterprises	94
10	Innovation leading enterprises	116
11	NDRC investment fund entrepreneurial projects	152
12	Total (deduplicated)	20,652

Source: developed by the author based on [50]

ZY Bank was established on December 23, 2014. It is the only provincial legal person bank in Henan Province with branches covering the entire province. On July 19, 2017, it was listed on the main board of the Hong Kong Stock Exchange. Total assets currently exceed 1.2 trillion, ranking 8th among domestic city commercial banks; it has 18 branches, more than 700 business outlets and 17 subsidiaries. Social reputation and brand influence continue to increase.

Since its establishment, Zhongyuan Bank has always adhered to the positioning of «the people's own bank of Zhongyuan», taking «turning Zhongyuan Bank into a first-class commercial bank» as the strategic development goal proposed by the Henan Provincial Party Committee, and striving to «strive to become a first-class bank and build a century-old foundation». Focusing on the mission and vision of «building a better finance, serving a better society, and becoming the most trusted bank for the people of the Central Plains», with the strategic positioning of «rooting in the Central Plains, deeply cultivating the Central Plains, relying on the Central

Plains, and serving the Central Plains», implement the strategic path of «going online to the countryside, digitally intelligent future, keeping integrity and innovation, and forging ahead», and fully implement the «service strategy, the solemn commitment of «serving entities, serving enterprises, and serving the people».

In order to further fulfill the responsibilities of provincial legal person banks, play the leading role of local legal person banks, and use high-quality financial services to help achieve the «two guarantees», ZY Bank insists on returning to its roots, supporting the real economy, and serving the scientific and technological innovation strategy. Unswervingly and vigorously deploying science and technology innovation financial business, in January 2022, the science and technology innovation dual carbon financial service center. A first-level management department, was established at the head office to coordinate the research and formulation of science and technology innovation dual carbon policies, product creation, business promotion, channel construction, and services support, etc. A total of 5 science and technology branches and 1 science and technology innovation dual-carbon specialized team have been established in Zhengzhou, Luoyang, Jiaozuo, Hebi and other cities, with nearly 100 employees.

ZY Bank has not yet established an exclusive product system for segmented customer groups. Currently, the coverage and business scale of its two key products for technology and innovation enterprises, «Technology Loan» and «Specialized New Loan», need to be improved. Among them, the «Technology Loan» product is a cooperative. The bank uses the risk capital pool established by the Henan Provincial Department of Science and Technology and various municipal (district)

science and technology bureaus as a loss compensation mechanism to issue RMB loans to technology-based small and medium-sized enterprises for their short-term production and operation turnover. See Table 2.2 for specific indicators and data:

Table 2.2 - Specific indicators and data for ZY Bank

Indicator	End of 2022	Compared to the Beginning of the Year (Proportion)
Number of accounts opened	7553	985 (15.0%)
Customers		
Borrowers	1549	240 (18.3%)
Among which: Number of accounts with a balance of RMB 10 million (inclusive) or less	1062	77.0% (7.3%)
Number of new accounts opened this year	1106	
Loans		
Loan balance	421.8	43.2 (11.4%)
Among which: Balance of RMB 10 million (inclusive) or less	47.2	11.0% (2.5%)
Amount of loans issued this year	375.0	

Source: developed by the author based on [69]

The service model is a credit loan issued to innovative small and medium-sized enterprises, «specialized, special and new» small and medium-sized enterprises, and

national-level specialized, special and new «little giant» enterprises. As of the end of 2022, ZY Bank had opened 7,553 science and technology enterprise accounts.

2.2 Analysis of the current situation of ZY Bank's business process

ZY Bank's science and technology financial business process is the same as the traditional credit business process. It is divided into different stages according to business practice, mainly including the marketing acceptance stage, the pre-loan investigation stage, the loan approval and loan stage, and the post-loan management stage.

The marketing acceptance stage of ZY Bank's science and innovation financial business mainly involves the acquisition of target customer lists, identification of customers with financing intentions, and loan application acceptance.

The acquisition of target customer lists mainly involves the head office contacting provincial government supervisors. Departments (science and technology departments, industry and information technology departments), obtain the list of officially recognized science and technology innovation target customers in the province with science and technology innovation labels (such as technology-based small and medium-sized enterprises, high-tech enterprises, specialized and special new enterprises, etc.), and then obtain all the list of science and technology innovation target customers. The provincial list is classified and sorted according to

the city where the registration place belongs, and is distributed to the city branches in the form of offline EXCEL forms through the internal website or email. Then the customer management department of the city branch will list the customers within the jurisdiction according to the city where the registration place belongs. The county (district) forwards it to outlets and account managers.

The process of identifying customers with financing intentions is mainly for the account managers of each outlet to get the list and contact the customers through various methods such as telephone marketing, on-site visits, and relationship referrals to achieve contact and understand whether the company has account opening, settlement, or loan financing and other financial needs, helping customers match suitable products. For customers with financing needs, the account manager identifies the customer as an intended customer; for customers without financing needs, the account manager conducts referral marketing for other products such as open accounts, transaction settlement, salary payment, personal business, etc.

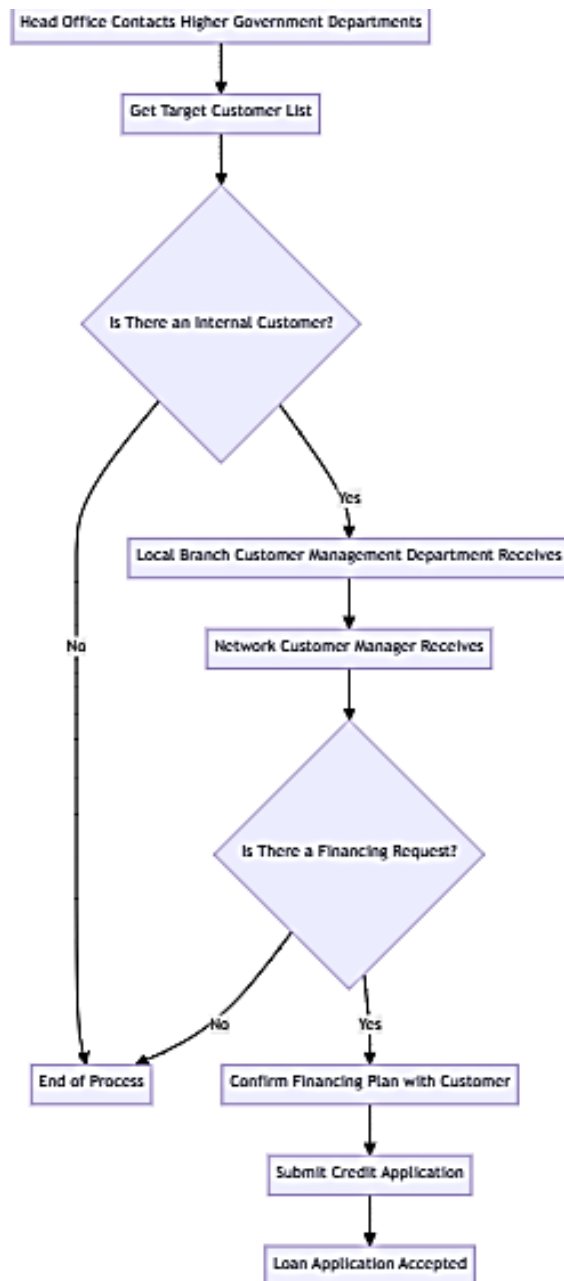


Figure 2.1 – The loan application acceptance process

Source: completed by the author

The loan application acceptance process is mainly for the account manager to conduct a preliminary qualification screening of the intended customers with financing needs based on the bank's credit policy and customer access. After passing the screening, the customer will be notified, and the customer will submit a customer credit application form and project application form to ZY Bank. The account

manager submits the project to the corporate customer relationship management system for project approval. After approval, the account manager will obtain the right to host the customer, which means that the credit business application has been officially accepted.

The pre-loan investigation stage mainly involves data collection and analysis, on-site investigation and verification, investigation report writing, submission for review and approval, etc. The entire pre-loan investigation stage requires two account managers to conduct on-site verification to ensure the authenticity, completeness and compliance of the loan application materials.

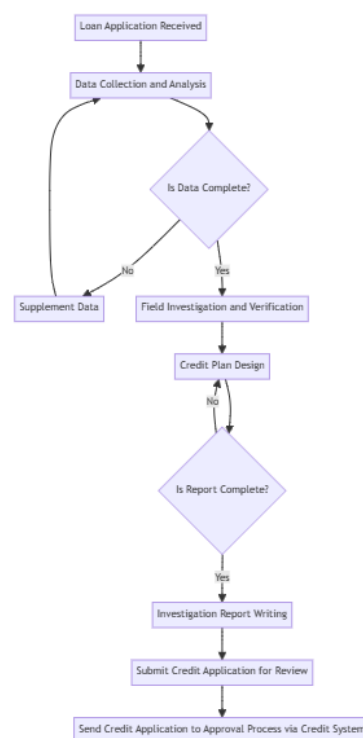


Figure 2.2 – The pre-loan investigation stage

Source: completed by the author

Among them, the data collection and analysis mainly involves the account

manager notifying the customer to provide the borrower and guarantor's business license, company articles of association, legal person ID card, financial statements for the past three years and other information, and conducting the company's overview, industry, production operations and financial indicators.

On-site investigation and verification mainly involves the account manager's on-site verification of the company, checking the operation of machinery and equipment, raw materials and inventory warehouses, checking accounting books, and conducting face-to-face interviews to investigate and verify the company's production and operation, financial status, capital transactions, and guarantees. The actual purpose of the loan, etc., cross-verify the paper application materials provided in the early stage to verify the authenticity;

Investigation report writing is when the account manager conducts detailed analysis, designs a credit plan, and writes an investigation report based on the collected data and company information obtained through on-site investigation, including credit application and historical cooperation, basic information of the applicant, industry analysis and operations status, financial analysis, credit situation analysis, financing purpose and repayment source analysis, guarantor analysis and risk analysis, investigation conclusions, and initiate the credit reporting process through the credit system, and submit the credit review step by step.

The loan approval and loan stage mainly involves the loan approval and loan stages. The loan approval stage mainly includes customer information review, review opinions, reporting to the credit review committee for collective deliberation, and issuance of approval notice; the loan stage mainly includes contract signing, on-

site The main flow chart of underwriting, loan review, quota validation, fund entry and other steps is shown in Figure 2.3:

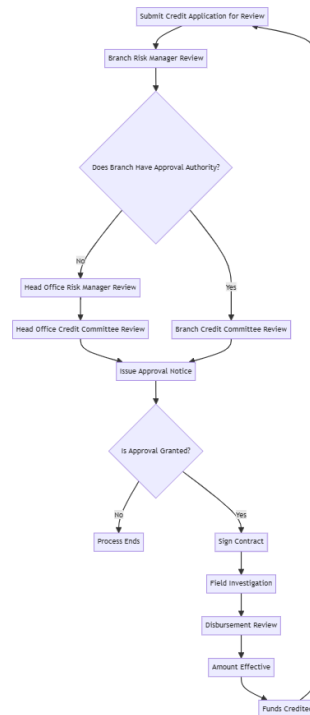


Figure 2.3 – The loan approval and loan stage

Source: completed by the author

The loan approval process refers to the risk manager analyzing and judging the customer's credit risk status based on the pre-loan investigation report. If necessary, he will conduct an on-site investigation of the customer with the account manager, and then issue review opinions of approval, rejection, and return, and report them to the credit review. The meeting will be reviewed at a meeting, and the members of the Credit Review Committee will vote. An approval notice will be issued based on the voting results. Customers who agree with the collective review results of the Credit Review Committee can enter the loan process. Among them, the business

within the branch's authority shall be reported to the branch's credit review committee for final review after the branch's credit review manager completes the review; for business that exceeds the branch's authority, it must be reported to the head office, and the head office's reviewer will review it and then report it to the head office's credit review committee for final review.

The loan link is when the account manager notifies the customer to prepare for the withdrawal procedures, including signing the loan and guarantee contract. This link is currently conducted offline, and the guarantor or collateral is verified on-site according to the guarantee conditions. When the guarantee method is a mortgage, mortgage registration is also required. After completing the formalities, the corresponding loan information will be prepared and submitted to the loan center for loan review, which will mainly review compliance, completeness and implementation of approval conditions. After passing the review, the loan limit will be registered in the system, and then the funds will be processed in the core system.

Accounting processing and completion of loan issuance

The quality of credit assets is the lifeline of banks. As an important part of controlling credit risks and preventing the occurrence of non-performing loans, post-loan management plays a vital role in ensuring the safety of loan funds. Post-loan management is the management of the entire process from the date of loan disbursement to the recovery of principal and interest or the end of credit.

Post-loan inspection adopts a combination of on-site and off-site inspection. Among them, the on-site inspection should adhere to the two-person principle. On-site inspections require on-site visits to customers, interviews with actual controllers,

legal representatives, financial managers, etc., inspection of business premises, review of corporate financial books, inventory of raw materials and inventory, etc., to discover problems in a timely manner and prevent «symptoms» of problems.

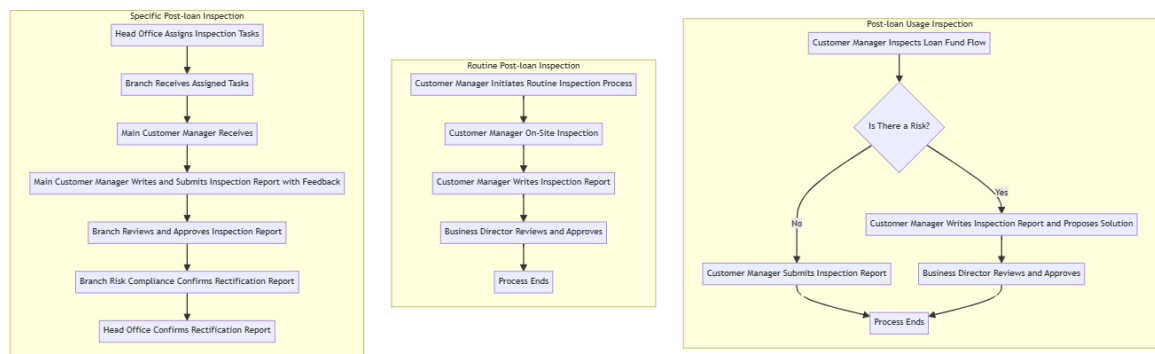


Figure 2.4 – The post-loan stage

Source: completed by the author

During the on-site inspection, paper or image data such as the borrowing enterprise, guarantor, collateral, project construction progress, and sales progress should be retained as important content of the post-loan inspection report and entered into the credit system. At the same time, certification materials corresponding to the actual use of customer funds, various documents that have been inspected annually (the articles of association and capital verification reports also need to be collected if there are changes), the latest financial statements, electricity (water) bill invoices, warehouse entry and exit orders, purchase and sale contracts, bank statements of capital supervision accounts, project construction progress related vouchers, real estate sales ledgers, housing management bureau online signing data, etc.

Off-site inspections should use credit reporting systems, in-bank credit

management systems, credit risk early warning systems, compliance off-site monitoring systems, telephone and WeChat, the Internet, external media and other channel tools, or use third-party data or platforms to collect and analyze information and risk research and judge.

ZY Bank's post-loan inspections are divided into purpose inspections, routine inspections and specific inspections. After each post-loan inspection, the account manager must comprehensively integrate capital account supervision, on-site inspections, off-site inspections, risk warnings, etc. Enter the inspection results in the credit management system in a timely manner, and analyze and evaluate the customer's risk status. The account manager and the person in charge of the operation are responsible for the specific implementation of purpose inspection and routine inspection. The account manager submits the inspection report to the person in charge of the operation for approval and the process ends. Specific inspections are organized by the credit management department of the head office and branch, the company group financial services department, and the company's credit product management department. The operating agencies and account managers are responsible for cooperation and specific implementation. The tasks are assigned to the inspected branch for acceptance, and the account manager in charge fills in the feedback. The process ends after step-by-step review and confirmation by the general manager of the relevant branch department, the branch risk director, and the head office department.

2.3 Analysis of problems existing in ZY Bank's financial business process

ZY Bank's science and technology innovation financial business currently does not have an independent and related process framework. It basically follows the financial business process of traditional enterprises. Because science and technology innovation enterprises have their own uniqueness, many problems arise in the process of expanding the science and technology innovation business operation.

This research adopts the questionnaire survey method and distributes questionnaires to ZY Bank's science and innovation customers and ZY Bank's internal staff of ZY Bank's science and innovation financial business. It analyzes the problems existing in the current ZY Bank's science and technology financial business process from the perspectives of customers and bank employees.

(1) Purpose of questionnaire survey

The purpose of issuing the ZY Bank Science and Technology Innovation Customer Questionnaire is to identify problems in the ZY Bank Science and Technology Innovation Financial Business Process from the perspective of customer experience, combined with the customer's process experience in different aspects such as loan application, information provision, and credit approval. Analyze from the perspective of customer relationship management theory and propose corresponding measures to optimize the business process of science and technology innovation finance.

The main purpose of conducting a questionnaire survey on relevant internal

staff of ZY Bank is to explore ZY from the perspective of industry personnel, from the perspective of marketing, business handling efficiency, and the compatibility of current practices with the characteristics of science and technology innovation enterprises. Problems existing in the bank's scientific and technological financial business process, and in response to these problems, more convenient, time-saving and efficient business process optimization measures are proposed from the perspective of bank practitioners.

(2) Targets of questionnaire survey

Questionnaire 1.

The survey targets are ZY Bank's science and technology innovation enterprise customers: randomly selected science and technology innovation enterprise customers with existing business cooperation from 18 branches of ZY Bank across the province, including technology-based small and medium-sized enterprises and high-tech enterprises recognized by the science and technology and industry information departments. «Specialized, Specialized and New» small and medium-sized enterprises, «Specialized, Specialized and New» «Little Giant» enterprises and other different types. As direct participants in the Science and Technology Innovation Financial business process, customer experience is the most direct basis for process improvement. 20 sci-tech enterprise customers were randomly selected from each branch, of which 30 were selected from areas with good resource endowments for sci-tech enterprises such as Zhengzhou, Luoyang, Xinxiang and Xuchang, and questionnaires were distributed using the Questionnaire Star software platform. A total of 400 questionnaires were distributed. 388 questionnaires were

returned, 380 were valid questionnaires, and the valid questionnaire recovery rate was 95%.

Questionnaire 2.

The survey targets are relevant staff involved in the science and technology innovation financial business process of ZY Bank, covering the science and technology innovation financial service center of the head office's leading management department of science and technology innovation finance, 18 prefecture-level branches in the province, and outlets (Zhengzhou, Luoyang, Jiaozuo and Technology branches established in Hebi and other places must participate) three levels, as well as different positions involved in the whole process such as account managers, product managers (customer group promotion positions), risk managers (review and approval personnel), loan review personnel, and management position personnel. Among them, there are account managers who are responsible for front-end marketing, who handle specific business throughout the entire process. They are direct feelers of the business process and have the most say. There are also product managers from the head office and branches who are responsible for promoting science and technology business. They are responsible for promoting the whole process. The bank and the management and promotion of science and technology financial business within its own jurisdiction, as well as the coordination and communication of problems encountered in the whole process of business processing, will come into contact with all personnel involved in the business process; at the same time, there are also personnel from the credit management department responsible for business review and approval. Mainly responsible for the

formulation of credit policies, the design of the approval process, and the review and approval of specific businesses; there are also loan review personnel, post-loan management personnel, etc., as well as management personnel involved in the entire process, such as branch presidents, department managers, etc.

Questionnaires were sent to relevant staff randomly selected from each level. 150 questionnaires were distributed, 146 questionnaires were returned, and 146 were valid questionnaires. The effective questionnaire recovery rate was 97%. Among them, the levels of the survey objects are: head office (12%), branches (30%), sub-branches (58%); the positions of the staff are: account manager (56%), product manager (14%), risk management Managers (12%), loan reviewers (9%), management positions (7%)

(3) Design of questionnaire

This questionnaire survey was conducted in an anonymous form. The question settings included the type of enterprise, operating years; the second category includes 6 questions related to the process of science and technology financial business, divided into three parts.

There are 12 questions for internal employees (see Appendix 2 for details of the questionnaire), which are divided into two categories. The first category is questions about the basic information of the research objects, with a total of 2 questions. The question setting includes the position and unit where the employee is located. The second category consists of 10 questions related to the business process of science and technology innovation finance, divided into three parts. The first part is questions 3-4, and the questions are mainly about the staff's evaluation of the

staff's satisfaction with the science and technology financial business process, including overall satisfaction and which aspects they are satisfied with; the second part is questions 5-6 are set the main reasons are the reasons why staff are dissatisfied with the science and technology innovation financial business. It mainly includes what aspects of the science and technology innovation financial business process exist, such as marketing, management efficiency, science and technology innovation enterprise characteristics, financial products and personnel structure, etc., as well as which stages exist issues such as marketing acceptance, pre-loan investigation, loan approval and disbursement, post-loan management, etc. The last part is questions 7-12. The question setting is mainly about the staff's suggestions for optimizing and improving the science and technology financial business process, which mainly includes four parts: application marketing acceptance, pre-loan investigation, loan approval and lending, and post-loan management.

Analyze the problems existing in ZY Bank's science and technology financial business process from the customer's perspective:

(1) Satisfaction evaluation

The first part of the questionnaire is about the overall satisfaction of science and technology enterprise customers with ZY Bank's science and technology financial business process. Among the valid questionnaires collected, 15.78% of corporate customers think they are very satisfied; 20.44% of corporate customers choose satisfied; but there are also 21.45% % of corporate customers think it is average; 21.05% of corporate customers are dissatisfied; 21.28% of corporate customers say they are very dissatisfied. From this set of data, it can be shown that

63.78% of corporate customers still choose average or dissatisfaction, and there is still a lot of satisfaction room for improvement and improvement.

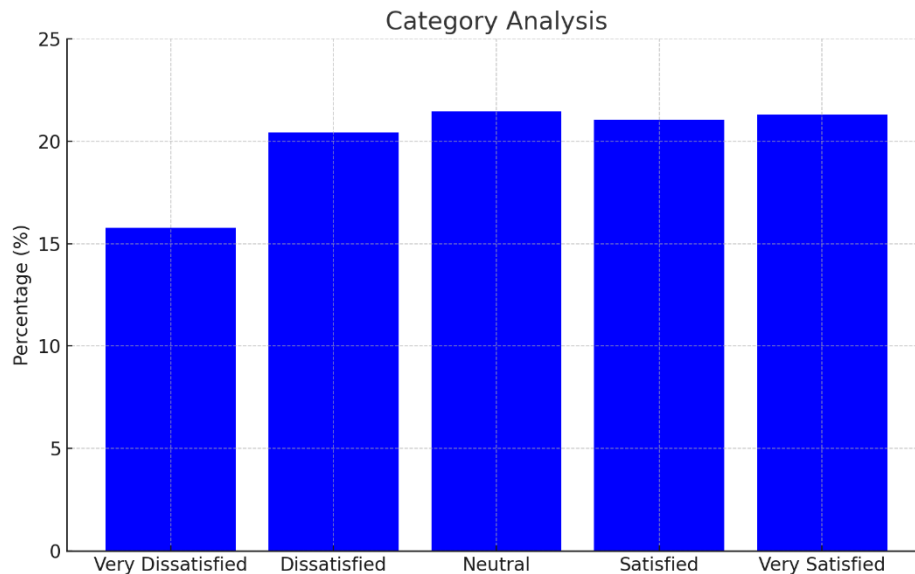


Figure 2.5 – Satisfaction evaluation for customers

Source: completed by the author

(2) Reasons for satisfaction

Judging from the reasons why Kechuang customers are satisfied with the Kechuang financial business process, 24.58% of Kechuang customers are satisfied with the simplicity and clarity of the application materials; 26.74% of Kechuang customers are satisfied with the fast processing efficiency, and 29.12% of customers are satisfied with the financial products. Completely satisfied, 28.64% of Kechuang customers expressed satisfaction with the professionalism of the account manager, and 8.45% of customers chose other reasons. From this set of data, it can be seen that the distribution of satisfaction reasons is relatively even, among which they chose financial products and the professionalism of the account manager. The

number of people who are highly satisfied is slightly higher, but they think that the processing efficiency is average and there is a lot of room for improvement in the simplicity of application materials.

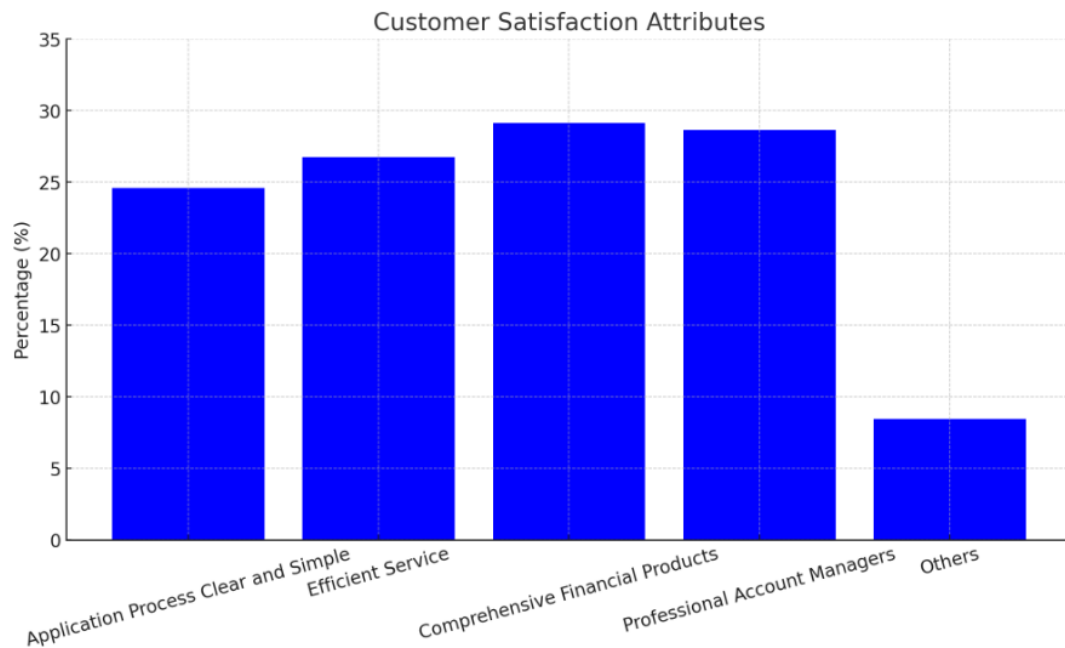


Figure 2.6 – Reasons for satisfaction for customers

Source: completed by the author

(3) Reasons for dissatisfaction

In the dissatisfaction survey, the reasons for dissatisfaction are analyzed separately. Among them, the two problems of long processing process and high access threshold accounted for 31.43% and 30.36% respectively. These problems are relatively prominent, while the application materials are cumbersome, the business types are single, and the account managers are unprofessional, accounting for 28.33% respectively. , 28.34% and 25.34%, indicating that corporate customers agree that the processes in these aspects need to be optimized urgently when handling science

and technology innovation business.



Figure 2.7 – Reasons for dissatisfaction for customers

Source: completed by the author

(4) Handling process aspects

In terms of the survey of high-efficiency links in the processing process, the overall customer satisfaction level is average, indicating that there is relatively room for process optimization and improvement. Among them, the proportion of customers who choose the quota approval link is relatively low at 20.44%, and the pre-loan investigation link and loan application link are selected. The proportion of customers who choose the lending and post-loan links is relatively high, accounting for 25.32% and 28.67% respectively.

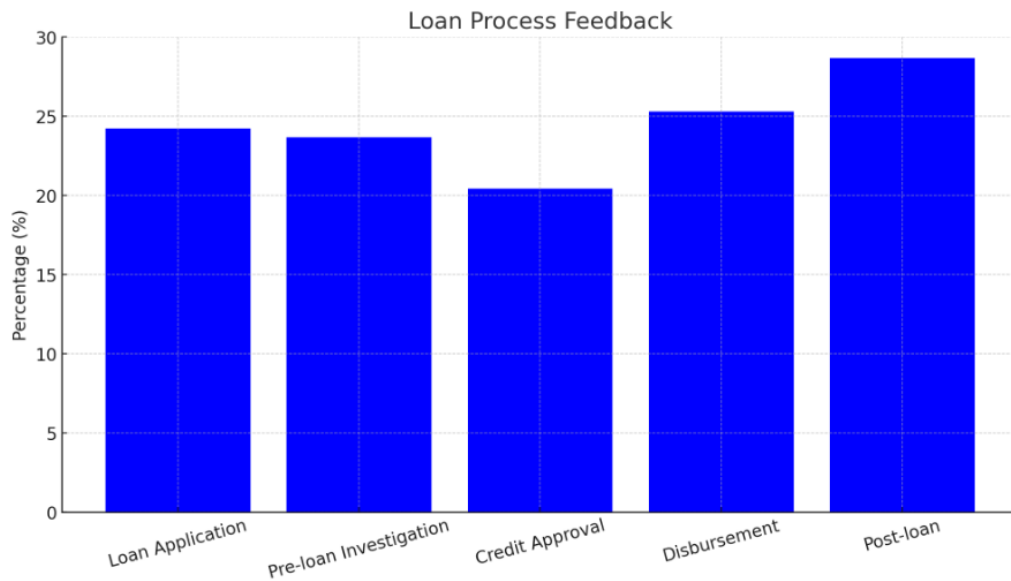


Figure 2.8 – Handling process aspects for customers

Source: completed by the author

In the survey of long-time-consuming business process links, most customers believe that quota approval and pre-loan investigation take the longest, as high as 36.11% and 35.66% respectively, while loan application, loan disbursement and post-loan links are relatively faster, respectively. is 28.34%, 19.44%, 7.55%

(5) Influences on choosing a cooperative bank

In each link of the investigation process, which factors will affect the company's application for science and technology innovation business in our bank, most customers choose to focus on the quota approval link 40.06%, the loan application link 38.54%, the pre-loan investigation link 35.46%, and the loan link 33.75%. The link has more interactions with customers, and customers have a more direct experience. However, the post-loan link does not interact much with customers, and has little impact on customers. Only 4.76% of customers choose this link.



Figure 2.9 – Influences on choosing a cooperative bank for customers

Source: completed by the author

2. Analyze problems existing in ZY Bank’s technological innovation financial business process from the perspective of internal employees through data analysis of effective questionnaires, it can be seen that the satisfaction of ZY Bank’s internal employees with the current science and technology financial business process needs to be improved. By searching for the reasons and stages of dissatisfaction, it was found that in the marketing acceptance, pre-loan investigation stage, loan process Both the approval and loan stages and the post-loan management stage require process optimization, with focus on marketing empowerment, business processing efficiency, and the reflection of the characteristics of scientific and technological enterprises. This points out the key directions for process optimization in the next step.

(1) Satisfaction evaluation

The first part of the questionnaire is about the overall satisfaction of internal

employees with ZY Bank's science and technology innovation business. Among the valid questionnaires collected, 21.97% of employees think they are very satisfied with their satisfaction with science and technology innovation financial business; 26.58% of employees choose to be satisfied; but There are still 20.45% employees who think it is average; 24.64% employees are dissatisfied; 6.36% employees think it is very dissatisfied. From this set of data, it can be seen that 51.45% of employees still choose average or dissatisfied. There is still a big gap in business satisfaction. Room for improvement and improvement.

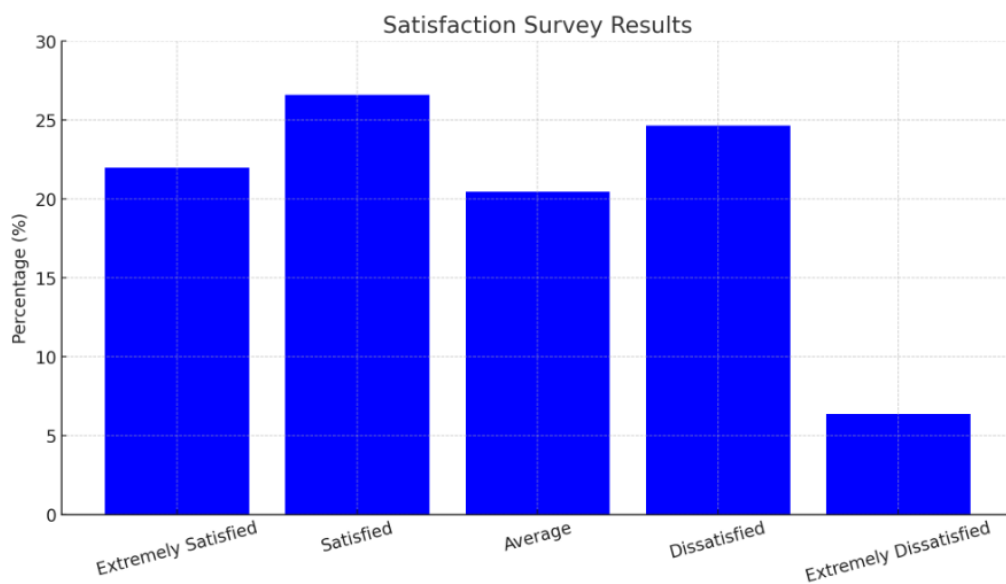


Figure 2.10 – Satisfaction evaluation for employees

Source: completed by the author

From the perspective of internal employee satisfaction, 15.87% of employees are satisfied with marketing empowerment; 22.38% of employees are satisfied with management efficiency, 20.56% of employees are satisfied with the characteristics of scientific and technological innovation enterprises, 28.67% of employees are

satisfied with financial products, 27.64 % of employees are satisfied with the personnel structure. This set of data can show that most people are relatively satisfied with ZY Bank's financial products and personnel structure, and there have been great improvements in management efficiency, marketing empowerment, and the reflection of the characteristics of scientific and technological enterprises.

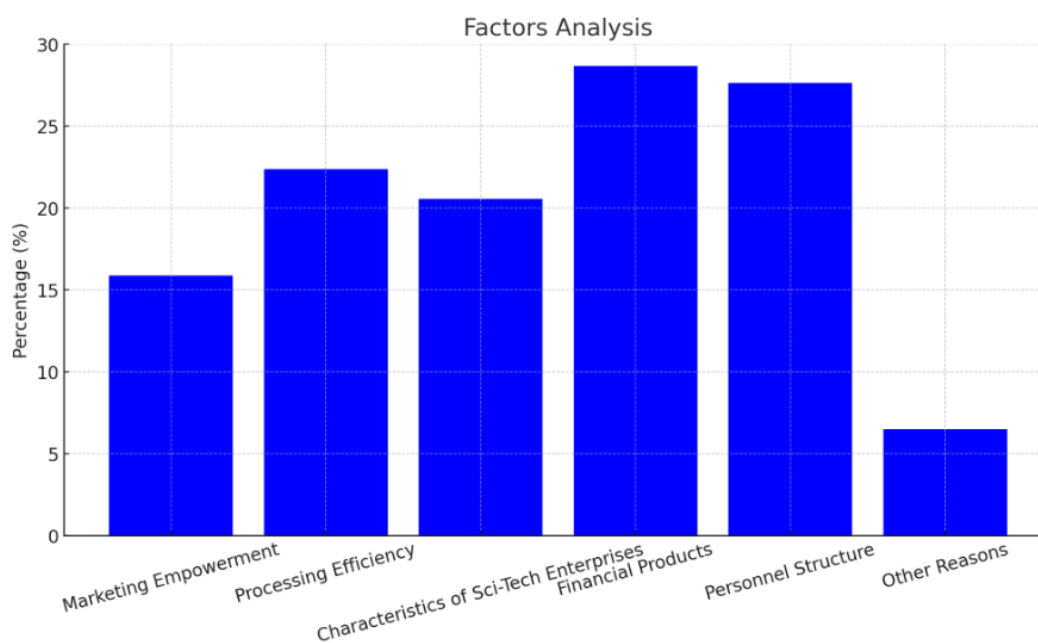


Figure 2.11 – Factor analysis of satisfaction for employees

Source: completed by the author

(2) Reasons for dissatisfaction

In the dissatisfaction survey, the reasons for dissatisfaction and which links were dissatisfied were divided into several issues, including inaccurate marketing empowerment, low efficiency of business processing, and failure to consider the characteristics of scientific and technological innovation enterprises in pre-loan surveys and approvals. They are all relatively prominent, indicating that employees

agree that the processes in these aspects need to be optimized urgently when conducting scientific and technological innovation business.

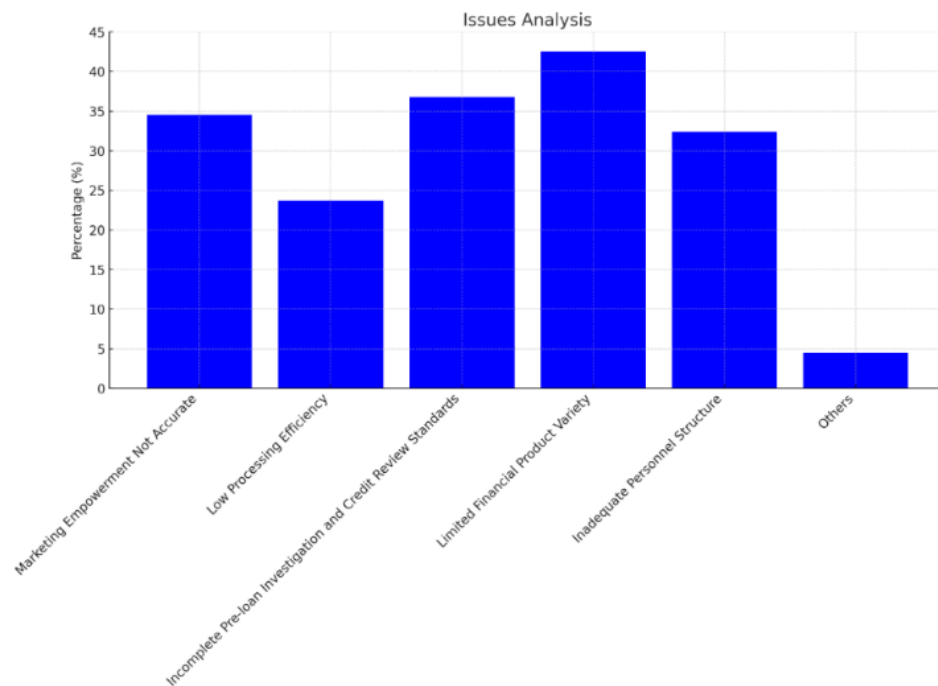


Figure 2.12 – The current distribution of problems in the business process of science and technology innovation finance

Source: completed by the author

Among the selections of stages that employees think need to be optimized, the selections for the marketing acceptance stage, pre-loan investigation stage, loan approval and loan stage and post-loan management stage are relatively concentrated, covering almost all processes that need to be optimized, specifically as follows.

(3) Improvement suggestions

During the marketing acceptance stage, 45.67% of people believe that it is more appropriate to pre-screen the list of target customers before issuing it, and 42.34%

of people believe that there should be unified standards and hierarchical identification for screening scientific and technological innovation companies, and there is a need for marketing empowerment. urgent.

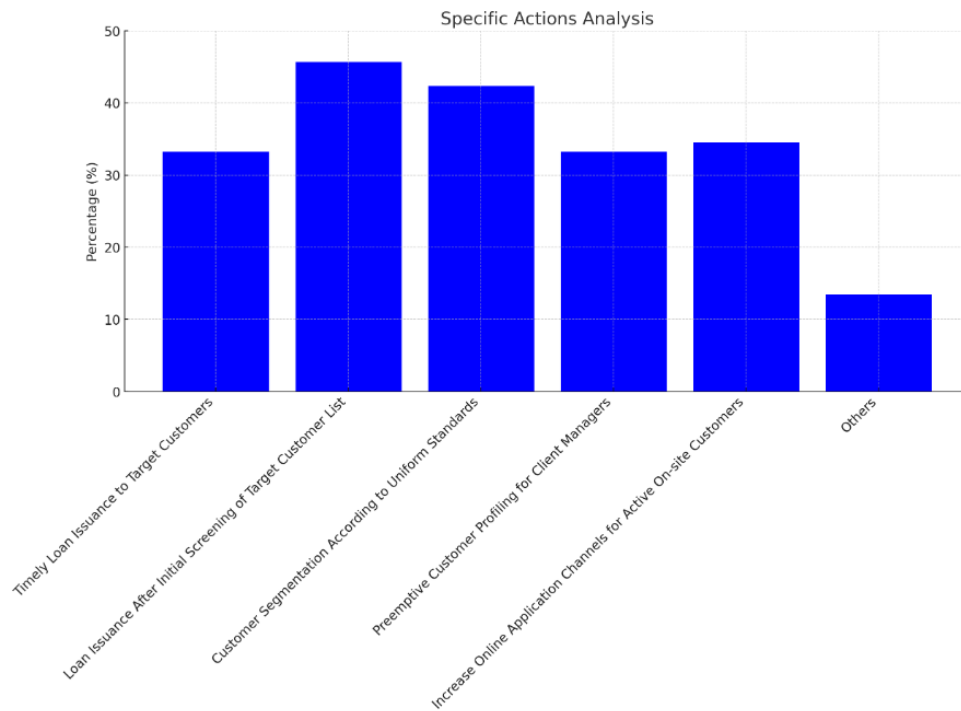


Figure 2.13 – The specific distribution of optimization suggestions

Source: completed by the author

During the pre-loan investigation stage, 56.83% of people believed that the pre-loan investigation should add content related to technological innovation to adapt to the characteristics of scientific and technological enterprises, and 38.65% of employees believed that a unified and standardized credit investigation report template was particularly important, and the professional capabilities of account managers and Regarding the quality of survey reports, 30.21% and 34.23% still believe that it needs to be optimized and improved.

In the review and approval stage, 53.15% of people believe that the approval process is redundant and inefficient. They hope to be given special authorization and full-time approval, accounting for 48.67% and 38.34% respectively. They are more worried about the lack of exclusive evaluation standards for science and technology innovation finance (47.21%). %), it will not be able to form the competitiveness of business development in the long run. In addition, it is also necessary to use electronic contract substitution issues to improve the efficiency of lending and disbursement.

In the post-loan management stage, 42.5% of the staff were worried about the incomplete post-loan early warning mechanism, and had expectations for the post-loan emphasis and differentiated NPL tolerance (25.45% and 23.56% respectively), and some people chose In order to optimize the implementation of due diligence and exemption factors.

Among the safeguards required for process optimization, the selection of employees, accelerating the establishment of science and technology branches or specialized teams, supplementing the introduction of scientific and innovative financial professionals, and improving the professional capabilities and quality of personnel accounted for (48.67%, 44.78%, 47.21%), respectively. Some people also checked the special assessment and imperfect risk tolerance mechanisms.

Problems revealed in ZY Bank's technological innovation financial business process:

- 1) Inaccurate marketing empowerment

ZY Bank's science and technology innovation financial business was officially

proposed after the establishment of the first-level department at the head office in early 2022, and rose to the level of the bank's strategy. Therefore, in the early stages of business development, the head office's science and technology innovation dual carbon financial service center served as the lead management of the entire bank's business. The department needs to guide branches to correctly understand what science and technology innovation enterprises are, which belong to science and technology innovation financial business, and how to carry out science and technology innovation financial business in different areas. Through multiple frequency and multiple occasions, various new forms of transmission, guide branches to pay attention to science and technology innovation financial business and actively carry out science and technology innovation financial business. To create a financial business, the marketing empowerment of front-line personnel is particularly important and necessary in this process.

ZY Bank's science and technology innovation financial business mainly implements list-based management of science and technology innovation enterprises, explores customer needs, designs corresponding plans and seizes business opportunities. ZY Bank's current list management of science and technology innovation enterprises mainly relies on the lists of companies with science and technology labels officially recognized by government departments such as science and technology departments, industry and information technology departments, such as high-tech enterprises, technology-based small and medium-sized enterprises, and specialized and special new enterprises. etc., there are the following problems in the marketing process. The current list is mainly obtained offline through the public

documents of the competent government departments and bureaus, and there will be a certain lag. It is often released through public channels such as government websites or financial media. Only the head office can see the acquisition, and then distribute it layer by layer. A certain amount of time has passed before it reaches the front-line account manager. Moreover, because different types of lists have different identification times and update frequencies, there may be omissions, making it impossible to seize marketing opportunities at the first time.

Although there are certain standards for identifying science and technology innovation lists with different label types, they are endorsed by government credibility and the overall quality is relatively high, but the identification standards are more related to indicators such as operating income scale and R&D investment proportion. During actual business development, it is discovered that some companies on the list have experienced risk events or overdue interest arrears and other bad credit situations in other financial institutions. In this case, the account manager's marketing visit after the list is issued will cause a loss of energy and reduce the marketing success rate.

At present, ZY Bank's science and technology customer list management has implemented classification management according to labels. However, due to different competent authorities, the evaluation indicators for identification are not unified. The size, risk level and potential marketing value of the enterprise are also different, and there is a lack of unified standards. Customer stratification means that account managers cannot identify high-quality potential customers and sub-optimal customers with limited energy and carry out precision marketing to improve the

quality of admitted customers.

2) Business processing efficiency needs to be improved

Most of the scientific and technological innovation enterprises are in the seed stage and start-up stage. Their capital needs are short-term, frequent and urgent, and they have high timeliness requirements for business processing. ZY Bank's current technological innovation finance business is basically the same as the business process for traditional corporate customers. The main stages include marketing acceptance, pre-loan, loan and post-loan stages, mainly offline. During customer application acceptance, review and approval, and loan disbursement Contract signing and other processes take a long time, and the response to customer needs is not fast enough, which greatly affects the customer experience. In particular, the credit approval of traditional corporate customers requires step-by-step review, meetings, and approvals by the head office and branches. There are many links and the chain is long. It cannot respond to the needs of scientific and technological innovation enterprises for financing efficiency in a timely and effective manner.

From the perspective of the stages of science and technology financial business, first, in the marketing acceptance stage, customers need to find the account manager of ZY Bank first when applying for business. The account manager can only initiate the loan business application after conducting a preliminary qualification review. In this case, rely on the response speed of the account manager. If the account manager manages a lot of customers, is busy with business, and cannot take care of it, it may cause delays in initiating business applications and failure to report in time, especially for customers who take the initiative to come to the door. The probability

of this situation occurring the risk will be relatively large; secondly, during the review and approval stage, scientific and technological innovation enterprises, regardless of their qualifications, the amount of the loan applied for, risk mitigation measures, whether the products used are standard, and whether the risks are relatively controllable, all need to go through the branch and head office levels. Approval must be carried out at all levels, and the approval time must be at least 1 week. In a fiercely competitive environment where the products of financial institutions are highly homogeneous and online credit loan products are constantly being launched, the approval time for multiple products from many financial institutions has been shortened to seconds if ZY Bank still applies for small-amount loans according to the online. If follow the traditional process for approval, you will not have any competitive advantage, and the timeliness of review and approval has become a bottleneck for business development.

After the current application is approved, the customer still needs to sign a paper contract, as well as relevant paper documents such as shareholder meeting resolutions during the loan stage, and two people are required to be present for verification. In this case, it will take a certain amount of time for bank staff to come to the door for verification. Moreover, in the face of force majeure factors such as extreme weather and epidemics, they may not be able to come to the door, and the loan cannot be issued even though they have been approved, will affect the lending efficiency.

3) Failure to consider the characteristics of scientific and technological innovation enterprises

Science and technology innovation enterprises cover a wide range of industries, and most of them belong to new technologies, new industries, new formats, and new business models. They are mainly knowledge-intensive or technology-intensive. Although in the early stages of entrepreneurship, R&D investment is large, and technology and market prospects are uncertain. But they will also master core technologies and patented assets, have good growth potential, and have great potential. Traditional commercial banks rely more on financial indicators such as corporate income and profits and traditional means such as guarantees and mortgage measures to make judgments, and lack the understanding of the industry, technology and other professional knowledge, lack of investigation and reference judgment on the characteristics of scientific and technological innovation enterprises when evaluating customers, and cannot accurately and objectively comprehensively assess the risks and values of scientific and technological innovation enterprises. It is difficult to identify customers and easily lose potential high-quality customers.

ZY Bank currently conducts both the pre-loan investigation process by the account manager and the review and approval process by the risk manager in accordance with the traditional industry and traditional enterprise model. There are cases where customers who are the earliest to contact customers fail to be approved or the credit limit is relatively high when evaluated according to traditional credit preferences and standards. The loss of potential customers caused by low risk, most of these customers are in the start-up or growth stage. Once the opportunity is not grasped in the early stage to enter into cooperation, the customer grows and even enters the stage of capital market, the marketing difficulty and cost will be greater.

There is a lack of exclusive and unified evaluation standards and management mechanisms for science and technology innovation companies in terms of pre-loan investigation, credit approval, post-loan management, risk tolerance, etc. It is resulting in front-line account managers not knowing how to understand science and technology innovation customers and in their industry, review and approval personnel do not know how to refer to the technological innovation dimension for review and review judgment.

In manual mode, account managers make their own choices whether to engage in science and technology innovation business, after the loan application is randomly assigned to different risk managers for review, personal professional ability and science and technology innovation finance experience have a greater impact on business judgment. If you have less exposure to science and technology innovation business in the early stage and lack of professional ability, there may be a probability of misjudgment, which will affect business development. At the same time, it will not be conducive to the training reserve of the team of science and technology financial professionals, and will also cause the loss of potential customers.

4) Existing product categories are relatively single

Science and technology innovation enterprises have their own unique development characteristics and growth patterns. They will go through different life cycles and stages such as the start-up stage, growth stage, maturity stage and decline stage. The demands for financial products and services are also different at different stages of development. Although commercial banks are currently increasing their financial support for science and technology innovation enterprises, the basic

product system is still relatively weak compared with large state-owned banks or joint-stock banks. The «full life cycle» product system of science and technology innovation enterprises has not yet been perfected, diversified and customized. The problem of insufficient financial products and services is still prominent.

The Science and Technology Innovation Financial Business Management Department of ZY Bank Head Office was established on January 8, 2022. After its establishment, it began to build a science and technology financial product system. However, due to the short establishment time, there are few department personnel, and there is a lack of product creation capabilities. The current situation and practical difficulties of experienced personnel, such as more urgent, dangerous and heavy work, are:

- the lack of building a complete product system around the demand characteristics of different life cycles;

- the lack of innovation in specialized and characteristic products, which cannot effectively meet the needs of enterprises, the demand for customization can truly help enterprises solve pain points and difficulties, such as the lack of talent loan products that focus on talent entrepreneurship and individual loans in the early stage; the financial needs of the capital market are diversified in the mature stage, and there are insufficient intelligence-based products;

- benchmarking the market and in the same industry, there is a lack of key products and flagship products that are well-known in the market and well-known among customers, and the brand effect is not outstanding enough.

5) Imperfect personnel structure

The characteristics of science and technology innovation enterprises such as light assets, uncertain prospects for technology research and development and achievement transformation, and insufficient information transparency determine the mismatch between risks and returns of science and technology innovation financial business, that is, low short-term returns but great long-term help; low explicit returns.

Hidden returns are high, and it is difficult to achieve «self-revolution» to increase financial services for scientific and technological enterprises. At the same time, science and technology innovation enterprises cover a wide range of industries, have cutting-edge technologies and market applications, and are highly professional. City commercial banks need to establish science and technology branches or science and technology innovation finance teams, implement special assessment incentives, and introduce supporting policies and mechanisms to stimulate science and technology innovation.

The organizational structure of ZY Bank is imperfect. There are only 6 science and technology branches and specialized teams in the whole bank, with less than 100 employees, and it has not realized a real specialized science and technology innovation business. It has insufficient personnel reserves. There are only 5 people in the head office responsible for the whole bank.

To promote innovative financial business management, it is necessary to connect with 18 prefecture-level branches across the province, and the workload is relatively saturated. The product managers responsible for the scientific and technological innovation business within the jurisdiction at the branch level are all

part-time, and they are often changed due to job adjustments, and they are often just familiar with the business and are on the right track.

Apart from technology branches and specialized teams, there are no full-time technology innovation account managers at the branch level. Corporate account managers are mainly responsible for the development of technology innovation business. The professional capabilities of personnel need to be improved. In the past five years, ZY Bank has mainly relied on large-scale group customers, real estate customers and government financing platforms have supported the highly prosperous development of the company's business. At present, a certain degree of path dependence has been formed. Whether it is the marketing personnel of the business line, the review and approval of the risk line and the loan-in-loan the back-office personnel have weak professional knowledge, lack of forward-looking judgment on technology and market prospects, insufficient ability to identify and judge the risks of science and technology innovation financial business, and insufficient connection between front-office marketing and middle- and back-office professional management services. Special assessment of science and technology innovation business has not yet been implemented. In the case of a mismatch between risks and returns, business units pay more attention to current interests, short-term gains and assessment scores, and ignore long-term effective science and technology innovation business, and there is insufficient endogenous motivation to develop science and technology innovation business.

6) Low degree of digital application

In addition to unstandardized internal governance, financial management, and

low information transparency, scientific and technological innovation companies also have high technical and professional barriers in the industry. In terms of credit evaluation, intellectual property level, etc., there are imperfect information sharing mechanisms and information asymmetry. Problems restrict the development of science and technology innovation finance. At the same time, compared with large state-owned banks and joint-stock banks, city commercial banks have limited technology investment costs and relatively insufficient scientific and technological talents. It is difficult to connect and share their own front, middle and back-end data, as well as connect and share external data.

ZY Bank started cooperating with McKinsey around 2018 to carry out digital transformation of its retail business, investing a lot of resources and achieving good results; however, in comparison, the digital transformation of the company's business started late and was independent. Implementation lacks systematic top-level design and planning, insufficient support from within-industry resources, and a weak professional team. In addition, when developing science and innovation financial business. The existing databases within the bank are limited in type, data quality is poor, and the systems are different. The front, middle and backend data have not been truly connected, and the data integration and governance of the four banks after the merger are even more difficult. This is due to the limited integration and openness of government information and the lack of comprehensive enterprise-related big data, such as enterprise intellectual property data, innovation and R&D investment data, and data on awards and subsidy funds. The connection between bank and government data needs to be strengthened.

Conclusions to Section 2

By distributing questionnaires to ZY Bank's science and technology innovation enterprise customers and relevant internal staff, and sorting and analyzing the questionnaires, it was found that ZY Bank's science and technology innovation financial business process has inaccurate marketing empowerment, failure to consider the characteristics of science and technology innovation enterprises, and lack of due diligence in review and approval. The quality of investigation reports is not high, the efficiency of the approval process is low, the post-loan early warning mechanism is incomplete, and the account manager's professional capabilities are insufficient.

SECTION 3

ZY BANK TECHNOLOGY INNOVATION FINANCIAL BUSINESS PROCESS OPTIMIZATION PLAN

3.1 Overall goals of the business process optimization for ZY Bank

ZY Bank's technological innovation financial business process optimization mainly examines the rationality of the process from four main stages. By improving the core links in each stage, it avoids existing problems in the past and achieves improvements at the overall level of the process combination to achieve operational success. The effect of qualitative improvement in efficiency. The goal of this process optimization is to decompose and describe each business from beginning to end without completely changing the original financial business process of ZY Bank, and to construct a series of relatively stable methods and behavioral orders in a simple form, and to establish relationships with all levels. The goals are closely linked to the fitting system, thereby making the bank more standardized and integrated operations, and ultimately achieving the purpose of improving efficiency. At the same time, it is also required to improve the bank's agile response to customers and enhance its market competitiveness among peers; ensure orderly collaboration between departments and positions, save process running time, and reduce costs. [58]

The overall goal of ZY Bank's science and technology innovation financial

business process optimization is to be customer-centered, comprehensively grasp the development laws and characteristics of science and technology innovation enterprises, and focus on the four stages of marketing acceptance, pre-loan investigation, loan approval and disbursement, and post-loan management. Optimize the entire journey of science and technology innovation finance business, improve business processing efficiency, enhance professional capabilities, effectively control business risks, solve the challenges and problems faced by the development of science and technology innovation finance, stimulate the endogenous motivation of branches to develop science and technology innovation finance business, and enhance market competitiveness, realize the incremental expansion of science and technology innovation financial business, ensure the healthy and long-term development of science and technology innovation finance business, and fulfill the responsibilities of provincial corporate banks. [60]

At present, ZY Bank does not have a reasonable management mechanism for its technological innovation enterprise customers. Now it is optimizing the financial business decision-making process for the company's technological innovation customers. The specific ideas are as follows:

1. Build an integrated system. Since science and technology enterprises are obviously different from traditional enterprises and have high risk attributes, their financial business processes cannot be completely copied and unified to copy the original processes. Therefore, a unified and integrated system is constructed from beginning to end, that is: process optimization is not only It cares about coordination and stability at a certain level, but also takes into account coupling interactions at

different levels;

2. Reflect horizontal synergy. The details of the optimization process must fully reflect the consideration, familiarity and grasp of the Fayol Bridge and the power system. This optimized interactive mechanism not only takes into account the progress procedures and control methods, but is more like a «crystallization of collective wisdom»;

3. Evaluable and controllable. Process optimization design not only proposes specific solutions, but also reflects the assessment and evaluation of the results of specific management process operations. It also controls the entire management entropy and forms a clear set of identification and dynamic management mechanisms.

3.2 Optimization principles of the business process for ZY Bank

1) Customer-centric

Customers are the cornerstone for banks to survive. Science and technology innovation enterprises have core technological advantages, are deeply involved in their main businesses, have unique development trends and characteristics, and differentiated financial needs. [64] Adhering to the customer-centered approach to optimizing the business process of science and technology innovation, we must always stand from the perspective of customers, consciously integrate customer

needs into the entire process of financial services, and meet various financial needs through optimized processes and innovative products and services, and truly serve.

2) Efficiency first

Efficiency is a concentrated expression of the competitiveness of the banking industry and directly affects customer satisfaction with the bank. In particular, the demand from scientific and technological innovation enterprises is short-term and urgent, which puts forward higher requirements for efficiency. [27] Adhering to the priority of efficiency and optimizing the scientific and technological innovation amount business process, we must quickly respond to the needs of the market and customers, promptly analyze and find unreasonable links in the process, and make targeted improvements to reduce repeated approval process nodes. Thereby providing customers with convenient and fast financial services, make financial services more extensive, more precise, and more warm, bring better customer experience, and establish a better market reputation.

3) Professional support and empowerment

Professional capabilities are the cornerstone of banking business development. Technological innovation enterprises are different from traditional low value-added small and medium-sized enterprises. They are mainly distributed in subdivided industries and have core technical advantages and barriers. Banks can only have the courage and ability to «walk on the blade» and respond to the actual needs of each customer. [16] Only by establishing new concepts, applying new technologies, and developing new products can we provide customers with professional, personalized, and comprehensive optimal solutions and continuously improve the professional

level of financial services by deeply understanding the development trends of the industry in which our customers are located.

4) Effectively prevent and control risks

Asset quality remains an important indicator for measuring the risk management level of commercial banks. The customer evaluation standards and risk preferences of commercial banks do not match the development characteristics of scientific and technological enterprises, so risk control remains the core and primary issue. [18] Commercial banks generally aim at stable operations. Science and technology innovation enterprises themselves have naturally high-risk attributes, which are not in line with the prudent risk preferences of commercial banks. Science and technology innovation enterprises have a large capital investment gap, long return cycles, and lack of effective and qualified collateral. Mitigating risk exposures, but commercial banks have limited returns from providing loan financing and cannot fully make up for the losses caused by the risks they bear. Therefore, it is necessary to balance the relationship between development and stable operation in the process of developing science and technology innovation finance. Under the existing management mechanism, further explore, innovate and improve the risk management model that adapts to the development laws and characteristics of science and technology innovation enterprises, so as to effectively prevent and control. Under the premise of risk control, we will vigorously develop science and technology innovation financial business. [19] The optimization of ZY Bank's science and technology innovation financial business process must be based on the control of real risks and run through the entire process of pre-loan, loan and post-

loan. Only in this way can the safety of credit funds be guaranteed and the success of science and technology innovation financial business be realized. High quality and sustainable development.

The optimized overall process is still divided into four stages, namely marketing acceptance, pre-loan investigation, approval and loan disbursement, and post-loan management. However, based on the process optimization theory, each stage has been optimized accordingly. The main optimization content is as follows:

- in the business acceptance stage, online customer acquisition channels have been added to ensure timeliness; blacklist filtering and screening have been added to improve the quality of the list; customer stratification and portraits have been added, and stratification rules for scientific and technological enterprises have been formulated, unify customer evaluation standards, improve high-quality customer identification and marketing success rate; [12] increase customer self-service application functions through online electronic channels such as online banking, and improve business acceptance efficiency;

- optimize pre-loan investigation methods during the pre-loan investigation stage and unify investigation reports. The template is more suitable for the characteristics of scientific and technological innovation enterprises and improves the investigation efficiency;

- in the loan approval stage, an exclusive approval process of «first-level review and first-level approval» or «first-level review and second-level approval» has been added for exclusive products of scientific and technological innovation. Shorten the approval chain; build an intelligent risk control model that adapts to the

characteristics of scientific and technological enterprises to improve risk management and control efficiency; [4] add a paperless electronic contract signing function in the loan stage to improve loan efficiency and customer experience;

- further optimize the post-loan management stage.

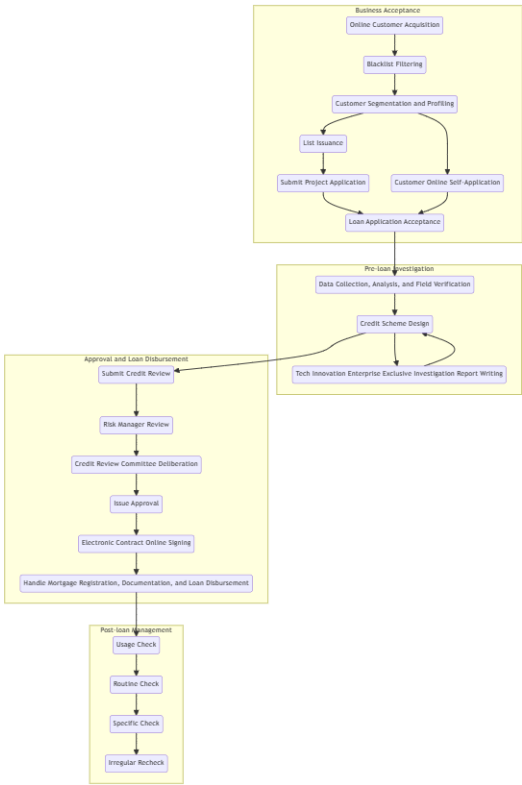


Figure 3.1 – The work flow of the optimization plan

Source: completed by the author

The post-loan management model adds occasional re-inspections, making post-loan management more professional and targeted, and improving the efficiency of risk control management in science and technology financial business.

3.3 Optimization plan of the business processes for ZY Bank

The optimization plan is to provide «dimensionality reduction» factors for the system formed by various process elements. The cost is to filter out some relatively unimportant information in the system while maintaining its main functions. Its original intention is to make the department management process of the organizational structure simple and efficient through the nodes of its Fayol bridge, and it does not mean to lose some of its functions. or function. The design basis for the optimization and design of ZY Bank's technological innovation financial business process is based on the following points:

(1) Draw conclusions based on the questionnaire survey and analyze existing problems;

(2) Based on the combination of national policies and ZY Bank's own reality, the overall goals and principles for optimizing the science and technology financial business process are clarified;

(3) Based on customer relationship theory, enterprise life cycle theory, ECRS process optimization theory, etc., the following science and technology financial business process is designed based on the four stages of marketing acceptance, pre-loan investigation, loan review and approval, and post-loan management.

Optimization plan, the specific optimization design plan is as follows:

1. Marketing acceptance stage:

(1) The target customer list is obtained and distributed online to ensure the timeliness of the list distribution.

ZY Bank should actively connect with government departments such as science and technology, industry and information technology, and establish online customer acquisition channels. Through direct system connection, obtain the list and basic information of officially recognized science and technology innovation target customers, assign science and technology innovation customer labels, and obtain through the bank's internal channels. The digital marketing platform Lingji system distributes customer information according to the place of registration. If the customer is a new customer, it will be sent to the branch product manager and the nearest branch will be recommended according to the customer's registration location. The branch product manager will allocate the customer according to the branch's marketing arrangements; if the customer is an existing customer and there is an account management customer. Managers and organizations will directly distribute it to the corresponding executors and corresponding organizations. This mode can solve the problem of untimely updates and data lag caused by irregular dynamic identification of the list. It is also conducive to full-process closed-loop management of subsequent docking services for target customers, and timely follow-up to solve problems encountered in business promotion.

(2) Increase blacklist filtering and screening to reduce absolute reliance on the quality of government-certified lists.

After obtaining the target customer list, preliminary screening can be performed through internal data and external industrial and commercial, tax and judicial information to check the business status, tax information, litigation information, administrative penalties, breach of contract information, guarantee information. For

multiple credit reports, whether they have been included in the blacklist, for customers who trigger the abnormal blacklist, filter and eliminate them, and then issue them to branches for connection. This can effectively avoid bad customers and reduce the waste of energy and energy caused by front-line personnel's docking visits. Opportunity cost situation further improves the identification of high-quality customers.

(3) Unify standards for stratification to improve the identification of high-quality customers and the quality of admitted customers.

The current list of Kechuang target customers contains different label types and different evaluation standards. Account managers mainly conduct information verification and access judgment based on the application materials provided by customers. This kind of verification and judgment is relatively subjective and the standards are not uniform. For high-quality customer selection lacks unified standards and effective guidance. This traditional method can easily lead to uneven customer quality, difficult to control risks, and weak business sustainability. Therefore, there is an urgent need to stratify customers according to unified standards and improve customer experience. Accuracy in identifying quality customers. The overall idea of scientific and technological innovation stratification is to first assign different coefficients to comprehensive scores based on the company's establishment years, asset-liability ratio, net profit margin, asset scale, revenue scale, industry, number of scientific and technological innovation labels, etc.

Table 3.1 - Specific scoring system

DIMENSION	COEFFICIENT
Years of establishment	
	Greater than 10 years
	5-10 years
	3-5 years
	Within 3 years
Debt-to-asset ratio	
	Top 20% in each industry
	Ranked 20-50%
	50-70%
	70-last
Net profit margin	
	Top 20% in each industry
	Ranked 20-50%
	50-70%
	70-last
Asset scale	
	Top 20% in each industry
	Ranked 20-50%
	50-70%
	70-last
Revenue scale	

DIMENSION	COEFFICIENT
	Top 20% in each industry
	Ranked 20-50%
	50-70%
	70-last
Industry	
	Belong to the strategic emerging industry
	Do not belong to the strategic emerging industry
Number of science and technology innovation labels	
	For each additional label, the coefficient increases by 0.1, with an upper limit of 1.5
	1 label

Source: built by the author based on [17]

On the basis of the comprehensive scoring results of scientific and technological innovation enterprises, A, B, and C are sorted hierarchically in different industry types according to the comprehensive scoring results. Among them, Class A customers are the top 30% of the comprehensive scores in industries that our bank's credit policy actively supports, and the best ones will be selected. Support the top 20% of customers in the industry with a comprehensive score; Category B customers are the top 30%-60% of the industry with a comprehensive

score that our bank's credit policy actively supports after excluding blacklisted customers, and the top 20%-50% of the industry with a comprehensive score will be supported on a merit-based basis. Prudently support the top 10% of customers with comprehensive scores in the industry; Category C refers to customers other than Category A and B. According to the stratification results, type A customers are of higher quality than type B customers, and type B customers are of higher quality than type C customers. The account manager already has a certain understanding of the customer before conducting marketing docking based on the customer stratification results. Both service efficiency and marketing success rate will be improved. At the same time, it can improve the quality of customer access and effectively reduce the risks of subsequent business development. [17]

(4) Accurately recommend potential customers through customer portraits to improve the success rate of credit screening and identification.

Currently, the acquisition of credit-intending customers with financing needs mainly relies on account managers to connect with customers offline. They rely on manual identification and subjective experience judgment, which requires high demand insight capabilities of account managers, which will result in some intended customers not being effectively discovered and brought. Incoming customers are lost. Customer portraits can be obtained through the integration of internal and external information, such as basic company information, shareholder background information, etc., and can be displayed and pushed through the mobile PAD terminal to assist account managers to understand the customer's basic situation and needs in advance. They can familiarize themselves with the customer and prepare in advance

before visiting the customer, allowing the account manager to be more familiar with the customer's profile. Quickly and accurately identify intended customers, greatly increasing the success rate of marketing. At the same time, the interview content, contact information and other information that customers need during the visit can be registered online to further enrich customer portraits.

(5) Increase online application channels and improve business acceptance efficiency. The distribution of the target customer list to the account manager to meet customer needs is currently done offline. This will cause the account manager to be busy with work and neglect to provide services to customers with financing needs who proactively come to their door. Therefore, on the basis of the original offline channels, more enterprises submit a loan application through the online banking or mobile banking terminal's science and technology enterprise loan application portal. The application will be assigned to the corresponding branch and account manager based on the localized proximity principle. The customer's project approval will be automatically obtained and directly entered into the pre-loan investigation link.

2) Pre-loan investigation stage

(1) Optimize pre-loan investigation methods to better suit the characteristics of scientific and technological innovation enterprises.

Science and technology innovation enterprises have characteristics that are different from traditional industries. They focus on research and development, are easy to produce high value-added products, have a high proportion of scientific researchers, and have high industry barriers. They have long R&D cycles and large investments. The products are small in scale before they are put on the market. Once

the research and development is successful. It will quickly occupy the market and its scale will grow exponentially. Currently, ZY Bank account managers still refer to the traditional industry due diligence content when conducting data collection, analysis and on-site investigation of science and technology innovation customers. When checking the financial indicators of science and technology innovation enterprises, the profit is negative or the revenue scale is small, etc., which does not meet the traditional loan standards. When there is a situation, there is a misjudgment that the customer will not be easily approved, which can easily lead to missing high-quality customers. [3] When conducting pre-loan investigations, account managers should adopt a pre-loan investigation method that is different from the traditional «cash flow» approach and focus more on the industry prospects, technical strength, founders and teams, R&D investment, intellectual property rights, achievement transformation, and policies of the company.

The investigation of «technology flow» content such as subsidies not only focuses on the current scale and financial indicators of the company, but more importantly, looks at the company's technological content and growth from a future perspective.

(2) Standardized and templated credit investigation reports to improve the efficiency of pre-loan investigations.

After communicating with account managers and risk managers, the feedback showed that the current investigation report template is not uniform, and the content is complicated and comprehensive, but the real key points are not highlighted, resulting in a heavy workload for account managers to write and perfunctory

situations, affects the quality of investigation reports, and also increases the difficulty of review by risk managers and reduces review efficiency. Therefore, it is urgent to establish a set of pre-loan investigation report templates exclusive to science and technology innovation enterprises, compress unnecessary investigation content, or automatically fill it in through technical means, without the need for account managers to fill it in manually, and focus on the due diligence content of the «technical flow» of technological innovation, so that it can not only reduce the manual workload and writing time of the account manager, but also more accurately and clearly present the key content that the risk manager wants to know, further improving the efficiency of pre-loan investigation and review.

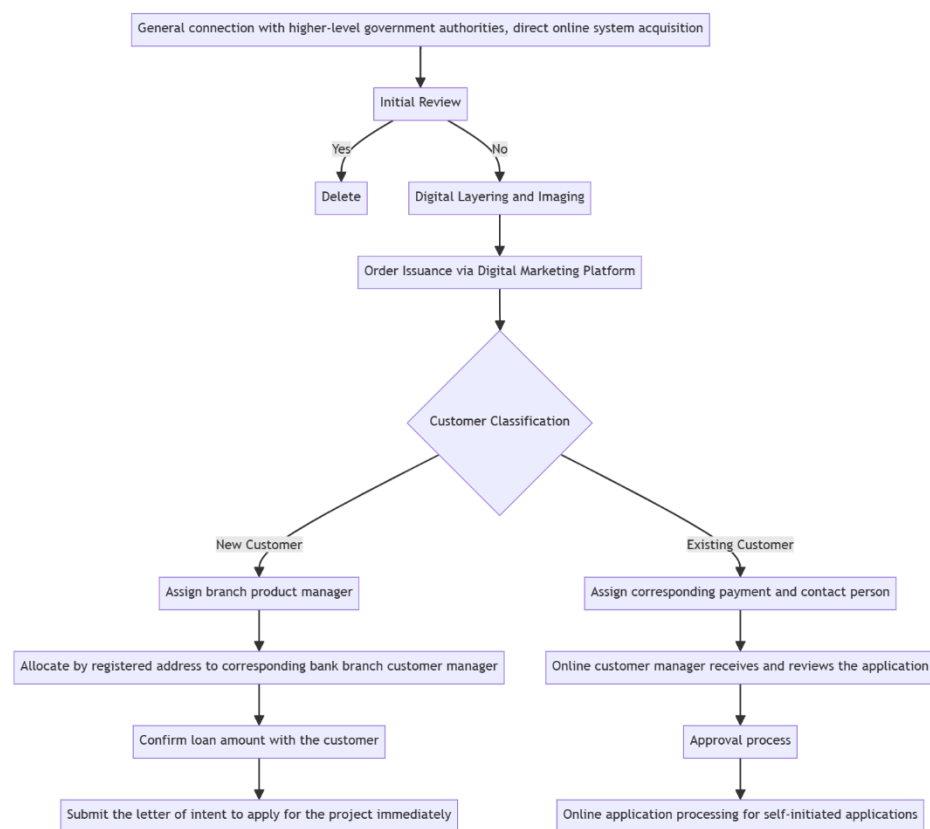


Figure 3.2 – The main process of the optimized pre-loan investigation stage

Source: completed by the author

3) Loan approval and loan disbursement stages

(1) Implement «special authorization + full-time approval + special product business exclusive process» to shorten the approval chain. Combined with the problems discovered in the previous investigation, the approval process was optimized and «special authorization + full-time approval» was implemented. The approval personnel of the Credit Management Department were embedded or dispatched to the Science and Technology Dual Carbon Financial Service Center of the business management department of the head office to conduct centralized approval, and grant a certain amount of special authorization authority, and assign or embed approval personnel to implement dual-line management. [36] At the same time, in principle, credit approval adopts a step-by-step review and approval system.

However, for standardized products with relatively controllable risks, such as technology loans, specialization and special new loans, or high-quality customers such as specialization, specialization and new enterprise business, a «one-level review and one-level review» is adopted. «Approval» or «first-level review and second-level approval» exclusive review and approval process to shorten the review and approval chain. «First-level review and first-level approval» refers to business that has been reviewed and approved by the operating organization/product department and is directly submitted to the head office for approval by the authority/person with the authority to review and approve. «First-level review and second-level approval» means that after the first-level branch completes the credit approval process, the risk manager of the head office will no longer review the

project, and the risk manager of the first-level branch will directly submit it to the head office's authorized approval agency/person for approval.

(2) Build an intelligent risk control model that adapts to the characteristics of scientific and technological innovation enterprises to improve risk management and control efficiency.

In view of the characteristics of «four highs and one lightness» of scientific and technological enterprises that are difficult to assess in value, ZY Bank based on the traditional risk control system. On the basis of this, we use big data, artificial intelligence and other technologies to integrate data and information, and explore the creation of a comprehensive intelligent risk control model for science and technology finance that is more suitable for the characteristics of science and technology innovation enterprises, covering credit evaluation, risk assessment and review and approval models, and make timely iterative revisions to the model based on market and industry changes to comprehensively improve the risk control management efficiency of science and technology innovation financial business. [37]

The construction of an exclusive intelligent risk control model mainly uses financial technology means to integrate information, increase the consideration of factors such as the industry development situation, R&D team, technical level, patent status, research results and future development prospects of scientific and technological innovation enterprises, and pay attention to the enterprise. The ability to transform new growth and high-tech achievements, without over-reliance on the «three tables» and asset pledges, more comprehensively and accurately reflects the development prospects and potential value of scientific and technological innovation

enterprises, through their R&D investment, research results, market performance, government and the level of capital market support, etc. [51] To reasonably determine the credit limit for science and technology innovation enterprises, greatly improve the availability of credit for science and technology innovation enterprises, effectively solve the problem of inconsistent standards caused by offline manual approval, and gradually break the recognition of science and technology innovation enterprises. The glass door of knowledge explores and solves the problem of «cannot understand and dare not lend» to science and technology innovation enterprises.

Exclusive intelligent risk control model construction can be introduced into the Science and Technology Enterprise Innovation Points System Service Plan of the Torch Center of the Ministry of Science and Technology. The innovation point system refers to opening up and integrating government data resources to improve innovation for enterprises with outstanding innovation capabilities such as high-tech enterprises and technology-based small and medium-sized enterprises. The capability evaluation system also assigns innovation points, and relies on enterprise innovation points to proactively identify and screen high-quality enterprises and provide high-quality financial services. [54] The «Enterprise Innovation Points System Work Guidelines (1.0)» researched and formulated by the Torch Center of the Ministry of Science and Technology aims to promote the aggregation of innovation elements into enterprises through the «Enterprise Innovation Points System» and help «hard technology» and «good seedling» enterprises stand out and achieve high-quality development. It provides strong support for self-reliance and self-reliance through horizontal science and technology, promoting stable economic

growth and high-quality development. The innovation points evaluation index is oriented to highlight the evaluation of enterprise innovation capabilities and focus on the investigation of enterprise growth and operation capabilities. The core indicators mainly include technological innovation indicators, growth operation indicators and auxiliary indicators.

The Torch Center of the Ministry of Science and Technology conducted in-depth research and analysis on 30 major domestic and foreign innovation capability evaluation reports such as the Global Innovation Index and the EU Industrial R&D Investment Scoreboard. Based on full reference to international and domestic innovation evaluation practices, combined with the two-year national Based on the pilot experience of the High-tech Zone, the core indicators of the «Enterprise Innovation Points System» were studied and formulated from the aspects of value discovery, accessibility, comparability, quantification and interpretability of indicators to achieve quantitative evaluation of enterprise innovation capabilities. Especially in the evaluation of key core technological innovation capabilities. [62] The core indicators follow the principles of coordination between systematicity and independence, balance between total indicators and relative indicators, and combination of guidance and scalability. They cover a total of 3 types of first-level indicators and 18 second-level indicators:

- The first category is technological innovation indicators (specifically including the amount of R&D expenses, the growth rate of R&D expenses, the proportion of R&D expenses in operating income, the proportion of scientific and technological personnel in the total number of employees, the number of invention

patent applications related to the main business, and the number of invention patent applications related to the main business).

– The second category is growth management indicators (specifically including high-tech product income, operating income, operating income growth rate, proportion of graduate students or above, R&D expenses plus.

– The third category includes 6 indicators including income tax deduction and exemption, profit rate on net assets, etc.). [49]

In the setting of indicator weights, we have focused on the evaluation of enterprise innovation capabilities and the examination of enterprise growth and management capabilities, and comprehensively adopted a «level-by-level equal weight» empowerment method. After careful analysis and reference, more than 730 effective «core indicators» Based on the results of the «Relative Importance Questionnaire» and the consultation opinions of industry experts, the reference weight assignments of 3 types of first-level indicators and 18 second-level indicators were initially determined. On this basis, the integrated enterprise indicator data was calculated based on the entropy value method. Comprehensive calculation and analysis results are based on the fields of electronic information technology, biological and new medical technology, aerospace technology, new materials technology, high-tech service industry, new energy and energy-saving technology, resources and environmental technology, advanced manufacturing.

(3) Paperless signing of electronic contracts improves the efficiency of the loan process and customer experience.

Currently, after the ZY Bank loan is approved, the account manager must

prepare complete loan information offline and submit it to the loan center for manual compliance legal review, including but not limited to paper loan contracts, guarantee contracts, shareholder meeting resolutions, trade background contracts and other essentials , and all contract documents need to be filled out manually by the account manager in duplicate, which greatly reduces the efficiency of the loan process and may lead to business interruption in the face of force majeure factors such as the epidemic.

In order to effectively improve the current situation of repeatedly filling in contract text manually and traveling to and from customer sites for underwriting, ZY Bank can consider using electronic contracts to replace paper contracts. The standard content and fixed terms that appear in the contract will be automatically generated by the system, and other personalization needs to be done manually. Filled-in fields, such as borrower name, amount, interest rate, adjustment method, entrusted payment method, repayment account number can be entered online through the system. [65] After the two are combined, a complete version of the contract can be generated online and then pushed to the client company. The contract is signed online through online channels such as online banking, and the lending center conducts an online review. After the review is passed, an electronic seal with encryption and anti-counterfeiting technology is stamped, and the contract becomes effective. This model can save the account manager from queuing and waiting offline. It saves time and energy in filling out paper contracts and prevents multiple round-trips from filling in mistakes, which is wasted time. On the other hand, it can also effectively prevent operational risks caused by signing contracts offline, improve loan efficiency,

and optimize customer experience.

3) Post-loan management stage

(1) Hierarchical and precise post-loan early warning effectively improves post-loan management efficiency.

Post-loan inspections are of great significance to the quality control of credit assets, and can effectively avoid risk problems caused by information asymmetry between banks and enterprises. ZY Bank currently has a phenomenon of «focusing on lending but not on management». Account managers pay more attention to whether the loan can be approved, but not enough attention was paid to changes in the customer's operating conditions after the loan was granted, and post-loan inspections were merely a formality. [57] Routine post-loan inspections are carried out on-site or off-site on customers after loan disbursement. Depending on the credit asset risk classification and customer business type, the frequency of inspections ranges from one month to half a year. The model is relatively extensive and can be further optimized. The post-loan management model allows to choose door-to-door or off-site loan post-loan according to the credit grade to carry out precise post-loan management and improve the accuracy of post-loan management.

(2) Use financial technology to add irregular re-checking functions.

On the basis of the original post-loan early warning that focuses on explicit credit risk indicators such as financial indicators, public opinion risks, and litigation, based on the characteristics of scientific and technological innovation enterprises, different aspects such as technological development, changes in industry status, growth, and changes in financing capabilities are added. Regularly recheck and use

financial technology means to recheck the assessment and risk status of science and technology innovation enterprises to avoid or reduce possible market risks, valuation risks, etc., and improve the risk control management efficiency of science and technology innovation financial business.

Conclusions to Section 3

The design basis for the optimization and design of ZY Bank's technological innovation financial business process is based on the following points. At the marketing acceptance stage - the target customer list is obtained and distributed online to ensure the timeliness of the list distribution; increase blacklist filtering and screening to reduce absolute reliance on the quality of government-certified lists; unify standards for stratification to improve the identification of high-quality customers and the quality of admitted customers; recommend potential customers through customer portraits to improve the success rate of credit screening and identification; increase online application channels and improve business acceptance efficiency.

At the pre-loan investigation stage it is recommended to optimize pre-loan investigation methods to better suit the characteristics of scientific and technological innovation enterprises; standardize and template credit investigation reports to improve the efficiency of pre-loan investigations. At the loan approval and loan

disbursement stages it is suggested to implement «special authorization + full-time approval + special product business exclusive process» to shorten the approval chain; to build an intelligent risk control model that adapts to the characteristics of scientific and technological innovation enterprises to improve risk management and control efficiency; introduce paperless signing of electronic contracts. At the post-loan management stage it is recommended to introduce hierarchical and precise post-loan early warning effectively improves post-loan management efficiency, also using financial technology to add irregular re-checking functions.

CONCLUSIONS

Through research on the development of domestic science and technology innovation financial business, through the study and application of bank process optimization theory, there was deeply explored the problems existing in ZY Bank's science and technology innovation financial business process, and combined with the development status of ZY Bank's science and technology innovation financial business. In this way, relevant characteristics were found, and based on this integration and optimization, we found out the problems existing in science and technology innovation enterprises, and proposed a specific science and technology innovation finance business process optimization plan for ZY Bank, with the purpose of improving ZY Bank's science and technology innovation finance. To improve business processing efficiency, identify high-quality potential customers, score and classify customers, bring a higher-quality differentiated service experience, and make up for the omissions in the current business process.

Based on the analysis and research of ZY Bank's technological innovation financial business process, the conclusions are as follows.

With the guidance of national macro policies, science and technology innovation enterprises have gradually developed into a new force in the national economy, playing an important role in activating the market, promoting growth, expanding employment and reform and innovation. Science and technology innovation finance has become an emerging business in business. Development in

banks, the development focus of commercial banks is gradually tilted towards scientific and technological innovation enterprises. Identifying and serving high-quality scientific and technological innovation enterprises will help commercial banks improve their own competitiveness and business transformation.

Through the analysis of ZY Bank's existing processes, combined with the attributes of science and technology innovation enterprises, it was found that the credit business process of traditional commercial banks can no longer meet the differentiated needs of science and technology innovation enterprises. The main problems are as follows: professional capabilities and customer service capabilities need to be improved. The professional level and leadership ability of account managers need to be further strengthened. The branch's service methods for high-quality head customers and major projects are single, unclear division of labor, lengthy approval process, low degree of paperless business process, and heavy post-loan batch tasks. Correcting these inherent problems will help improve customer experience, improve bank management efficiency, and achieve a win-win situation for banks and customers.

In terms of ensuring the smooth implementation of the optimization plan, mainly starting from the six aspects of product, organizational structure, human resources, institutional mechanism, ecosystem, and digitalization, briefly explain what supporting safeguard measures need to be put in place during the implementation of the plan, so as to seek smooth process optimization and upgrade.

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