Journal of Combinatorial Mathematics
and Combinatorial Computing
www.combinatorialpress.com/jcmcc

Research on the Optimization Model of Digital Transformation Path for Financial Cloud-Driven Enterprises Based on Dynamic Planning

Chengcheng Zhu[1,✉]

[1] *Accounting College, Zhengzhou Vocational College of Finance and Taxation, Zhengzhou, Henan, 450000, China*

ABSTRACT

In the face of the requirements of the financial management system, enterprises need to accelerate the digital transformation of finance and realize the "data-driven" management decision-making operation mechanism. The article constructs a new quality productivity-based finance-driven enterprise digital transformation path, and makes it clear that enterprises need to play a new type of labor objects, labor materials and laborers to achieve digital transformation. Based on this transformation framework, a system dynamics approach is used to construct an enterprise financial dynamic planning system, which consists of five parts: a financial analysis subsystem, a target gap adjustment subsystem, an income statement subsystem, a balance sheet subsystem, and a production and operation subsystem, and analyzes the driving factors that affect value growth. The feasibility of the model is determined through the methods of structure test and sensitivity test on the dynamic financial planning model. Taking Group A as a case study object, the financial data for the five-year period from 2019-2023 are analyzed, and the operation of the enterprise is reflected through the financial indicators of each system, which proves the validity of the model and promotes the realization of the digital transformation of the enterprise, which contributes to the management of enterprise value.

Keywords: dynamic planning; system dynamics, enterprise digitalization; new quality productivity

1. Introduction

Since the 21st century, with the accelerated application of a new generation of information technology represented by artificial intelligence, digital information, mobile communications, the Internet of Things and blockchain, the new round of scientific and technological revolution and industrial change has developed in-depth, and it has become a general trend to cultivate new kinetic energy and upgrade the industrial model and enterprise form with the leverage of informatization and intellectualization

✉ Corresponding author.
E-mail address: Zcc0720050044@126.com (C. Zhu).
Received 15 January 2024; Revised 25 March 2024; Accepted 30 December 2024; Published Online 15 April 2025.
DOI: 10.61091/jcmcc127a-455

[1-2]. Especially with the new Crown pneumonia epidemic, the digital economy plays an irreplaceable and positive role, becoming a new engine to promote economic and social development, industrial digitalization, digital industrialization has become an important driving element of the fourth industrial revolution [3-6].

In such a situation, the construction of the financial cloud industry and finance collaboration system to promote the digital transformation of enterprises is of great significance to the company [7]. In the basic model of financial shared services, aims to reduce costs and increase efficiency for business processing by creating standardized and regulated processes [8]. Financial cloud, a cloud-based financial sharing model, integrates advanced technologies such as artificial intelligence, big data, mobile Internet, cloud computing, and Internet of Things to enable users to obtain the required financial services anytime, anywhere, and through any device, and to promote the transformation of the enterprise to the digital era [9-11]. And the financial cloud analyzes the massive data inside and outside the enterprise, and with the assistance of models and algorithms, transforms the resulting data into the required information, and analyzes, processes, and handles all kinds of information for the service of enterprise operation [12-14]. Financial reporting will go beyond the traditional accounting and supervisory functions and step into the field of big data technology to provide enterprises with refined data services in an intuitive and visual way. Financial cloud comprehensively supports financial, strategic financial and operational units in making business decisions, giving powerful energy to enterprise informatization and giving full play to the value of data [15-17].

First, it is an important initiative to practice the strategy of digital China. The research reports of relevant departments have proposed the construction of digital China and have made important discussions on the development of the digital economy many times [18-19]. Chinese enterprises should follow the deployment of national decisions and major national strategies, firmly promote the digital transformation of the industry, and it is incumbent upon them to promote the digital transformation of enterprises with the construction of the financial cloud industry and financial collaboration. Secondly, it is an important initiative to adapt to the direction of industry development. As China's economic development has entered a new normal, the industries have also entered a new period of transformation and development [20-22]. The all-round penetration of the new generation of information technology is profoundly affecting the industry's original mode of production, organization, business model, value chain distribution and competition pattern [23]. Although the company has achieved certain results in digital application, most of the production and operation processes are still traditional, and there is still a lot of room for upgrading and transformation, which is urgently needed to improve the competitiveness of enterprises. Through the construction of financial cloud industry and finance synergy, to improve the level of enterprise development and development of quality and efficiency, upgrade the supply chain and value chain of the enterprise, to adapt to the trend of digital transformation of the industry, but also the company's inherent needs [24-25]. Finally, digital transformation is an important initiative to upgrade the enterprise management system. At present, there are still a lot of management problems in the management of projects in various industries, and there are places where “leakage” occurs, and the financial and business interface is not close, and the production and fulfillment of the project, procurement and sales, accounting and other aspects of the system, which can not form an effective synergy. The company through the financial cloud industry and financial collaboration construction, sorting out the current management system and management processes, adaptive organizational change, data governance system and process change, consolidate the process, standards, systems, “three major foundations”, enhance the standardization of management, standardization, refinement, to create efficient and high-quality enterprise management system [26-27].

Literature [28] explores cloud computing, financial shared services and other theories and technologies in the state-owned enterprise financial management application practice, including the construction of financial sharing principles and processes, process reengineering, accounts payable

process reengineering, etc., which provides an important reference for the optimization of enterprise financial management. Literature [29] discusses the financial sharing mode construction of small and medium-sized enterprises based on SaaS outsourcing services, analyzes the necessity of shared finance from the perspective of the information age background and enterprise financial difficulties, as well as the feasibility of shared finance technology and realization path, etc., and at the same time, also analyzes the problems and obstacles existing in the construction of small and medium-sized enterprises' financial sharing mode and puts forward constructive suggestions. Literature [30] compared the advantages and disadvantages of the traditional financial management model and financial sharing model, and combined with actual cases, pointed out that with the development and expansion of the enterprise scale, management costs, process complexity and redundancy and other problems occur frequently, so for the above financial problems based on the financial sharing of the solution to the proposal. Based on the actual situation of enterprises and the background of the informationization era, the above studies affirm the shared financial model based on cloud computing, and conduct in-depth studies from the perspectives of the establishment of the principle of financial sharing, the implementation path, and the advantages of shared finance.

The development of the financial sharing model based on cloud computing technology has to a certain extent also promoted the digital transformation of enterprises. Research on enterprise digital transformation is mainly divided into, enterprise digital transformation path, effect and factors affecting enterprise digital transformation, in which some scholars are concerned about the impact of the digital economy on enterprise digital transformation. Literature [31] analyzes the impact of the digital economy on enterprise innovation based on the resource dependence theory, pointing out that the development of the digital economy promotes the enterprise's digital transformation, and the enterprise's digital transformation is conducive to the enterprise's technological innovation. And some scholars focus on the benefits of enterprise digital transformation for enterprise production and operation. Literature [32] systematically reviewed the research related to enterprise digital transformation, pointing out that digital technology-enabled enterprises help to improve production efficiency, reduce production costs, and contribute to the improvement of social and corporate economic benefits, and put forward some suggestions for enterprise digital transformation. Contributions [33] analyzed the data text of a-share listed companies in Shanghai and Shenzhen, assessed the degree of enterprise digital transformation, and in-depth research on how enterprise digital transformation affects carbon emission intensity, and found that enterprise digital transformation promotes carbon emission reduction by enhancing the level of enterprise technological innovation, the ability of internal control, and the ability of environmental information disclosure. Finally, some scholars have also analyzed the impact of enterprise financing mode and equity structure on enterprise digital transformation. Literature [34] based on the panel data of 930 Chinese a-share listed companies, conducted a study on enterprise digital transformation and heterogeneity, and found that enterprise digital transformation has a positive effect on enterprise efficiency improvement and technological innovation, while equity concentration and financing constraints significantly affect the impact of enterprise digital transformation on enterprise technological innovation.

The study proposes a finance-driven enterprise digital transformation path in the context of new quality productivity, establishes an enterprise financial dynamic planning system with the help of the system dynamics method, which consists of five parts: the financial analysis subsystem, the target gap adjustment subsystem, the income statement subsystem, the balance sheet subsystem, and the production and operation subsystem, and conducts a sensitivity test of the model. Taking Group A as a case study object, the financial dynamic planning model is applied to the company. By analyzing the financial data of Enterprise A over the past five years, estimating and organizing the parameters that need to be used in the model, proposing a simulation scheme for the planning parameters, analyzing the simulation results by applying the model simulation, and finally giving the optimal combination of

strategies through the analysis of the environment in which the enterprise is located as well as the industry's prospects for development and other issues.

2. Digital transformation of corporate finance based on system dynamics

2.1. Analytical framework for data-driven digital transformation of corporate finance

2.1.1. A data-driven analytical framework for new quality productivity. This paper constructs the path of finance-driven enterprise digital transformation in the context of new quality productivity development, as shown in Figure 1. Among them, data elements, as a new factor of production, are the premise of the data-driven model. From the identification of factor resources to the real realization of data-driven and the promotion of financial digital transformation, data elements also need to be used as "labor objects", together with "labor materials (relevant technologies for processing data elements)" and "workers (financial digital talents and digital employees)" to form the core elements of new quality productivity, and realize data-driven financial digital transformation through the improvement of the efficiency of various factor combinations. At the same time, the governance risks brought by the characteristics of data elements cannot be ignored, and the issue of data security should be emphasized. Based on this framework, this paper will analyze the problems of enterprise finance digital transformation and put forward corresponding countermeasures.

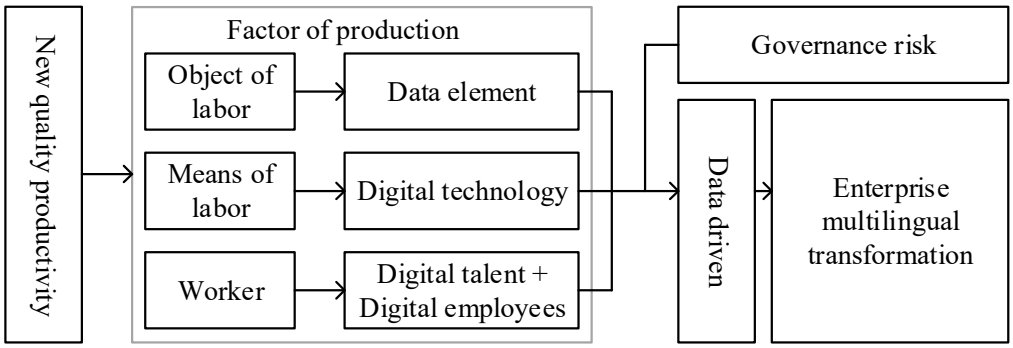

Fig. 1. The financial drive enterprise number word transformation path

2.1.2. Data-driven digital transformation path for corporate finance:

1) Labor object: establish a cross-sectoral data sharing mechanism. Establish a data governance mechanism with clear authority and responsibility, clearly formulate data requirements, data specifications, quality requirements, etc., by the business sector, and determine the database architecture, metadata architecture, and other technical aspects by the IT department; at the same time, build a standardized data entry and maintenance process, especially sorting out and optimizing cross-departmental data collection, flow and analysis processes, and conduct regular data cleaning and maintenance to ensure that the data is consistent and complete, accurate.

2) Labor data: carry out data technology upgrading in an all-round way. Technology is not only an independent production factor, but also a composite factor that has a catalytic effect on the combination of other factors, and technological progress will lead to the re-combination of data, labor, land, capital, etc. and produce the effect of "1+1>2". Enterprises should strengthen the use of emerging data technologies, including cloud computing, data lakes, big data analysis, big modeling applications, etc., so as to enhance enterprise data processing and value mining capabilities.

3) Workers: Enhance the ability of digital human-machine collaboration. Data-driven digital transformation of enterprise finance, the relevant financial digital talents should include three levels,

respectively, grassroots application-oriented talents, financial talents who understand digital technology, and technical talents who understand finance, for which the enterprise should take corresponding measures in the cultivation mechanism, cultural construction, and process reengineering, etc., to enhance the ability of digital human-computer synergy. Digital employees can effectively deal with a large number of repetitive, complex data computing and transaction processing tasks, significantly improve work efficiency; at the same time to replace or assist manual customer service, real-time response to user inquiries, provide personalized service, improve customer experience. Digital employees not only supplement and enhance the capabilities of traditional workers, but also change the composition of productivity to a large extent, forming a "human-machine collaboration" work mode.

4) Managing Risk: Building a Sound Data Security System. The adoption of emerging data technologies means that enterprises need a higher level of information security and privacy protection. For this reason, the establishment of a sound data security system is the key to guaranteeing data security and privacy protection, the use of encryption technology, access control and other means can effectively prevent unauthorized access, protect sensitive information, and ensure the security of corporate and personal data.

2.2. System Dynamics (SD) Modeling Basis

2.2.1. System dynamics and its basic characteristics. System dynamics is based on feedback control theory as the core, computer simulation technology as a means, the use of traditional mathematical methods of the analytical formula to reflect the quantitative relationship between the factors and variables, through numerical simulation and analytical control to understand the dynamic behavior of the system over time and the structure and function of the characteristics of the system [35]. System dynamics is based on system theory, combined with cybernetics, decision theory, information theory, computer simulation, and so on, and put forward the theory of "dynamic and complex problems" suitable for social and economic fields. As a method of recognizing and solving dynamic complex problems through structure-function analysis and information feedback, it has the main features of applicability, comprehensiveness, standardization and delay.

2.2.2. Application of system dynamics. System dynamics is based on qualitative analysis, the use of quantitative analysis as a support, and gradually optimize the problem-solving strategy, and its applied research can be divided into five phases: system identification, research and analysis, model creation, simulation experiments and testing and evaluation.

2.2.3. System dynamics modeling. The system dynamics model (SD for short) contains three components such as causality diagram, flow diagram and series equation, etc. The causality diagram is the foundation of the SD model, the flow diagram is the core of the SD model, and the series equation is the key to the realization of simulation experiments based on the system thinking [36]. The basic unit of the system dynamics model is the information feedback loop, which consists of "flow" and "elements" (divided into flow level variables, flow rate variables and auxiliary variables). The effect of the constant turnover of the same feedback loop over time is the accumulation of flow levels, and the correlation between the different feedback loops reflects the influence of the flow level variables on each other. The flow level is accumulated at a certain flow rate, i.e., the flow level is controlled by the flow rate, and the flow rate variable is the control variable [37]. The flow rate is influenced by the set of flow level variables and related auxiliary variables, which is the result of the synthesis of the decision-making mechanism, with information composite, and can be divided into the source flow rate and leakage flow rate. So the decision control mechanism of SD model is shown in Fig. 2, namely:

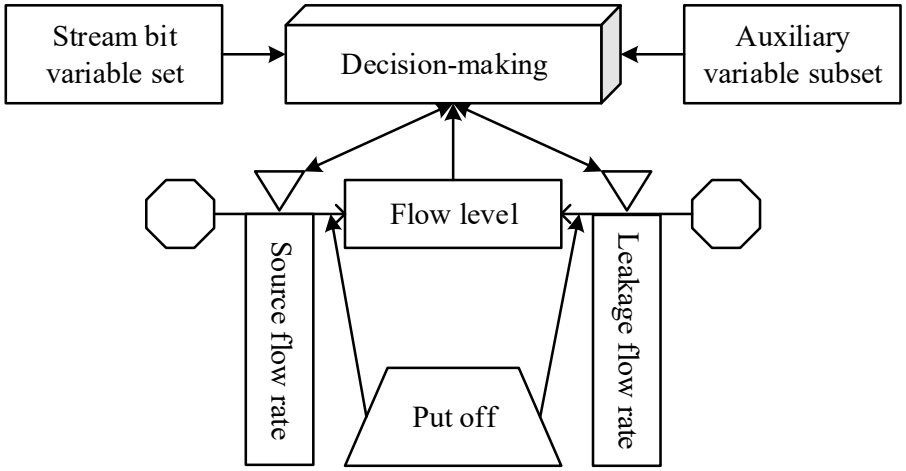

Fig. 2. The system structure of the control mechanism of the sd model

$$L(t) = L(t-\Delta t) + \Delta L(t-\Delta t) \tag{1}$$

Where: L is the stream level variable, t is the time, Δt is the time increment and $\Delta t > 0$; $L(t)$ is the value of the stream level at moment t, $L(t-\Delta t)$ is the value of the stream level at moment $(t-\Delta t)$, and $\Delta L(t-\Delta t)$ is the increment of $L(t)$ from $(t-\Delta t)$ to t.

In order to clearly represent the cumulative effect of flow level, the system dynamics then expresses equation (1) as:

$$L(t) = L(t-\Delta t) + \Delta t \times R(t) \tag{2}$$

$$L(t) = L(t-\Delta t) + \Delta t \times (R_{In}(t) - R_{Out}(t)) \tag{3}$$

$$\frac{dL(t)}{dt} = R(t) \tag{4}$$

Where: R is the flow rate variable, $R(t)$ is the merging rate at moment t, $R_{In}(t)$ is the inflow rate at flow level $L(t)$, and $R_{out}(t)$ is the outflow rate at flow level $L(t)$.

2.3. System Dynamics Model for Enterprise Financial Dynamics Planning

2.3.1. General description of the system. The financial planning system established in this paper consists of five subsystems: financial analysis, target gap adjustment, income statement, balance sheet and production and operation subsystem.

The five subsystems interact with each other to form an integrated whole. Figure 3 shows the general relationship between the subsystems.

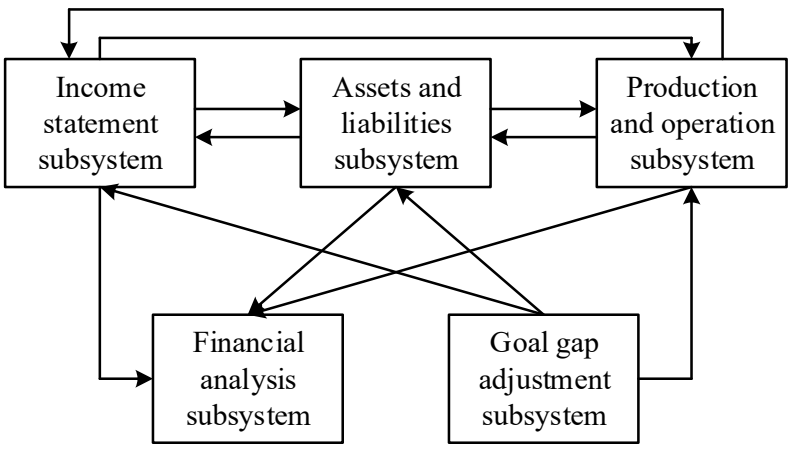

Fig. 3. Subsystem Relationship Overview

2.3.2. Financial analysis subsystem. Financial indicator analysis is the most common and effective method of company financial analysis, which can reflect the ability of the enterprise in debt repayment, profitability, operation, development and other aspects through the ratio between different financial statement subjects, and it is an important basis for evaluating the business results and financial status of the enterprise.

In this paper, the selected indicators are divided into five categories, and the finalized system of corporate financial and production indicators is shown in Table 1.

Table 1. Enterprise financial and production index system

Property	Metric	Computational method
Debt paying ability	Asset-liability ratio	Total liabilities / total assets
	Liability equity ratio	Total liabilities / owners' equity
	Fixed assets and product asset ratio	Fixed assets and product assets / total assets
Operation capacity	Fixed assets and product asset turnover ratio	Operating income / average fixed assets and product assets
	Owner's equity turnover ratio	Operating income / average owner's equity
	Turnover of total capital	Operating income / average total assets
Profitability	Net profit ratio	Net profit / operating income
	Total assets profit margin	Net profit / average total assets
	Return on equity	Net profit / average owners' equity
Growth ability	Increase rate of business revenue	(Current operating income-early business, business income) / early operating income
	Net profit growth rate	(Current net profit-pre-net profit) / previous net profit
	Growth rate of fixed assets and product assets	(Total fixed assets and product assets at the end of the period-the total amount of the beginning)
Productive power	Raw material equivalent yield	Mainly refers to the output of raw materials produced e
	Output of major refineries	The main value is the product processed from the raw material

2.3.3. Target gap adjustment subsystems. Financial and production indicators are often used to analyze the past financial status or operating results of an enterprise, this paper adopts the idea of goal management, starting from the setting of ideal indicator values, to adjust the ideal financial statements in line with the ideal indicators, so as to provide guidance for the planning and budgeting of the enterprise's production, operation and financial activities, and can also be used to compare with the current situation to better analyze the status of the enterprise.

For the gap between the actual financial indicators and the target financial indicators, the adjustment mechanism designed in this paper is shown in Table 2.

Table 2. The target gap adjustment mechanism table

Nature	Index	Gap	Adjustment mechanism design
Solvency	Asset ratio	Overlow	Increase total liability
		Too high	Reduced total liabilities
	Liability ratio	Overlow	Increase total liability
		Too high	Reduced total liabilities

	Fixed assets and product asset ratios	Overlow	Reduced total assets
		Too high	Increase total assets
Operational capacity	Fixed assets and product asset turnover	Overlow	Increase revenue growth
		Too high	Lower revenue growth
	Owner's equity turnover	Overlow	Increase revenue growth
		Too high	Lower revenue growth
	Total asset turnover	Overlow	Increase revenue growth
		Too high	Lower revenue growth
Profitability	Net profit	Overlow	Increase gross margin, lower operating expenses and business External expenditure ratio
		Too high	Reduce gross interest rate, increase operating expenses and business External expenditure ratio
	Gross margin	Overlow	Increase gross margin, lower operating expenses and business External expenditure ratio
		Too high	Reduce gross interest rate, increase operating expenses and business External expenditure ratio
	Return on equity	Overlow	Increase gross margin, lower operating expenses and business External expenditure ratio
		Too high	Reduce gross interest rate, increase operating expenses and business External expenditure ratio
Growth ability	Revenue growth	Overlow	Computer simulations, or financial constraints
		Too high	
	Net profit growth rate	Overlow	Computer simulations, or financial constraints
		Too high	
	Fixed assets and product asset growth rate	Overlow	Computer simulations, or financial constraints
		Too high	
Productive capacity	Raw material equivalent yield	Overlow	Increase fixed assets and product assets
		Too high	Reduce fixed assets and product assets
	Main refining production	Overlow	Increase fixed assets and product assets
		Too high	Reduce fixed assets and product assets

2.3.4. Balance sheet and production and operation subsystems. As can be seen from the indicators chosen by the model, the balance sheet items involved are total assets, total liabilities, owner's equity, fixed assets, and oil and gas assets. The reason for the simplification of the statement is that, on the one hand, it is because of the complexity of the model, and on the other hand, it is because, for the company, fixed assets and product assets are the most important, in addition to the three core data of total assets, total liabilities and total owner's equity. Balance sheet subjects, grasp these two subjects, financial and production have a certain guarantee.

2.3.5. Income statement subsystem. In this paper, because of the modeling needs, some sub-accounts of the income statement subsystem are merged to simplify the whole report. The simplified income statement is shown in Table 3.

Table 3. Reduced profit statement

Project	Operating income - operating costs
	Gross margin - operating expenses
	Operating profit + open revenue (branch)
	Gross profit - income tax
	Net profit

2.4. Power flow diagrams for dynamic enterprise financial planning

2.4.1. Overall system causality. Based on the above subsystem causality diagram, the causality of the whole system is obtained. Among the more important ones are the following five:
1) Operating income and related elements → operating capacity → operating capacity target gap adjustment → operating income.
2) Income statement accounts such as total profit → profitability → profitability target gap adjustment → gross profit, operating expenses and non-operating income and expenses respectively as a percentage of operating income → relevant income statement accounts.
3) Balance sheet accounts → solvency → solvency target gap adjustment → relevant balance sheet accounts.
4) Assets → Ratio of fixed assets and oil and gas assets → Fixed assets and oil and gas assets target gap adjustment → Assets.
5) Fixed assets and productive assets → Products, production → Production adjustment → Fixed assets and productive assets.

2.4.2. Basic Design of Model Flow Diagrams. Simulating the dynamic financial and production operations of an enterprise is a key step in modeling the dynamics of a financial planning system. The system dynamics approach is a method to simulate the real system through the use of various tools, state variables, rate variables, operational variables and so on are its common tools.

In the model developed in this paper, each of the financial accounts listed above appears as a state variable, but for the period value (income statement accounts) and the point-in-time value (balance sheet accounts), the significance of each state variable is different: the period value at time T represents the cumulative value of the corresponding account from the initial moment to time T; by contrast, the point-in-time value at time T represents the state value of the corresponding account at time T moment; in contrast, the value of the time-point value at T moment represents the state value of the corresponding subject at T moment. Based on the state variables, the model flow diagram can be built by adding tools such as operation variables and rate variables, as shown in Fig. 4.

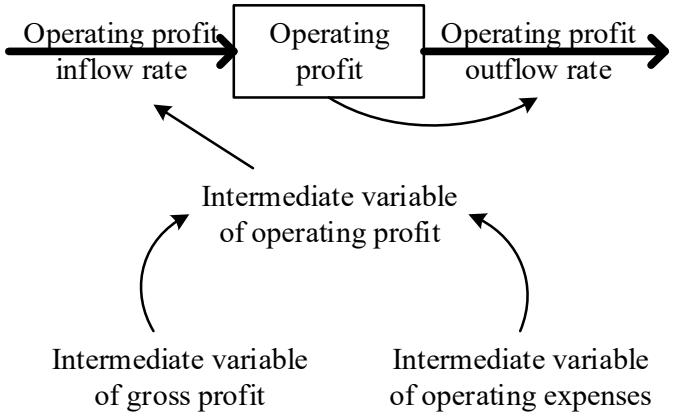

Fig. 4. Expression and use of elements

3. Testing and application of dynamic planning models for corporate finance

3.1. Tests of the financial dynamic planning model

3.1.1. Content and methodology of model testing. The test of the dynamic financial planning model should not focus on specific data and details, due to the insensitivity of the model to data, built to analyze and predict future trends in the growth of current flows and trends in value, and then to seek the optimal state of corporate strategic decision-making. Therefore the focus should be on testing the structure and behavior of the model.

Dynamic financial planning model test method generally speaking, there are two kinds of qualitative aspects of the test and quantitative aspects of the test, usually the analysis of the output results is the more important aspects of the model test, because for the model input assumptions are generally based on the model builder's self-selection of the relevant financial knowledge and understanding of the model, only through the test of the simulation results, you can make the appropriate adjustments to the input assumptions of the variables. Therefore, there are three aspects of quantitative tests to be performed in general, the test of structure and magnitude, the sensitivity test and the veracity test. These enough can be carried out through Vensim software.

3.1.2. Sensitivity testing of the model. Sensitivity testing of the model. Sensitivity has two components. One is the sensitivity of the structure; the other is the sensitivity of the variable parameters. In the model generally can be through the sensitivity test method to determine which are the main variables in the parameter variable two, which are irrelevant variables. This has a great effect on the analysis of simulation results and later parameter adjustment and combination. In the model of free cash flow, sales growth rate determines a number of variables, first of all, we change the initial formula of sales growth rate XSZZL = ACTIVE INITIAL (0 + STEP (0,4),0). The meaning of the formula is that the initial value of the sales growth rate is 0, and with the extension of time, the growth rate has not been increased always zero. Then the obtained sensitivity test plot of increase in sales revenue (XSZZL), net cash flow (XJJLL) and sales (XS) is shown in Figure 5. It can be seen that all the three parameter variables also do not have any increase in the case of zero value of growth rate and remain in the form of straight line.

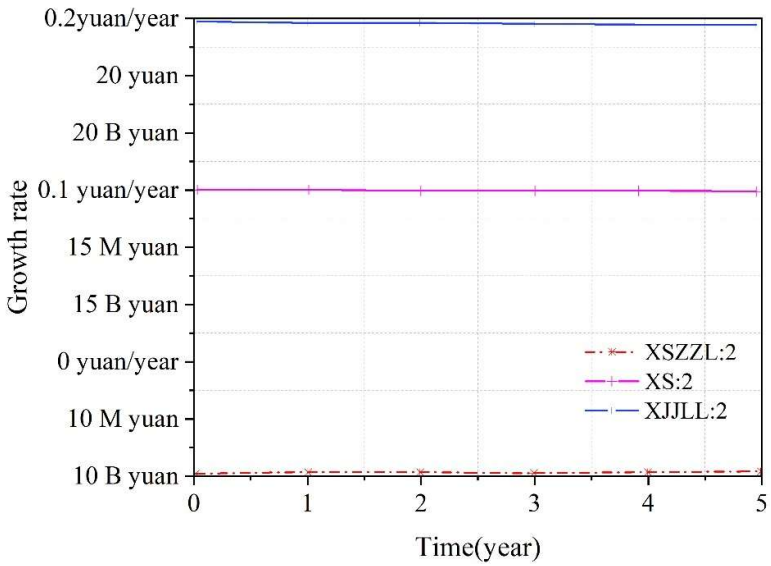

Fig. 5. Dynamic financial planning model sensitivity test

Then change the formula of sales growth rate, the initial value is set to 0.2, the second year increased by 0.1, then its formula becomes xszzl = ACTIVE INITIAL (0.2 + STEP (0.1, 2), 0.2), this time, the sales revenue increase, net cash flow and sales trend as shown in Figure 6, with the increase of time shows an upward trend, and each shows a different growth trends, so we can conclude that the sensitivity to the presence of sales growth rate in the simulation is high.

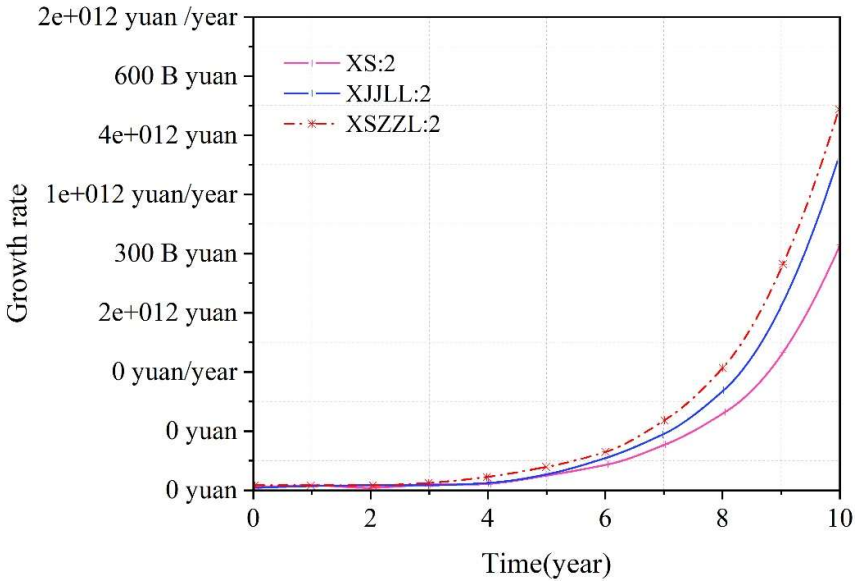

Fig. 6. Dynamic financial planning model sensitivity test

3.2. Dynamic Financial Planning System Base Model Case Effectiveness Analysis

The following part of this paper is based on a group of companies (hereinafter referred to as Group A companies) financial data and related information as the basic basis for case analysis.

3.2.1. Basic financial data. Group Company A is a group of companies whose main business is home appliance manufacturing company and the relevant financial data of this group of companies for the years 2019 to 2023 are shown in Table 4.

From the table, it can be seen that the cost of debt ratio is negative in 2023, for this reason, the four-year average of 3.54% from 2019 to 2023 is taken in the validation analysis below. The opening amounts of sales revenue and net cash flow are 47,257.5 million yuan and 465.43 million yuan, respectively. The cash realization ratio is 81.5% based on 2019 data.

Table 4. A financial analysis data of the Group companies

	2019	2020	2021	2022	2023	Average (Five years)
Sales revenue growth	138.45%	0.97%	1.21%	31.77%	8.22%	36.12%
Investment income ratio	0.181	-0.452	8.133	0.127	-0.067	1.58
Investment income rin.	6.22	-3.213	0.141	8.224	-17.122	115
Interest and tax sales (Main business) Profit margin	8.78%	6.41%	6.27%	5.55%	2.68%	5.94%
Profit cash implementation ratio	81.45%	-73.14%	-7.27%	7.16	-55.45%	132.318%
Rate of income tax	21.21%	18.52%	18.13%	18.57%	17.82%	18.85%
Dividends as a percentage of sales revenue	2.15%	2.11%	2.07%	0.31%	2.21%	1.7%
Interest-bearing debt ratio	27.22%	45.42%	44.78%	8.88%	0.51%	25.36%
Debt cost ratio	3.12%	2.25%	2.58%	6.22%	-29.54%	-3.07%

Data on the relevant financial ratios of another Group A company are shown in Table 5:

Table 5. A Simulated variable value of dynamic financial planning(wan yuan)

	2019	2020	2021	2022	2023	Five years average
Sales revenue	1117523.85	1147822.23	1157339.39	145733.29	1630653.48	1077788.37
Interest and tax profit	91236.41	59398.38	55377.35	60624.15	41654.16	61733.29
Increase the net flow of cash in the operation	54171.38	-34148.17	-2874.21	3112.62	-17984.97	568.46
Primary after-tax business profit	49677.55	45588.27	51755.79	33456.25	35641.32	44949.63
Revenue growth	632367.23	10233.65	12433.32	357411.68	112337.22	191060.15
Sales revenue growth	134.58%	0.87%	1.21%	28.65%	6.83%	34.27%

3.2.2. Environmental analysis and development of preliminary scenarios:

1) Analysis of the business environment: The main business of Group A belongs to home appliances, so the development of the home appliance industry has a decisive impact on its value creation and sustainable development. According to the analysis of the industry, the home appliance industry has entered a mature period, and has been affected by the law of diminishing scale effect, home appliance enterprises, unless there are new growth points, or else it is difficult to have high-speed growth, and thus assume that the home appliance enterprises are fixed growth.

2) Preliminary setting of variable values and financial policies. Now we take 5 years as the planning period, take the average profit margin of main business in 2019 and 2023 as the profit margin of main business in the planning, and the initial value of the company's sales revenue and net cash flow in the planning period is recognized according to the figure at the end of 2023. Other relevant parameters and decision variables needed are shown in Table 6. Sales growth rate (g), fixed asset investment income ratio (rf.), working capital investment growth rate (rw.), investment income effect (amount of sales revenue per dollar of investment) (rin.), corporate EBITDA (pro.), where liabilities are interest-bearing liabilities and have an interest rate on interest-bearing liabilities (rd.).

Table 6. A Simulated variable values for group dynamic financial planning

Elements	Data	Elements	Data
g	22%	cashpro.	75%
rf.+rw	14%	t	22%
Rin.	7.7%	interp	3%
pro.	7%	i/(e+i)	11%
rd.	2.5%		

3.2.3. Simulation and analysis of results. Substituting the data in the table into the dynamic financial planning simulation model yields what is shown in Figure 7. It can be seen that although the company's sales revenue (XXSR) is rising, reaching a maximum of 151244 yuan in year 5. The net cash flow (XJJLL) is also slightly increasing, but its free cash flow (ZYXJLL) is decreasing and remains negative, thus its value is decreasing. For this reason, it is necessary to adjust and reset the variables and perform a simulation analysis.

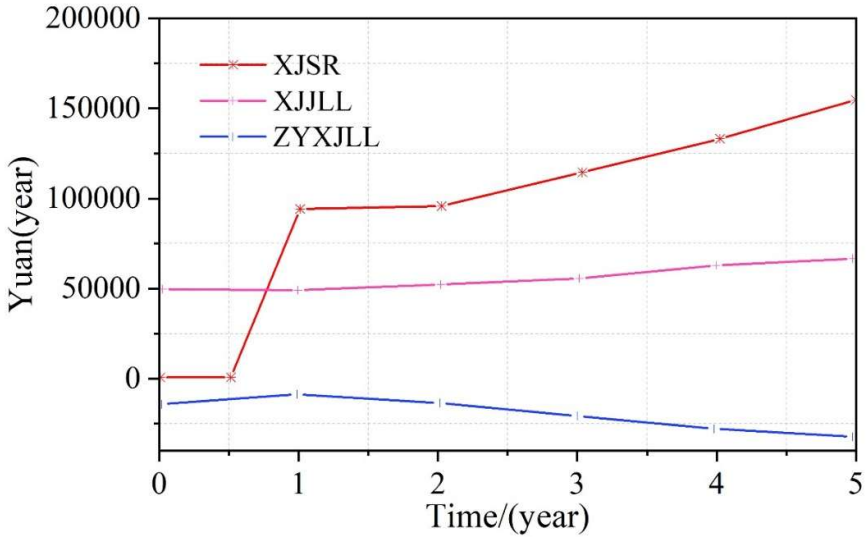

Fig. 7. Simulation and analysis diagram of the dynamic financial planning system model

3.2.4. Financial planning adjustments, re-simulation and planning outputs. The simulation analysis reveals that with the current level of profitability and management, it is difficult to achieve the goal of sustained value growth by relying solely on adjustments to financial policies. Therefore, Company A may create more value only if it slows down its growth rate and seeks to harmonize its growth with appropriate financial policies on the basis of improving its profitability and management level. It is now assumed that i/(I+e) in the model is changed to 45%, rd. to 15%, and the dividend payout rate is reduced to 2%, and substituting these data into the model, the trend remains unchanged, although the amount is greatly reduced. Considering the company's overall profitability and market development prospects, it is assumed that appropriate use of borrowing to solve the problem of development funds and reduce the proportion of equity financing; at the same time, according to the current cash flow and its main business profitability, it is not appropriate to pay too many dividends, assuming that the proportion of debt of the new funds is 42%, the level of dividend payout of 2% of the sales revenue, to increase EBITDA to 35%, and to cash flow realization rate adjusted to 96%. Entering the values of these variables into the model yields the results shown in Figure 8.

It can be seen that the growth of sales revenue fluctuates at the beginning and then grows exponentially, and the net cash flow from operating activities is initially higher than the growth of sales, and then lower than the sales revenue in the 2nd and 3rd years, but grows at a faster rate after the 4th year. It is encouraging to note that the incremental free cash flow is already positive at the end of year 1 and is on an upward trend - albeit a small one.

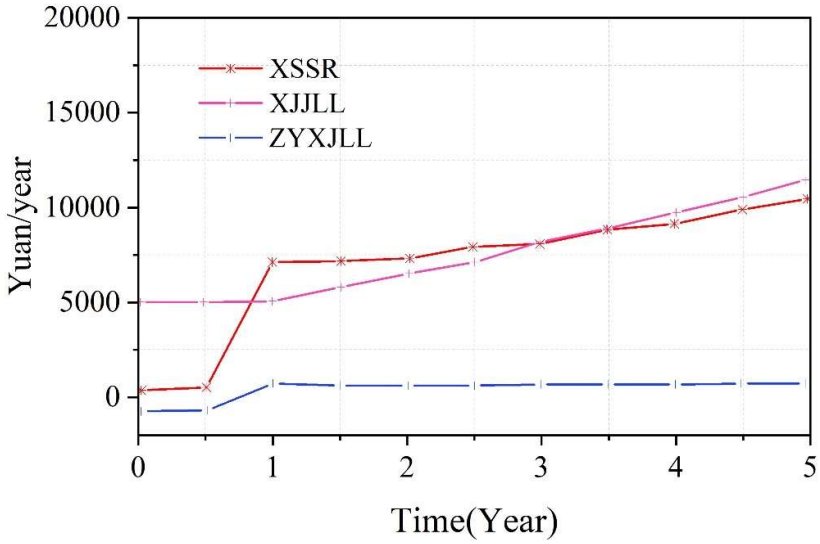

Fig. 8. Simulated behavior diagram of the dynamic financial planning system model

Based on the above simulation analysis, we can then get the financial policy portfolio can be listed as shown in Table 7.

Table 7. A Simulation output of the dynamic financial planning of the group companies

Elements	Data	Elements	Data
g	16%	Cashpro.	94%
rf.+rw	16%	t	22%
rin.	7%	iterp	2%
pro.	33%	i/(e+i)	44%
rd.	12%		

To make the company successful in the future development of the industry into a digital business, you can conduct a timely analysis of the parameters and adjust the financial planning or adjust the development of a new financial plan based on the analysis of the results of the implementation, as shown in Table 7.

4. Conclusion

The study constructs a data-driven analysis framework for enterprise finance based on new quality productivity. The system dynamics method is utilized to construct an enterprise financial dynamic planning system, and financial planning is carried out by setting different index values. The sensitivity test of dynamic planning proves the effectiveness of the model. Take Group A as an example to apply the financial dynamic planning model in this paper, by analyzing the company's financial data from 2019-2023. By adjusting, combining and optimizing the indicators of value drivers and free cash flow drivers, a reasonable financial planning scheme is finally obtained, which helps Group A avoid financial risks.

References

[1] Zhu, X., Ge, S., & Wang, N. (2021). Digital transformation: A systematic literature review. Computers & Industrial Engineering, 162, 107774.

[2] Kotarba, M. (2018). Digital transformation of business models. Foundations of management, 10(1), 123-142.

[3] Fischer, M., Imgrund, F., Janiesch, C., & Winkelmann, A. (2020). Strategy archetypes for digital

transformation: Defining meta objectives using business process management. Information & Management, 57(5), 103262.

[4] Zhuo, C., & Chen, J. (2023). Can digital transformation overcome the enterprise innovation dilemma: Effect, mechanism and effective boundary. Technological Forecasting and Social Change, 190, 122378.

[5] Cherepanov, V. V., & Popov, E. V. (2022). Concept of the digital transformation of an industrial enterprise. Editorial Office, 1022.

[6] Schwertner, K. (2017). Digital transformation of business. Trakia Journal of Sciences, 15(1), 388-393.

[7] Ivančić, L., Vukšić, V. B., & Spremić, M. (2019). Mastering the digital transformation process: Business practices and lessons learned. Technology Innovation Management Review, 9(2), 36-50.

[8] Chulkov, D. V., Cox, S. R., & Kim, J. (2021). Financial Impact of Moving to Cloud Computing. Journal of Applied Business and Economics, 23(1).

[9] Yu, Y. (2021, September). Application and Optimization of Enterprise Financial Sharing Service Center Based on Cloud Computing. In 2021 4th International Conference on Information Systems and Computer Aided Education (pp. 2366-2370).

[10] Nagy, J., Oláh, J., Erdei, E., Máté, D., & Popp, J. (2018). The role and impact of Industry 4.0 and the internet of things on the business strategy of the value chain—the case of Hungary. Sustainability, 10(10), 3491.

[11] Yu, Z., Lin, S. H., Cho, C. C., & Chen, C. (2023). Performance management algorithm of financial shared service center based on Internet of Things public cloud privacy protection. Mathematical Biosciences and Engineering, 20(7), 12510-12528.

[12] Plekhanov, D., Franke, H., & Netland, T. H. (2023). Digital transformation: A review and research agenda. European Management Journal, 41(6), 821-844.

[13] Klein, V. B., & Todesco, J. L. (2021). COVID ‐ 19 crisis and SMEs responses: The role of digital transformation. Knowledge and process management, 28(2), 117-133.

[14] Sebastian, I. M., Ross, J. W., Beath, C., Mocker, M., Moloney, K. G., & Fonstad, N. O. (2020). How big old companies navigate digital transformation. In Strategic information management (pp. 133-150). Routledge.

[15] Soto-Acosta, P. (2020). COVID-19 pandemic: Shifting digital transformation to a high-speed gear. Information Systems Management, 37(4), 260-266.

[16] Dewasiri, N. J., & Yadav, M. (2024). Transforming Financial Management With Cloud Computing: Strategies, Benefits, and Innovations. In Driving Transformative Technology Trends With Cloud Computing (pp. 116-135). IGI Global.

[17] Ismail, M. H., Khater, M., & Zaki, M. (2017). Digital business transformation and strategy: What do we know so far. Cambridge Service Alliance, 10(1), 1-35.

[18] Anthony Jnr, B. (2021). Managing digital transformation of smart cities through enterprise architecture–a review and research agenda. Enterprise Information Systems, 15(3), 299-331.

[19] Gurbaxani, V., & Dunkle, D. (2019). Gearing up for successful digital transformation. MIS Q. Executive, 18(3), 6.

[20] Feng, H., Wang, F., Song, G., & Liu, L. (2022). Digital transformation on enterprise green innovation: Effect and transmission mechanism. International journal of environmental research and public health, 19(17), 10614.

[21] Li, L., Su, F., Zhang, W., & Mao, J. Y. (2018). Digital transformation by SME entrepreneurs: A capability perspective. Information Systems Journal, 28(6), 1129-1157.

[22] Andriushchenko, K., Buriachenko, A., Rozhko, O., Lavruk, O., Skok, P., Hlushchenko, Y., ... & Kondarevych, V. (2020). Peculiarities of sustainable development of enterprises in the context of digital transformation. Entrepreneurship and sustainability issues, 7(3), 2255.

[23] Kraus, S., Schiavone, F., Pluzhnikova, A., & Invernizzi, A. C. (2021). Digital transformation in healthcare: Analyzing the current state-of-research. Journal of Business Research, 123, 557-567.

[24] Wang, H., & Wang, S. (2023). A semantic model for enterprise digital transformation analysis. Journal of Computer Information Systems, 63(1), 133-148.

[25] Pappas, I. O., Mikalef, P., Giannakos, M. N., Krogstie, J., & Lekakos, G. (2018). Big data and business analytics ecosystems: paving the way towards digital transformation and sustainable societies. Information systems and e-business management, 16(3), 479-491.

[26] Wu, K., Fu, Y., & Kong, D. (2022). Does the digital transformation of enterprises affect stock price crash risk?. Finance Research Letters, 48, 102888.

[27] Correani, A., De Massis, A., Frattini, F., Petruzzelli, A. M., & Natalicchio, A. (2020). Implementing a digital strategy: Learning from the experience of three digital transformation projects. California management review, 62(4), 37-56.

[28] Cao, C., Jin, Y., & Huang, H. (2021). Research on the Construction of Enterprise Financial Shared Service Center Based on Cloud Computing. In E3S Web of Conferences (Vol. 235, p. 01041). EDP Sciences.

[29] Yifan, L., & Qiutong, C. (2021, June). Financial sharing of SMEs based on cloud service SaaS outsourcing model. In Proceedings of the 2021 1st International Conference on Control and Intelligent Robotics (pp. 607-612).

[30] Deng, Y. (2022). Optimising enterprise financial sharing process using cloud computing and big data approaches. International Journal of Grid and Utility Computing, 13(2-3), 272-281.

[31] Li, R., Rao, J., & Wan, L. (2022). The digital economy, enterprise digital transformation, and enterprise innovation. Managerial and Decision Economics, 43(7), 2875-2886.

[32] Zhang, T., Shi, Z. Z., Shi, Y. R., & Chen, N. J. (2022). Enterprise digital transformation and production efficiency: Mechanism analysis and empirical research. Economic research-Ekonomska istraživanja, 35(1), 2781-2792.

[33] Shang, Y., Raza, S. A., Huo, Z., Shahzad, U., & Zhao, X. (2023). Does enterprise digital transformation contribute to the carbon emission reduction? Micro-level evidence from China. International Review of Economics & Finance, 86, 1-13.

[34] Li, T., Wen, J., Zeng, D., & Liu, K. (2022). Has enterprise digital transformation improved the efficiency of enterprise technological innovation? A case study on Chinese listed companies. Math. Biosci. Eng, 19(12), 12632-12654.

[35] Saeed P. Langarudi & Sajid Noor. (2024). System Dynamics Modeling and Analysis of New Mexico Oil Production and Taxation. Computational Economics(prepublish),1-49.

[36] Jose D. Meisel,Valentina Esguerra,Carolina Pérez Ferrer,Ivana Stankov,Felipe Montes,Natalia Tumas... & Olga L. Sarmiento. (2024). Understanding the obesity dynamics by socioeconomic status in Colombian and Mexican cities using a system dynamics model. Heliyon(22),e39921-e39921.

[37] Oyo Benedict,Guma Paterson Isdore,Rwashana Semwanga Agnes & Waiswa Daniel. (2024). Modeling Land-Use Land-Cover Change Complexity: A System Dynamics Approach. International Journal of System Dynamics Applications (IJSDA)(1),1-22.