# System Analysis of the Business Debt Financing Process Using the Functional Approach

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**Abstract:** The modern business environment necessitates the effective management of financial resources, with debt financing serving as a critical tool for raising capital and ensuring sustainable business growth. This study explores the decision-making process for business debt financing using the IDEF0 functional modeling approach, which provides a structured and systematic way to analyze financing decisions. The IDEF0 methodology involves the construction of a hierarchical system of diagrams, wherein each diagram offers a single description of a business process fragment. The initial step involves a comprehensive description of the business process, encompassing its intricacies and its interactions with the external environment.

The proposed framework decomposes the financing process into four main stages: assessing the necessity of debt financing, developing a financial plan, raising debt financing, and monitoring the fulfillment of debt obligations. The application of the IDEF0 model enhances strategic financial planning, ensuring that businesses adopt rational borrowing policies aligned with their long-term objectives.

In the research, the alternative options for raising debt financing for businesses were systematized. Decision-making parameters for choosing the option of raising debt financing for business were determined.

The findings contribute to improving financial management efficiency by offering a methodological basis for digital financial models that integrate data analytics, risk assessment tools, and automated decision-making mechanisms. This research is valuable for corporate managers, financial analysts, and policymakers aiming to enhance business resilience, optimize capital structures, and develop effective debt management strategies in an increasingly uncertain economic environment.

**Keywords:** System analysis, business process modeling, IDEF0 methodology, decision-making, debt financing.

## 1. INTRODUCTION

The modern business environment is characterized by high dynamism, which necessitates effective management of financial resources of companys. Attracting debt financing allows businesses to raise additional capital for development, expand activities and increase competitiveness in conditions when their own funds or other sources of financing are not available or insufficient. At the same time, decision-making on raising debt financing requires an analysis of requirements and careful justification, processing of incoming information flows to obtain high-quality output results.

The study of debt financing needs, instruments of its raising, and the impact of various indicators on decision-making on debt financing is an urgent task for economic science and business practice. Implementing the IDEF0 ("Icam DEFinition for Function Modeling", where ICAM is an acronym for "Integrated Computer Aided Manufacturing") methodology in the analysis of debt financing processes enables the formalization of management decisions, thereby contributing to the enhancement of strategic planning and the financial efficiency of the company.

## 2. RELATED WORKS

The issue of debt financing for business is often studied in the scientific literature. The authors consider various aspects of business debt financing. Generalizing theoretical studies on data analytics on debt financing research based on Scopus and WoS metrics is revealed in (Veres *et al*, 2023), the essence of different types of debt – by Yu H.-C., Johnson K. H. and Hsieh D.-T. (Yu *et al*, 2008), the role of debt financing – by A. Toukan (Toukan, 2021), O. Bedratenko (Bedratenko, 2012), O. Oliynyk, P. Zufan and V. Adamenko (Oliynyk *et al*, 2016), features of debt financing – by V.

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Shevchenko and L. Lutsenko (Shevchenko *et al*, 2019), ethics of debt financing – by P. O'Sullivan and P. Ricci (O'Sullivan *et al*, 2024), principles and prospects of debt financing – by Y. O. Yereshko, R. Friedman and I. V. Milko (Yereshko *et al*, 2016), advantages of debt financing – by A. A. Moussa (Moussa, 2025), the relationship between debt financing and profitability in emerging markets – by L. Nyamwanza, H. I. Haufiku and M. Ellen (Nyamwanza *et al*, 2020), factors influencing decision-making on raising debt financing – by M. O. Nyamita, H. L. Nyamita and N. Dorasamy (Nyamita *et al*, 2014), O. O. Lyubich and D. H. Khokhych (Lyubich *et al*, 2024), R. P. Gautam (Gautam, 2024), models of debt financing – by O. O. Oliynyk, L. M. Oliynyk and V. V. Adamenko (Oliynyk *et al*, 2015), directions of improvement of debt financing – by V. V. Makedon (Makedon, 2013), features of corporate debt financing under conditions of uncertainty – by Y. Pei and Y. Liu (Pei *et al*, 2024), the concept of using artificial intelligence and Data Science methods in debt financing – in (Veres *et al*, 2021; Veres *et al*, 2022).

Special attention was paid to debt financing by J. Cameron and M. E. Hoque, who analyzed the main problems for owners of small and medium-sized businesses operating in emerging markets (Cameron *et al*, 2016). In times of crisis, the need for debt financing of business entities is constantly growing, as noted by E. Polishchuk, A. Kornylyuk, I. Lopashchuk and A. Pinchuk (Polishchuk *et al*, 2020). N. Petru and A. Tomaskova prioritized the use of different types of financing (Petru *et al*, 2020), O. Oliynyk and I. Sidelnikova considered Eurobonds as a tool for raising debt financing in the international capital market (Oliynyk *et al*, 2014).

A separate area of research in recent years has been the impact of the ESG rating of a company on its ability to raise debt financing, as emphasized by F. Su and X. Xue (Su *et al*, 2024).

Since business entities are actively raising debt financing, the development of debt financing instruments was also the subject of scientific research (Lyubich *et al*, 2020; Hanechko, 2011; Pavliuk *et al*, 2014; Shuliuk *et al*, 2022). The possibilities of using various debt financing instruments largely depend on the level of development of the financial market in general and the stock market as part of it in particular. V. O. Romanyshyn and O. V. Bulavynets interpreted the debt market as an alternative source of financing for companies (Romanyshyn *et al*, 2014). Modern trends in the development of the international debt financing market were analyzed by N. V. Tarasevych (Tarasevych, 2021).

The comprehensiveness of debt financing research in the scientific literature demonstrates the relevance of the chosen topic and the need to develop it in our own research.

Let us review the scientific research on the application of the functional approach to modeling business processes for system analysis this process. The functional approach to process modeling was applied and studied in (Lees *et al*, 1975) 50 years ago and systematically developed by Chan *et al*. in (Chan *et al*, 2009). Also significant is the research of A. Saini, L. Thiry, which proposes a general methodology for modeling business processes using mathematical functions and higher order functions (Saini *et al*, 2017). T. Vasylieva and O. Zarutska (Vasylieva *et al*, 2013) described the development of a structural-functional approach to the analysis of financial sustainability in their study, and I. Dyakonova and Y. Petrenko (Dyakonova *et al*, 2013) described the resource-functional approach to the study of financial security of a company, I. Novakivskyi, I. Kulyniak, Yu. Dziurakh, S. Ohinok and L. Ukrainets had modelled the tourism market behavior based on discrete equilibrium models (Novakivskyi *et al*, 2024).

T. O. Havrylko and A. V. Havrylenko focused special attention on financial management information systems (Havrylko *et al*, 2015).

Quite close to the subject of the study is an article on the functional approach to building a model for managing the financial potential of a company, by N. Y. Bryukhovetska, I. P. Bulieiev, L. V. Ivanenko (Bryukhovetska *et al*, 2019), which establishes the nature and directions of the relationship between the components of the economic potential of a company in accordance with the functional approach to its structuring. The functional modeling of business processes of a company was carried out by N. A. Medvedeva, O. V. Radko and N. O. Naumenko (Medvedeva *et al*, 2016), K. V. Kokura (Kokura, 2013), who considered the features of the modern understanding of the process approach and methodologies of functional modeling of business processes for companies.

A number of studies have demonstrated the efficacy of employing the IDEF0 methodology in business process modeling. Specifically, these are the publications by G. Manenti, M. Ebrahimiarjestan, L. Yang and M. Yu (Manenti *et al*, 2019), O. Hurenko, I. Bohdanov, N. Tsybuliak, H. Lopatina, Y. Suchikova and A. Popova (Hurenko *et al*, 2023), M. Fu, D. Wang, J. Wang and M. Li (Fu *et al*, 2018), A. M. Titu, D. V. D. Suteu, M. I. Toderici and A. B. Pop (Titu *et al*, 2024). However, a survey of the extant literature reveals an absence of papers on modeling the debt financing process using the functional approach.

## 3. MATERIALS AND METHODOLOGY

The aim of the research is twofold: first, to characterize the decision-making process for debt financing of business, and second, to develop a structured approach to assessing the financial capabilities of an company. To this end, in the study there will be used IDEF0 contextual diagrams to model key factors of influence on business debt financing.

The following objectives were delineated:

- to examine the pivotal phases of the decision-making process for securing debt financing;
- to construct a contextual diagram of the debt financing process employing the IDEF0 methodology and decompose it;
- to contemplate potential sources, risks, limitations, and recommendations for debt financing;
- to ascertain the information base, limitations, and decision-making mechanisms for debt financing by businesses.

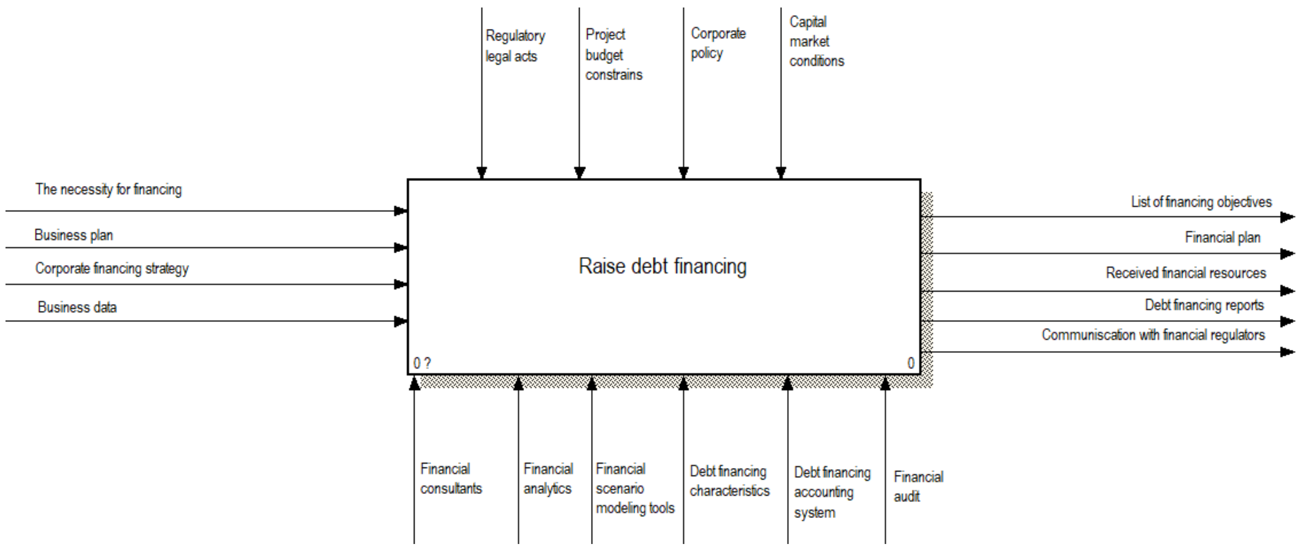


**Fig. (1).** Contextual diagram of the business debt financing process.

The functional model is employed to delineate prevailing business processes. This model utilizes both natural and graphical languages, with the IDEF0 methodology serving as the foundation for the graphical language employed in conveying information concerning a specific business process.

The IDEF0 methodology involves the construction of a hierarchical system of diagrams, wherein each diagram offers a single description of a business process fragment. The initial step involves a comprehensive description of the business process, encompassing its intricacies and its interactions with the external environment.

To this end, a contextual diagram is developed. Subsequent to this initial step is functional decomposition, wherein the process is divided into subprocesses, with each subprocess being described in isolation. This decomposition process is facilitated by the construction of decomposition diagrams. The process may be further refined by subdividing each process into smaller subprocesses until the desired level of detail is achieved.

An IDEF0 diagram is composed of two elements: blocks and arrows. The blocks in question represent processes, and the arrows represent the relationship between the blocks.

The purpose of each side of a block is reflected in the arrows that connect the blocks to each other or to the external environment:

- the left side of a block corresponds to input data, resources, materials, and data entering the process,
- the top side corresponds to management (control), rules, standards, procedures, and regulations that determine how the process is performed,
- the right side corresponds to output, which is products, services, or data that result from the process,
- the bottom side corresponds to mechanisms (means of execution), which are the resources or performers that carry out the process.

This designation is indicative of certain systemic principles. Specifically, inputs are converted into outputs, controls are established to limit or determine the conditions for performing transformations, and mechanisms are in place to demonstrate the process's performance.

## 4. RESULTS

In general, in order to make a decision on raising debt financing, it is necessary to analyze in detail the following information: current financial statements of the company, credit history and current level of debt, revenue and profitability trends, financing requirements (amount, purpose, use, sources, cost, repayment schedules, etc.), trends in the market in which the company operates, its market position and external conditions of operation, growth strategies of the company, risks, sensitivity to various financial scenarios, etc.

Let's build a contextual diagram of the business debt financing process using the functional approach. The IDEF0 methodology requires that the diagram have at least three and no more than six blocks. These restrictions keep the complexity of the diagrams and model at a level that is easy to read, understand, and use. Fig. (**1**) shows the results of building a contextual diagram.

The core element of the contextual diagram illustrating the business debt financing process is the concept of "raise debt financing". The following inputs are necessary for this step:

- the necessity of financing: befor raising debt financing, it is necessary to ascertain whether there is a need for financing and whether the business is capable of covering its financial requirements from alternative sources;
- the business plan: this document enables the determination of the amount of funds required by the company, the purposes for which they will (or may) be used, the anticipated income of the company, the possibility of using guarantees and collateral for debt financing, as well as the structure of debt financing (sources, maturity, etc.) and its associated risks;

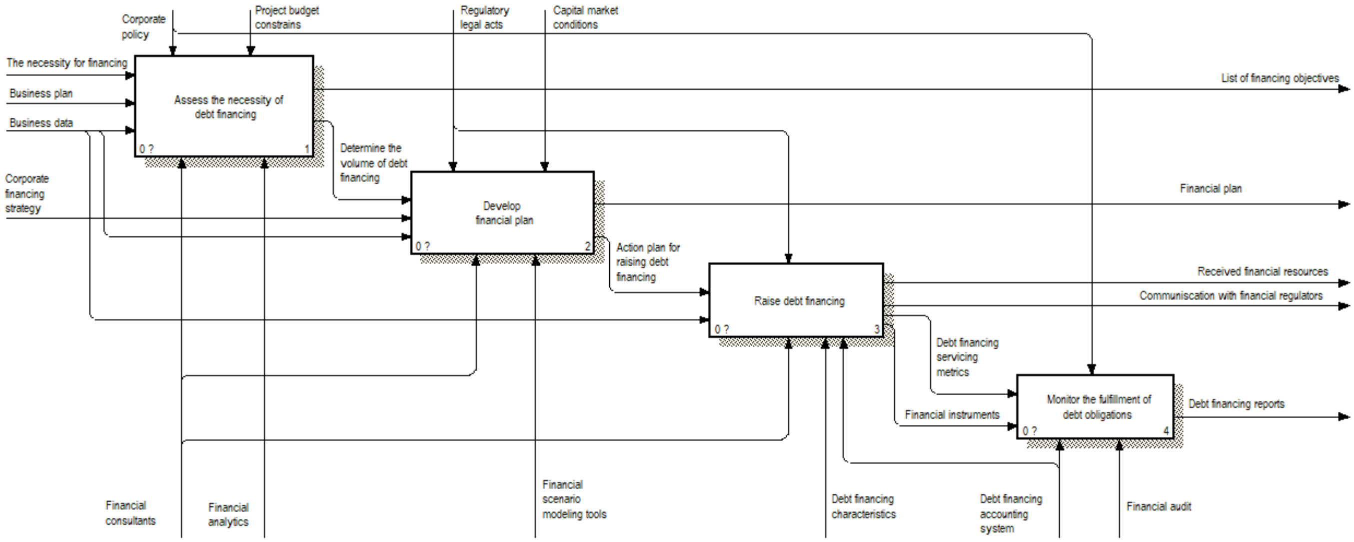


**Fig. (2).** Decomposition of the process "Raise debt financing".

- corporate financial strategy: the long-term plan for the management of the company's financial

- resources aimed at ensuring its stability, growth and competitiveness, on the basis of which decisions are made on the expediency of expanding the business, improving liquidity, reducing financial risks and increasing profitability by means of raising external financing;
- business data: these data allow to assessing the current state and level of development of the company, which is the basis for making decisions on raising external financing from the point of view of expediency, timeliness, creditworthiness and efficiency.

According to the contextual diagram of the business debt financing process (see Fig. **1**), the process will be managed (controlled) on the basis of regulations (both national and international, as well as internal corporate regulations adopted by the company), project budget constraints, corporate policy, and capital market conditions. The mechanisms that will ensure the implementation of the business debt financing process include: a) executors – financial consultants, b) resources – the results of financial analytics, financial scenario modeling tools, debt financing characteristics, debt financing accounting system, financial audits.

As a result of the process, based on the processing of input data using the mechanisms and within the management requirements, the following output results will be obtained:

- a list of financing objectives, which will clearly state for which purposes debt financing can and will be involved, and for which purposes such financing will not and / or cannot be involved;
- a financial plan, which will reflect the planned time parameters of debt financing, the planned capital structure, sources of its formation and sources of repayment of debt financing, assess the financial stability of the company, expected income and expenses, as well as potential risks;
- received financial resources – the amount of financial resources received to the company's accounts from sources of debt financing of the business;
- debt financing reports, which will reflect the status, structure and dynamics of the company's debt obligations, information on debt financing instruments and parameters, as well as the results of the analysis of the company's ability to service its debt obligations;
- communication with financial regulators, which will be based on interaction with government agencies that supervise the company's financial activities to ensure compliance with regulatory requirements, financial transparency and reduce the risk of legal sanctions. As a result, the company will prepare financial statements, coordinate debt transactions with regulators, comply with financial monitoring standards, requirements for liquidity, solvency, financial stability, etc.

As illustrated in Fig. (**2**), a decomposition of the contextual diagram of business debt financing is presented.

The process of raising debt financing was determined to be segmented into four distinct blocks:

- assess the necessity of debt financing;
- develop a financial plan;
- raise debt financing;
- monitor the fulfillment of debt obligations.

The steps should be completed sequentially. The "Assess the necessity of debt financing" block involves the processing of data on the need for financing, business data and the business plan in order to determine the amount of debt financing, as well as the formation of a list of financing tasks. After completing this step, the process of "Develop a financial plan" begins, which, based on the analysis of business data and corporate financing strategy and taking into account the identified financing volumes, will end with a

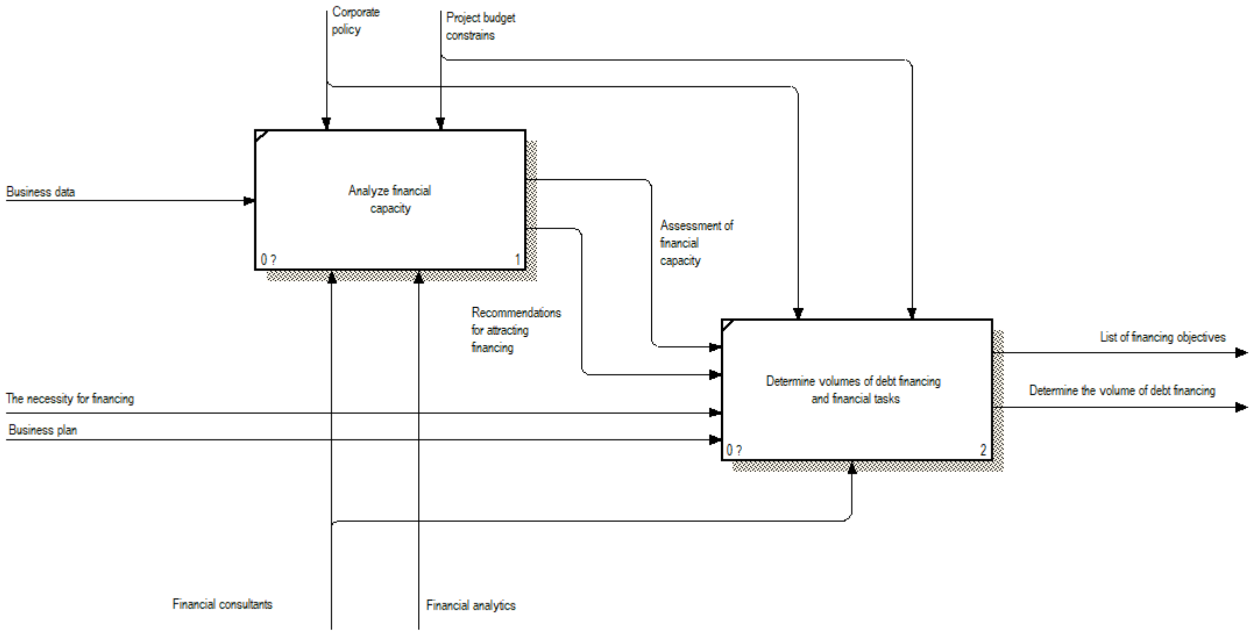


**Fig. (3).** Decomposition of the block "Assess the necessity of debt financing".

formed financial plan and action plan for raising debt financing. The third block "Raise debt financing" is implemented on the basis of business data and the action plan for raising debt financing formed at the previous stage, and as a result of the process, the company will select financial instruments for raising debt financing, determine the metrics for servicing debt financing, raise financial resources, and form communications with financial regulators. The last, fourth, block, "Monitoring the fulfillment of debt obligations," is carried out using data on financial instruments and debt service metrics and ends with reports on debt financing.

Corporate policy as management (control) mean determines the implementation of processes in blocks 1 and 4, project budget constraints – in block 1, regulatory legal acts – in blocks 2 and 3, and capital market conditions – in block 2. At the same time, block 1 involves such mechanisms as financial consultants and financial analytics, block 2 – financial consultants and financial scenario modeling tools, block 3 – financial consultants, debt financing characteristics and debt financing accounting system, block 4 – debt financing accounting system and financial audit.

Let's decompose each of the blocks of the business debt financing process. Fig. (**3**) shows the decomposition of the block "Assess the necessity of debt financing".

The necessity of debt financing should be assessed in 2 steps. At the first step, it is advisable to analyze the financial capacity of the company based on its business data, taking into account the restrictions imposed by corporate policy and project conditions (project budget constraints). This task should be performed by financial consultants using financial analytics tools. Successful completion of the first step results in a quantitative and qualitative assessment of the company's current financial capacity and recommendations for raising debt financing, including the feasibility of its involvement. The second step is to determine the amount and tasks (goals) of debt financing. To successfully complete this stage, in addition to the results obtained at the previous stage, it is advisable to include information from the business plan and data on the necessity of financing in the input data.

Based on the processing of the input information and taking into account the constraints discussed in the first stage, financial consultants form a list of financing tasks (the output information flow of the overall process) and determine the volumes of debt financing that should be involved. The determined volumes of financing become an additional input information flow for the next stage of the business debt financing process.

The decomposition of the "Develop a financial plan" block as the second stage of the business debt financing process is shown in Fig. (**4**).

The first task in developing a company's financial plan is to evaluate alternative debt financing options, which is based on the analysis of business data, corporate financing strategy and determined amounts of debt financing in order to form an evaluation of debt financing options and preliminary recommendations for the selection of debt financing options. The specifics of this stage are the management (control) mean of the process, which is carried out in accordance with the regulatory legal acts and the capital markets conditions, and an important mechanism to be used is financial scenario modeling tools.

Alternative options for raising debt financing for business are presented in Table **1**.

When the evaluation of debt financing options has been completed and preliminary recommendations for the selection of debt financing options have been developed, the next stage begins, during which the optimal debt financing option is selected and a financial plan is prepared. The management (control) mean and mechanisms used during this stage are similar to those used during the evaluation of alternative debt financing options. The result of the selection process is a financial plan (the output of the overall process) and an action plan for raising debt financing (to be used during the next stage of the process).

The choice of the option of raising debt financing is determined by the parameters given in Table **2**.

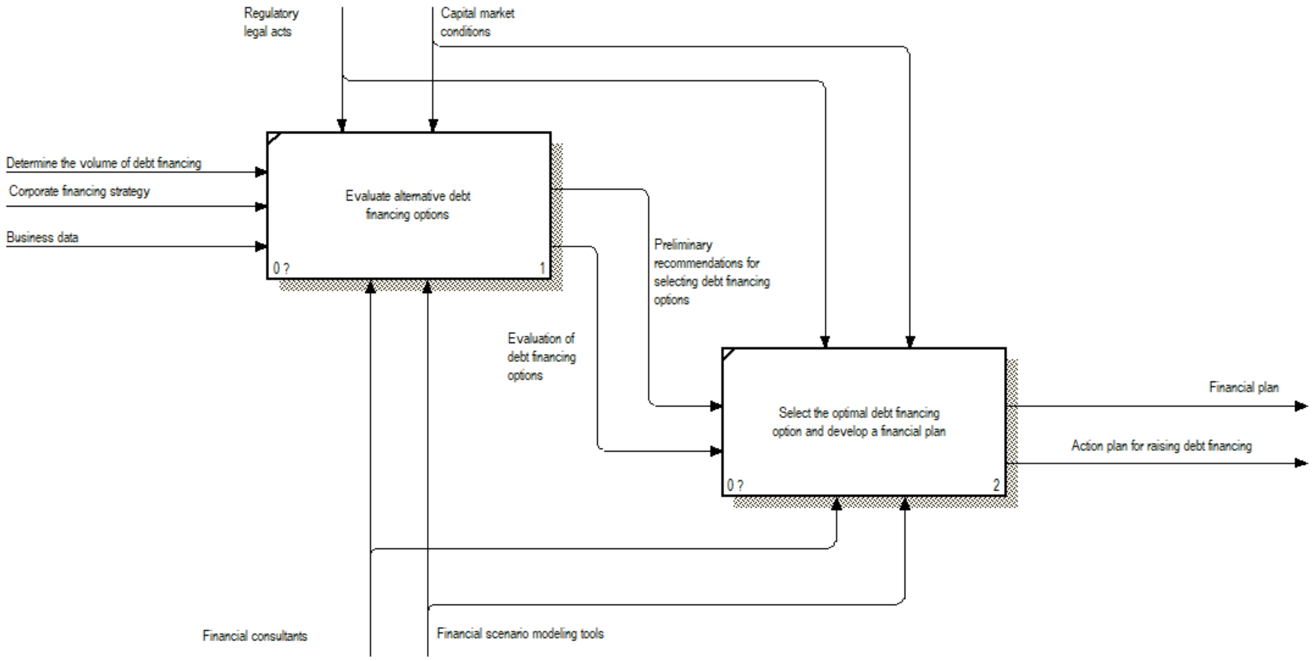


**Fig. (4).** Decomposition of the block “Develop a financial plan”.

**Table 1. Alternative options for raising debt financing for business.**

| Alternative Options for Raising Debt Financing | Examples of Options for Raising Debt Financing |
|---|---|
| Bank loans | – traditional term loans;<br>– short-term loans, which are used to cover immediate capital needs until long-term financing is secured;<br>– revolving credit lines for flexible access to funds |
| Corporate bonds | – issue of corporate bonds to institutional or retail investors;<br>– issue of debt instruments that can be converted into equity later |
| Trade credit | – deferred payment agreements with suppliers for goods or services;<br>– loans or guarantees provided by export credit agencies to support international trade;<br>– acquisition of assets through operating or finance leases rather than outright purchase |
| P2P lending | – raising funds directly from individual or institutional investors through online platforms;<br>– raising funds from a large number of investors through crowdfunding platforms with a promise of return with interest |
| Government loans | – access to loans or grants with low interest rates from government programs aimed at supporting business |
| Mezzanine financing | – hybrid financing that combines debt and equity, usually subordinated to senior debt |

**Table 2. Decision-making parameters for choosing the option of raising debt financing for business.**

| Decision-making Parameters | Indicators Used to Make Decisions |
|---|---|
| Financial condition of the company | – current debt to equity ratio and leverage potential; |

| Decision-making Parameters | Indicators Used to Make Decisions |
|---|---|
| | – cash flow projections to assess repayment capacity;<br>– credit rating and borrowing history |
| Capital requirements | – the exact amount of financing required;<br>– the purpose of the financing;<br>– expected duration of financing and repayment flexibility |
| Available financing options | – types of debt tools (e.g., loans, bonds, credit lines);<br>– terms and conditions associated with each financing option;<br>– availability of financing methods based on the company's profile |
| Market conditions | – current interest rates and trends in the debt markets;<br>– availability of financing on the local and international markets;<br>– economic and industry prospects affecting credit conditions |
| Lender's requirements and conditions | – documentation and collateral required for various debt financing options;<br>– conditions and restrictions related to debt agreements;<br>– assessment of relationships with potential creditors |
| The cost of debt financing | – total cost of borrowing, including interest rates, fees and other charges;<br>– comparison of effective annual interest rates between alternatives;<br>– tax consequences of interest payments |
| Terms of repayment | – flexibility of payment schedules (e.g., fixed or variable payments);<br>– grace periods or prepayment penalties;<br>– impact on short- and long-term liquidity |
| Regulatory and compliance requirements | – legal and tax obligations associated with various debt financing options;<br>– compliance with local and international financial regulations |
| Specific constraints of the company | – strategic considerations, such as maintaining control and ownership structure;<br>– existing debt obligations and transaction covenants;<br>– long-term alignment of the financing method with business objectives |
| Investor and stakeholder preferences | – stakeholder views on acceptable levels of leverage |

The third stage of the debt financing process is “Raise debt financing”, the decomposition of which is shown in Fig. (**5**).

The first necessary step in this stage is to fulfill the conditions for using financial instruments, which is based on the analysis of business data and the action plan for raising debt financing. The mandatory mechanisms of this process are the characteristics of debt financing, which are the basis for making decisions on debt financing by financial consultants. The outputs to the process of “fulfill the conditions for using financial instruments” are financial instruments, communications with financial regulators, and decisions on the use of financial instruments. The first two are both the output information flows of the overall process and the input data for the next stage – the process of raising debt financing through selected financial instruments, taking into account the characteristics of debt financing and using the debt financing accounting system in accordance with regulatory legal acts. The result of the successful completion of the process is the received financial resources, which will be reflected in the company’s accounts, as well as the characteristics of financial instruments that need to be further executed and controlled. These results are the input information flows for the final stage of the process, which is to ensure servicing and control of debt financing metrics.

The result of this process is the debt financing servicing metrics necessary to move to the final stage of the overall process – monitor the fulfillment of debt obligations, the decomposition of which is shown in Fig. (**6**).

The fourth stage of the debt financing process is divided into 2 steps:

– monitoring the performance of debt financing metrics;

– audit and analysis of debt operations.

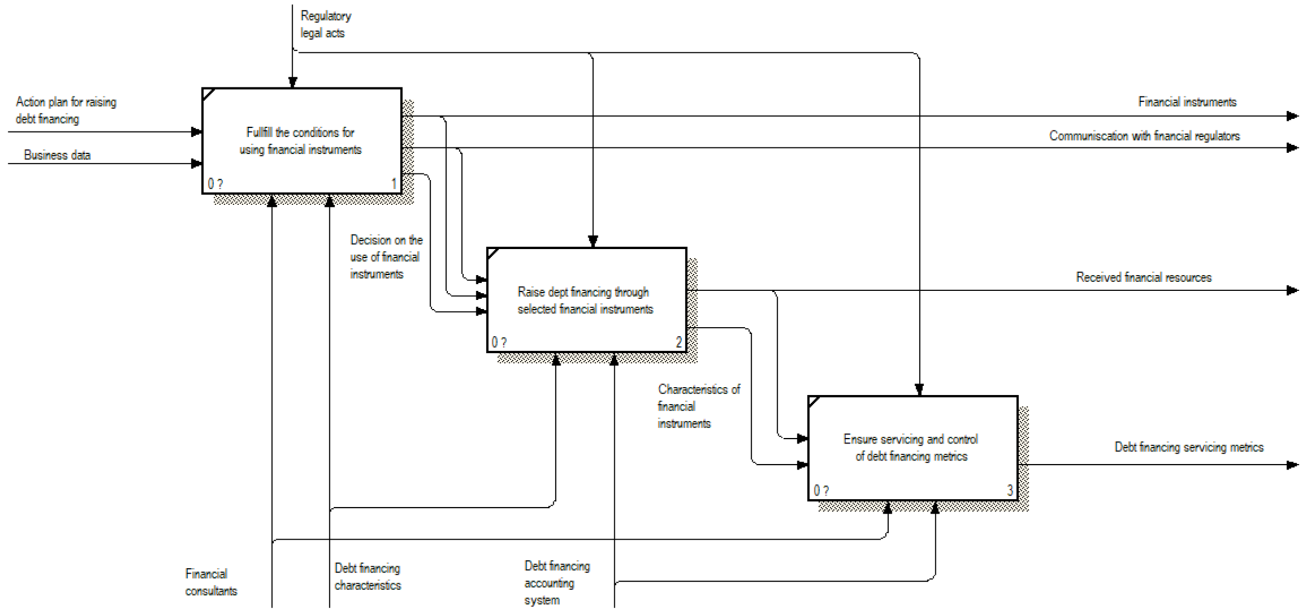


**Fig. (5).** Decomposition of the block "Raise debt financing".

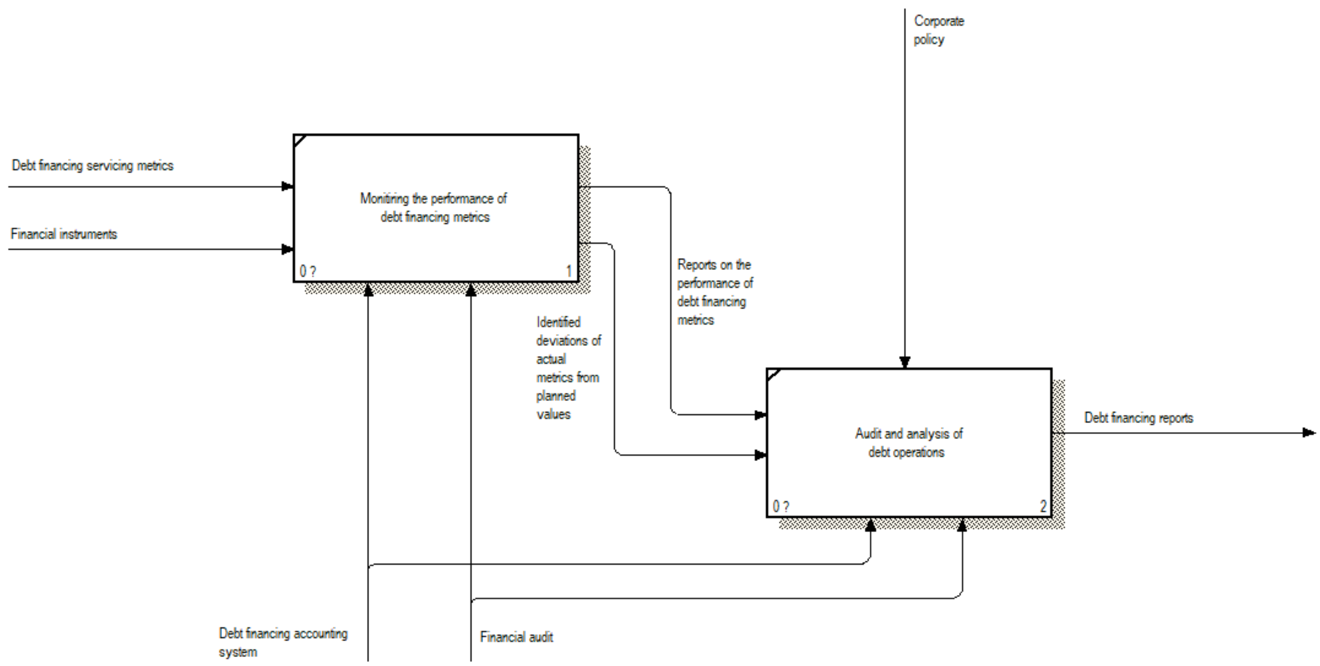


**Fig. (6).** Decomposition of the block "Monitor the fulfillment of debt obligations".

The input information for monitoring the performance of debt financing metrics is metrics for servicing debt financing and data on financial instruments used by the company, and the mechanisms of this process are the debt financing accounting system and financial audit. In fact, the process of monitoring the performance of debt financing metrics will be automated without the need for personal decision-making by the relevant people from the company. The result of this process is the detection of deviations of actual metrics from planned values and reports on the performance of debt financing metrics.

Based on the monitoring results, the company's debt operations are audited and analyzed. Reports on debt financing, generated in accordance with the requirements of corporate policy and using similar mechanisms as during monitoring, are generated automatically and serve as the basis for further decision-making on the feasibility and efficiency of raising debt financing in future periods.

## 5. DISCUSSIONS

To quantitatively analyze the generated IDEF0 diagrams of the process of raising debt financing for business, let's calculate the model indicators:

- number of blocks in the diagram – N;
- level of decomposition of the diagram – L;

- the balance of the diagram – B;
- number of arrows connecting to the block – A;

It is necessary that the number of blocks in the lower-level diagrams is lower than the number of blocks in the parent diagrams, i.e., as the level of decomposition increases, the N/L ratio would decrease. Thus, a decrease in this indicator indicates that as the model is decomposed, the processes should be simplified, and therefore the number of blocks should decrease.

Let's analyze the N/L ratio for IDEF0-diagrams of the business debt financing process (Table **3**).

**Table 3. Alternative options for raising debt financing for business.**

| N, the number of Blocks in the Diagram | L, Level of Diagram Decomposition | N/L Ratio |
|---|---|---|
| 4 | 1 | 4 |
| 2 | 2 | 1 |
| 2 | 2 | 1 |
| 3 | 2 | 1,5 |
| 2 | 2 | 1 |

According to the results of the calculations, we can observe that the N/L ratio has decreased from 4 to [1, 1.5], which means that by decomposing the process of debt financing of business, we have managed to simplify the understanding of the process, which was the purpose of the decomposition.

When making decisions on raising debt financing, the following restrictions should be taken into account:

- constrains on the company's debt-to-equity ratio set by corporate policy or market norms;
- operational constrains on additional borrowings, sale of assets or dividend payments;
- constrains on the use of certain assets as collateral due to existing liens or agreements;
- constrains on the availability or cost of financing;
- constrains on making payments on obligations (schedules, penalties);
- constrains in existing contracts or agreements on the amount or type of debt the company can incur;
- constrains related to ESG and sustainable finance initiatives;
- constrains of creditors on the company's ability to meet certain financial ratios;
- regulatory and legal restrictions;
- constrains caused by economic conditions, such as recessions or industrial downturns, *etc*.

## 6. CONCLUSIONS

Among the main challenges of raising debt financing by businesses are legislative constrains, requirements of financial regulators, risks of changes in market conditions and the need to ensure the solvency of the company. Maintaining a balance between debt and equity is a critical factor for maintaining the financial stability of the company.

The study confirmed that raising debt financing requires careful analysis and strategic planning. Making effective decisions on raising debt financing is possible on the basis of decomposition of the process of raising debt financing with the identification of incoming information flows, execution mechanisms, rules and regulations of management (control) mean to ensure objective output results as a basis for making such decisions.

As a result of constructing the IDEF0 context diagram, it is determined that the decision-making process for debt financing includes four main sub-processes: a) assess the necessity for debt financing; b) develop financial plan; c) raise debt financing; d) monitor the fulfillment of debt obligations. The proposed functional model for raising debt financing allows to clearly structure the decision-making process, which contributes to improving the efficiency of financial management of the company. The obtained results can be used as a basis for further research in the field of financial planning and development of company financing strategies. The proposed approach can be used to develop digital models of financial analysis that integrate with automated business financial management systems. The practical significance of the study lies in the possibility of applying the obtained results to improve the decision-making system for raising debt financing for business.

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