Designing a financing model for knowledge-based small and medium businesses

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Abstract

One of the most important financial decisions is the way of financing economic enterprises, which plays a significant role in the continuation and growth of their profitability. The ability of companies to obtain financial resources inside and outside the company in order to invest and implement development plans is one of the main factors in the growth of profitability of companies. Active commercial companies also need financial resources to develop the market, modernize technology, increase product quality, produce new products, and grow their profitability. Also, investors in economic projects will need capital and money to implement their plans. One of the most important financial decisions is the way of financing economic enterprises, which plays a significant role in the continuation and growth of their profitability. The ability of companies to obtain financial resources inside and outside the company in order to invest and implement development plans is considered one of the main factors in the growth of profitability of companies. Companies often when they need new financial resources, take advantage of the company's internal resources, including accumulated profits and reserves, or through receiving loans and credits from banks and financial and credit institutions or issuing shares and other types of debt securities. capital, they meet their needs. Therefore, this research deals with the design of the financing model for small and medium knowledge-based businesses and examines and discusses the theories of experts.

Keywords: financing, knowledge based companies, small and medium businesses, profit margin, ANP
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1 Introduction

The increasing expansion and complexity of economic activities and the rapid and ever-increasing transformation of commercial transactions in today's world, both domestic and international trade, and the need of manufacturing and commercial companies to maintain capacity by developing activities and projects, investing in order to maintain or increase the strength of competition from the field global trends have increased these companies' need for financial

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resources, and the company's ability to determine potential financial resources for preparing investments and preparing appropriate financial plans is considered one of the main factors of the company's growth and development [6]. From such conditions, it is more necessary than ever to use the techniques of financial managers in managing the affairs of companies [14].

Preparation of the correct financial policy strengthens the ability to participate in achieving strategic goals. It is obvious that long-term success for companies requires the production of goods with higher quality, lower cost and appropriate sales, which requires the provision of financial resources at an acceptable cost [4]. In most of the countries of the world, the capital market is considered as one of the most important tools to achieve economic growth and development. Although Iran is a country with many hidden capabilities, most Iranian companies suffer from a lack of capital. In addition to this, the country's capital market structure is weak in relation to the preparation and allocation of financial resources and does not work effectively and efficiently [5]. With the renewed prosperity of the Tehran Stock Exchange and the expansion of the stock exchange to other provinces and with the public acceptance of securities, the issue of how to make capital decisions According to the level of public awareness of financial provision methods and financial decision-making processes, it has become an important issue [9]. Several factors increase the amount of capital required by companies, one of the most important factors in the implementation of projects and development plans is successful companies that, in addition to continuing their activities and keeping their capital from the market, also take steps in the direction of growth and progress. [7].

The important factor is the increase in the general level of prices, or in the other words, inflation, which has caused the capital required to carry out current activities to be several times the capital required in previous years. Therefore, the management of the company is always facing the problem of financial security [12]. The company's financing decisions will change its financial structure, which will affect the risk-return of the company's shares in the market. Investors will consider this when evaluating the company, and as a result, the resources of the company's shareholders will be affected. For this reason, in deciding on short-term financing and long-term financing, the management must carefully consider the effects and results of each of the financing methods and gain a precise understanding of the financial instruments to be able to find suitable instruments in the financial markets. use and choose the most economical method of financial provision that is proportional to its risk and return [2].

Financing is one of the constant concerns of financial managers of companies. Financial managers of companies often need financing to carry out development plans or to provide their daily working capital. With the growth and development of financial science and the design of various financing tools, financial managers are faced with a multitude of tools and methods to secure their company's financial resources [1]. Financial managers are always faced with the serious question of which financing method or tool can provide the best and most optimal financing for the company under their management, so to help financial managers Correct decision-making of optimal financing in the financing process of an economic enterprise is necessary to provide quantitative and qualitative criteria in order to be able to make a decision regarding financing tools according to these criteria [13].

Financing methods for the continuation of activity and the implementation of profitable projects are very effective in the growth process of companies and cause the continuation of the life of companies in today's competitive world. Financial provision policies and appropriate financial decisions are made based on foresight and obtaining expected future benefits, as a result, such financial decisions can affect the performance and value of the company [16]. The main goal of companies is to increase the return on equity, and for this purpose, they use methods that help them achieve this goal. Increasing return on equity and, as a result, reducing the cost of capital increases the value of the company. Investors, whether shareholders or providers of long-term loans and facilities, by giving their capital or money to the company, have accepted the risk of not receiving it and want a return equivalent to the cost of the company's capital [10].

Based on this, if the main goal of the company is to maximize the wealth of the shareholders, then the capital structure should be used in a way that guarantees the long-term activity of the company and its profitability with the appropriate combination of resources, as well as maximizing the wealth of the shareholders. As a result, a financial manager can affect the wealth of shareholders by making changes in things such as profit per share, distribution policy, profitability risk and choosing the method of financial provision [11]. Bank lending conditions are divided into three factors: interest rate, repayment period and collateral. Difficult lending conditions prevent companies from accessing financial resources; especially through the banking sector and most financial institutions, the presence of high interest rates in banks to get loans reduces [3]. One of the important variables in the literature related to access to credit is firm size. Several studies show that the sources and amount of financing outside the firm change according to the stage of the life cycle of the firms [4].

Saidi et al. [15] refer to bail in difficult circumstances. According to them, financial institutions should protect

their assets, and if a bank feels that a business has a higher risk, it will consider stricter conditions for it, including the demand for higher collateral. Interest rate is one of the other factors that prevent financing. Banks usually argue that high credit costs are beyond their control because the base interest rate is set by central banks; however, the interest rate offered by banks is much higher compared to the base rate offered by central banks. On the other hand, access to financing, especially through banks, depends on whether the company can provide collateral to take a loan [8]. According to the regulations on recognition of knowledge-based companies and institutions, knowledge-based companies are private or cooperative institutions that aim to increase science and wealth, economic development based on knowledge and realize scientific and economic goals in line with the expansion of invention and innovation and finally the commercialization of results. Research and development (including design and production of goods and services) is formed in the field of superior technologies with a lot of added value (especially in the production of related software). According to the approved regulations, knowledge-based companies have goals such as encouraging the faculty of universities and research units to do more activities to meet the needs of society and the possibility of increasing the income of faculty members, commercialization of research findings, increasing the specific income of universities and research units, the general theme of knowledge-based activities are following Therefore, knowledge-based companies seek to provide financial resources for their activities to meet the needs of the society, but unfortunately, they are facing a lack of financial resources, and to provide financial resources, there are many methods, and on the other hand, there are time limits and etc. Therefore, this concern made the researcher ask the question, what is the optimal financing model for small and medium knowledge-based businesses?

2 Research methodology

The current research method is a combination (mixed) in which qualitative and quantitative methods are used together. In this research, after identifying the dimensions and indicators of the model and designing the final research model, qualitative data has been used to develop and localize the indicators of the conceptual model. Then this conceptual model is quantitatively tested using the analogical approach which is necessary and necessary in creating research hypotheses.

2.1 Society and statistical research sample

The statistical population of the current research is defined in two parts, Delphi and quantitative, as follows:

A) Qualitative section: In the qualitative section, the present research community includes financial experts, especially financing and investment companies, as well as senior managers of small and medium-sized knowledge-based businesses in Tehran. Experts are people who have the following characteristics:

1- University professors in the field of finance and financing companies

2- Having management experience in one of the knowledge-based small and medium businesses for 5 years

3- Master's degree or higher in finance and accounting or management

4- Has a history of working in the financial sector of knowledge-based small and medium businesses for 10 years

2.2 Research data collection methods and tools

The method of data collection in this research is done in two ways or the following methods:

1- Library method: The library method is used to collect necessary data and information regarding the theoretical foundations of the research and to understand and explain the variables as well as the background of the research. In this research, the theoretical foundations and the background of the research are collected through the library, articles and the Internet and are used in the form of analogical reasoning and in rejecting or proving the research hypotheses by applying appropriate statistical methods.

2- Field method: data collection was done by field method in this research in two stages:

1- Qualitative section: To collect the data of the qualitative section, three plans can be used:

- In-depth interviews
- Structured interviews

- Semi-structured interviews

In the qualitative part of this research, semi-structured interviews were used, that is, a series of questions were determined in advance, but during the interview, depending on the conditions and circumstances of the interview, other questions arose and were asked to the respondents during the interview.

2- Quantitative part: In the quantitative part, based on the criteria extracted from the qualitative stage, a researcher-made questionnaire was used to compare financing methods in knowledge-based companies based on the criteria determined to collect the required data. After obtaining the validity (construct validity using the factor analysis method), it was given to the respondents and they were asked to answer the questions if they were satisfied and interested. After completing the required number of questionnaires for statistical analysis, the total raw data was collected and analyzed using statistical software.

2.3 Research data analysis method

2.3.1 Data analysis of the qualitative section

Inductive qualitative content analysis was used to analyze the qualitative data of the research. In this plan, the steps of analyzing the collected qualitative data have been done in three stages: open coding, central coding, and selective coding.

2.3.2 Method of analysis of quantitative data

Considering that one of the objectives of the research is prioritizing financing methods, we use a pairwise comparison questionnaire, an example of which is presented below:

Table 1: Example of paired comparison questionnaire

	Questionnaire No. 1 (Determining the importance of criteria assuming no dependence between them): Determine the importance of each of the following criteria in relation to another factor. For example, what is the financial importance to the customer?																	
1	Index 2	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Index 1
2	Index 3	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Index 1
3	Index 4	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Index 1
4	horn 31	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Index 2
5	Index 4	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Index 2
6	Index 4	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Index 3

In this section, after identifying financing methods as well as their evaluation criteria, a paired comparison questionnaire is used to compare financing methods side-by-side based on evaluation criteria. After distributing the paired comparison questionnaire among the experts and collecting them using the ANP network analysis method, the evaluation and prioritization of financing methods in small and medium knowledge-based businesses will be done

2.3.3 Steps of ANP network analysis method

- Creating a network diagram of the research: in this step, the problem should be divided into criterion levels and, if there are sub-criteria and options, and the relationships between them should be determined. A very important point in this step is the existence of relationships between standards. These relationships can be specified in several ways. You can find out the relationships between standards by asking experts or by using methods such as the Dimtel method or the ISM method.

- Forming the matrix of paired comparisons: in this step, the elements of each level are compared in pairs to other related elements at a higher level and matrices of paired comparisons are formed. Also, at the end, a pairwise comparison of internal relationships should be made. These pairwise comparisons should be answered by Mr. Saati's 9-point spectrum, which is given below.

- Calculation of inconsistency rate: In this step, we calculate the inconsistency rate of ANP. If this rate is less than 0.1, it indicates the consistency of the matrix.

- Forming the initial super matrix: Using the weight of the pairwise comparisons, we form the initial super matrix. The initial supermatrix is the weights obtained in step 2 from pairwise comparisons.

- Creation of balanced supermatrix: After creating the initial supermatrix, the balanced supermatrix must be created.

- Creation of the limit supermatrix: the balanced supermatrix must be raised to the infinite power so that each row converges to a number and that number is the weight of that criterion or subcriterion or option.

3 Findings

The collected data has been analyzed using MaxQuda software and ANP method. In this part, the results of the data analysis are reviewed and the research questions are answered.

3.1 First part: Analysis of qualitative findings (identification of financing methods)

Axial coding: After open coding, which was done separately for each interviewee in the previous tables, in the next step, axial coding was done. At this stage, after performing open coding and determining financing methods in small and medium-sized companies, the extracted codes that are similar are placed in a group or category. In fact, the methods that are the same axis are categorized in the form of appropriate axis codes. The results of open coding and core codes are presented in table 1.

Table 2: Results of open coding and axial coding

Selective encoding	Main financing tools (code-oriented)	Financing methods (open source)
Financing methods for small and medium-sized knowledge-based companies	Internal financing of the company	Funding through members' personal resources
		Cash contributions of partners
		Pledge the property of the owners
		sale of property
		Retained earnings (no dividend)
	Financing through capital	Business angels
		Increasing members' shares
		Change in stock value
		Financing through partners
	Debt financing	Managed funds
		Government aid in Iran
		Technical and credit assistance
		Short term loans from banks and financial institutions
		Long-term loans from banks and financial institutions
	Private sources of financing	Private resources of the founders
		Funding from friends and family
	People's contributions	Financing through local centers
		Funding from donors
	New financing methods	Reduction of bureaucracy
		The company's relationship with other companies
		Use of consulting services
		Reducing collateral problems
		Removal of legal restrictions

The results of axial coding show that financing methods for small and medium-sized knowledge-based companies are divided into six main methods, which include financing through the company's internal resources, financing through capital, financing through debt, financing from through private sources, financing through public participation and new methods of financing. Each of these main methods has several financing strategies or methods for small and medium-sized knowledge-based companies, which can be seen in Table (16-4). In the following, the diagram of the financing model for small and medium-sized knowledge-based companies is presented, which consists of the main methods and sub-sections of each of the main methods. In the following, the graphic model of financing methods in small and medium-sized knowledge-based companies is presented. In order to know more about financing methods, in this section, the sub-category methods of each of the main methods have been introduced with sub-diagrams.

3.2 ANP network analysis (ranking of financing methods)

The first step is to form a hierarchical research model. In this research, the goal is to prioritize financing methods for small and medium-sized knowledge-based companies. In this model, we have 6 main methods, each of which has other subsections. Therefore, the research model is drawn as follows:
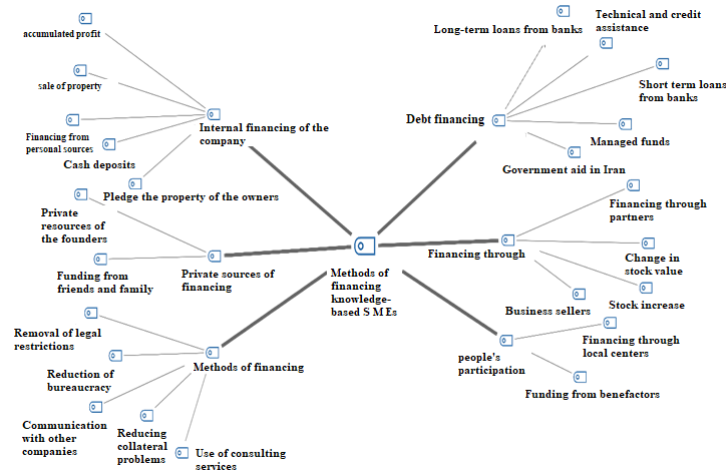
Figure 1: Proposed model of financing methods for small and medium businesses
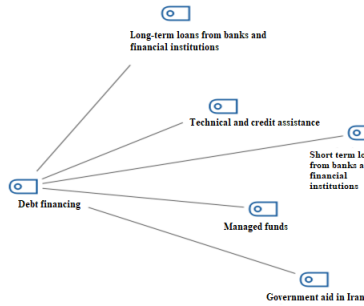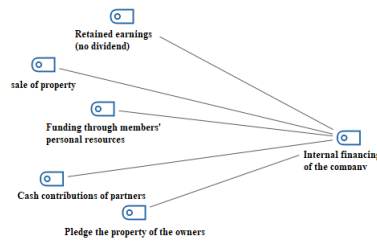

Figure 2: Debt financing methods

Figure 3: Financing methods through the company's internal sources
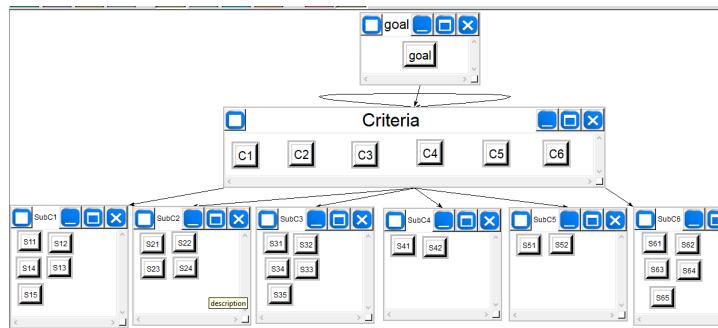

Figure 4: Hierarchical diagram of the research model

The purpose of the hierarchical research model is to prioritize financing methods for small and medium-sized knowledge-based companies. For this issue, we have 6 financing methods, each of which has its own subset methods.

Table 3 shows the components of the model and their symbols in the research model.

Table 3: Results of open coding and axial coding

The main means of financing	icon	Financing methods (open source)	symbol
Internal financing of the company	C1	Funding through members' personal resources	S11
		Cash contributions of partners	S12
		Pledge the property of the owners	S13
		sale of property	S14
		Retained earnings (no dividend)	S15
Financing through capital	C2	Business angels	S21
		Increasing members' shares	S22
		Change in stock value	S23
		Financing through partners	S24
Debt financing	C3	Managed funds	S31
		Government aid in Iran	S32
		Technical and credit assistance	S33
		Short term loans from banks and financial institutions	S34
		Long-term loans from banks and financial institutions	S35
Private sources of financing People's contributions	C4	Private resources of the founders	S41
		Funding from friends and family	S42
	C5	Financing through local centers	S51
		Funding from donors	S52
New financing methods	C6	Reduction of bureaucracy	S61
		The company's relationship with other companies	S62
		Use of consulting services	S63
		Reducing collateral problems	S64
		Removal of legal restrictions	S65

3.3 Pairwise comparison of financing methods with respect to the goal

Due to the existence of internal relationships between the criteria, the ANP network analysis method is used for weighting and ranking. First, pairwise comparisons are created and given to 15 experts. After collecting the paired comparisons, their inconsistency rate was calculated, all of which are less than 0.1, which indicates the consistency of the pairwise comparisons matrix, then they We integrate it with the geometric mean method and enter it into the Superdesign software for weighting and ranking. The ANP model is created in the Superdesign software and the integrated paired comparisons are entered in the software. The results are as follows.

Table 4: Pairwise comparison of financing methods with respect to the target (inconsistency rate: 0.04)

	C1	C2	C3	C4	C5	C6	Weight
C1	1	0.551	0.506	0.236	0.278	0.345	0.507
C2	1.815	1	1.552	0.506	0.168	0.214	0.648
C3	1.976	0.644	1	0.469	0.435	0.415	0.494
C4	1.506	1.438	0.347	1	0.419	0.215	0.372
C5	0.598	0.612	0.417	0.378	1	0.439	0.218
C6	0.526	0.638	0.217	0.486	0.875	1	0.248

3.3.1 Pairwise comparison of subset methods

In this section, the subgroup methods of each of the main methods are compared and evaluated. In this section, for each of the main methods, several methods are defined as a subset of the main method, which are compared two by two. The results of the paired comparison of the subgroup methods in the ANP model were created in the Superdesign software and the integrated paired comparisons were entered into the software, and the results are as follows.

Financing methods for small and medium-sized knowledge-based companies are divided into six main methods, which include financing through the company's internal resources, financing through capital, financing through debt, financing through private sources, financing Through public participation and new financing methods.

3.3.2 Formation of the primary super matrix

In this section, using the weights obtained in the previous step, we form the initial super matrix.

Table 5: Pairwise comparison of methods of the internal financing method of the company (C1) (inconsistency rate: 0.03)

	S11	S12	S13	S14	S15	Weight
S11	1	2.878	0.575	2.08	1.439	0.173
S12	0.347	1	0.333	0.500	0.321	0.065
S13	1.739	3.003	1	2.153	1.740	0.245
S14	0.480	2	0.464	1	0.475	0.099
S15	0.695	3.115	0.575	2.105	1	0.154

Table 6: Pairwise comparison of the methods of the subcategory of financing through capital (C2) (inconsistency rate: 0.08)

	S21	S22	S23	S24	Weight
S21	1	0.616	0.396	0.552	0.141
S22	1.623	1	0.411	0.444	0.171
S23	2.525	2.433	1	0.86	0.348
S24	1.812	2.252	1.163	1	0.341

Table 7: Pairwise comparison of debt financing method subcategory (C3) (inconsistency rate: 0.06)

	S31	S32	S33	S34	S35	Weight
S31	1	1.187	1.072	1.101	1.177	0.452
S32	0.485	1	0.662	2.582	1.072	0.327
S33	1.329	1.421	1	1.137	0.398	0.492
S34	0.985	0.865	0.464	1	1.524	0.168
S35	0.908	0.387	0.880	0.312	1	0.078

Table 8: Pairwise comparison of the methods of the subcategory of financing through private sources (C4) (inconsistency rate: 0.07)

	S41	S42	Weight
S41	1	1.802	0.643
S42	0.555	1	0.357

Table 9: Pairwise comparison of the methods of the subcategory of financing through public participation (C5) (inconsistency rate: 0.03)

	S51	S52	Weight
S51	1	2.429	0.708
S52	0.412	1	0.292

Table 10: Pairwise comparison of the new methods of financing (C6) (inconsistency rate: 0.02)

	S61	S62	S63	S64	S65	Weight
S61	1	0.846	2.188	0.64	0.711	0.137
S62	1.182	1	1.512	1.146	0.953	0.173
S63	0.457	0.661	1	0.627	0.372	0.085
S64	1.558	0.8726	1.595	1	1.413	0.202
S65	1.406	1.049	2.688	0.708	1	0.160

3.3.3 Formation of balanced super matrix

After forming the primary super matrix, the balanced super matrix must be created. The balanced super matrix is obtained by normalizing the primary super matrix.

3.3.4 Formation of the limiting super matrix

We raise the weighted super matrix to the infinite power so that it converges. The converged matrix is the bounded super matrix.

Table 11: Initial super matrix

	C1	C2	C3	C4	C5	C6	goal
C1	0	0.643	0.567	0.568	0.468	0.541	0.507
C2	0.708	0	0.433	0.427	0.374	0.387	0.648
C3	0.292	0.357	0	0.369	0.412	0.412	0.494
C4	0.168	0.278	0.292	0	0.457	0.319	0.372
C5	0.217	0.165	0.322	0.176	0	0.228	0.218
C6	0.329	0.246	0.132	0.108	0.098	0	0.248
goal	0	0	0	0	0	0	0
S11	0.173	0	0	0	0	0	0
S12	0.065	0	0	0	0	0	0
S13	0.245	0	0	0	0	0	0
S14	0.099	0	0	0	0	0	0
S15	0.154	0	0	0	0	0	0
S21	0	0.141	0	0	0	0	0
S22	0	0.171	0	0	0	0	0
S23	0	0.348	0	0	0	0	0
S24	0	0.341	0	0	0	0	0
S31	0	0	0.452	0	0	0	0
S32	0	0	0.327	0	0	0	0
S33	0	0	0.492	0	0	0	0
S34	0	0	0.168	0	0	0	0
S35	0	0	0.078	0	0	0	0
S41	0	0	0	0.643	0	0	0
S42	0	0	0	0.357	0	0	0
S51	0	0	0	0	0.708	0	0
S52	0	0	0	0	0.292	0	0
S61	0	0	0	0	0	0.137	0
S62	0	0	0	0	0	0.173	0
S63	0	0	0	0	0	0.085	0
S64	0	0	0	0	0	0.202	0
S65	0	0	0	0	0	0.160	0

3.3.5 determining the final weight of financing methods

The results of prioritization of financing methods for small and medium-sized knowledge-based companies show that the method of financing through capital (sale of shares) with a weight of 0.198 is in the first place among financing methods. Also, after that, the method of financing through the company's internal resources with a weight of 0.180 is the second most important method of financing for small and medium-sized knowledge-based companies.

Further, the results show that the debt financing method has a weight of 0.152, modern financing methods have a weight of 0.150, the financing method has a weight of 0.147, and the financing method has a weight of 0.147. 0.136 ranks the most important financing methods for small and medium-sized knowledge-based companies (Figure 5).

Graphic	Alternatives	Normal	Ranking
	Financing through the company's internal resources	0.180	2
	Financing through capital	0.198	1
	Debt financing	0.152	3
	Financing through private sources	0.147	5
	Funding through public contributions	0.136	6
	New financing methods	0.150	4

Figure 5: Ranking of the main financing methods

Regarding the methods under the set of main methods of financing, the results show that financing through members' personal resources with a weight of 0.096, change in stock value with a weight of 0.0656, financing through partners with a weight of 0.064, administration funds with a weight of 0.063 and pledging the property of the owners with a weight of 0.063 are in the first to fifth ranks of the most important financing methods for small and medium-sized knowledge-based companies.

Table 12: Balanced super matrix

	C1	C2	C3	C4	C5	C6	goal
C1	0	0.381	0.325	0.345	0.259	0.287	0.204
C2	0.413	0	0.248	0.259	0.207	0.205	0.261
C3	0.170	0.211	0	0.224	0.228	0.218	0.199
C4	0.098	0.165	0.167	0	0.253	0.169	0.150
C5	0.127	0.098	0.184	0.107	0	0.121	0.088
C6	0.192	0.146	0.076	0.066	0.054	0	0.100
goal	0	0	0	0	0	0	0
S11	0.235	0	0	0	0	0	0
S12	0.088	0	0	0	0	0	0
S13	0.333	0	0	0	0	0	0
S14	0.135	0	0	0	0	0	0
S15	0.209	0	0	0	0	0	0
S21	0	0.141	0	0	0	0	0
S22	0	0.171	0	0	0	0	0
S23	0	0.348	0	0	0	0	0
S24	0	0.341	0	0	0	0	0
S31	0	0	0.298	0	0	0	0
S32	0	0	0.216	0	0	0	0
S33	0	0	0.324	0	0	0	0
S34	0	0	0.111	0	0	0	0
S35	0	0	0.051	0	0	0	0
S41	0	0	0	0.643	0	0	0
S42	0	0	0	0.357	0	0	0
S51	0	0	0	0	0.708	0	0
S52	0	0	0	0	0.292	0	0
S61	0	0	0	0	0	0.181	0
S62	0	0	0	0	0	0.229	0
S63	0	0	0	0	0	0.112	0
S64	0	0	0	0	0	0.267	0
S65	0	0	0	0	0	0.211	0

Table 13: Limiting super matrix

	C1	C2	C3	C4	C5	C6	goal
C1	0.190	0.190	0.190	0.190	0.190	0.190	0.190
C2	0.188	0.188	0.188	0.188	0.188	0.188	0.188
C3	0.152	0.152	0.152	0.152	0.152	0.152	0.152
C4	0.147	0.147	0.147	0.147	0.147	0.147	0.147
C5	0.136	0.136	0.136	0.136	0.136	0.136	0.136
C6	0.125	0.125	0.125	0.125	0.125	0.125	0.125
S11	0.122	0.122	0.122	0.122	0.122	0.122	0.122
S12	0.118	0.118	0.118	0.118	0.118	0.118	0.118
S13	0.115	0.115	0.115	0.115	0.115	0.115	0.115
S14	0.112	0.112	0.112	0.112	0.112	0.112	0.112
S15	0.088	0.088	0.088	0.088	0.088	0.088	0.088
S21	0.067	0.067	0.067	0.067	0.067	0.067	0.067
S22	0.058	0.058	0.058	0.058	0.058	0.058	0.058
S23	0.033	0.033	0.033	0.033	0.033	0.033	0.033
S24	0.012	0.012	0.012	0.012	0.012	0.012	0.012
S31	0.047	0.047	0.047	0.047	0.047	0.047	0.047
S32	0.029	0.029	0.029	0.029	0.029	0.029	0.029
S33	0.050	0.050	0.050	0.050	0.050	0.050	0.050
S34	0.026	0.026	0.026	0.026	0.026	0.026	0.026
S35	0.032	0.032	0.032	0.032	0.032	0.032	0.032
S41	0.065	0.065	0.065	0.065	0.065	0.065	0.065
S42	0.064	0.064	0.064	0.064	0.064	0.064	0.064
S51	0.017	0.017	0.017	0.017	0.017	0.017	0.017
S52	0.021	0.021	0.021	0.021	0.021	0.021	0.021
S61	0.010	0.010	0.010	0.010	0.010	0.010	0.010
S62	0.025	0.025	0.025	0.025	0.025	0.025	0.025
S63	0.020	0.020	0.020	0.020	0.020	0.020	0.020
S64	0.012	0.012	0.012	0.012	0.012	0.012	0.012
S65	0.018	0.018	0.018	0.018	0.018	0.018	0.0

Table 14: Final weight of financing methods

The main means of financing		Financing methods (open source)	Weight	Final weight
Internal financing of the company	0.190	Funding through members' personal resources	0.235	0.096
		Cash contributions of partners	0.088	0.016
		Pledge the property of the owners	0.333	0.063
		sale of property	0.135	0.025
		Retained earnings (no dividend)	0.209	0.039
Financing through capita	0.188	Business angels	0.141	0.026
		Increasing members' shares	0.171	0.032
		Change in stock value	0.348	0.065
		Financing through partners	0.341	0.064
Debt financing	0.152	Managed funds	0.298	0.063
		Government aid in Iran	0.216	0.045
		Technical and credit assistance	0.324	0.032
		Short term loans from banks and financial institutions	0.111	0.049
		Long-term loans from banks and financial institutions	0.051	0.056
Private sources of financing	0.147	Private resources of the founders	0.643	0.007
		Funding from friends and family	0.357	0.024
People's contributions	0.136	Financing through local centers	0.708	0.052
		Funding from donors	0.292	0.036
New financing methods	0.150	Reduction of bureaucracy	0.181	0.039
		The company's relationship with other companies	0.229	0.022
		Use of consulting services	0.112	0.014
		Reducing collateral problems	0.267	0.033
		Removal of legal restrictions	0.211	0.026

Table 15: Final weight of financing methods

The main means of financing	Weight	rank
Financing through the company's internal resources	0.180	2
Financing through capital	0.198	1
Debt financing	0.152	3
Financing through private sources	0.147	5
Funding through public contributions	0.136	6
New financing methods	0.150	4

Table 16: Final weight of financing methods

Methods of financing	Weight	rank
Funding through members' personal resources	0.096	1
Cash contributions of partners	0.016	19
Pledge the property of the owners	0.063	5
sale of property	0.025	16
Retained earnings (no dividend)	0.039	10
Business angels	0.026	14
Increasing members' shares	0.032	13
Change in stock value	0.065	2
Financing through partners	0.064	3
Managed funds	0.063	4
Government aid in Iran	0.045	9
Technical and credit assistance	0.032	13
Short term loans from banks and financial institutions	0.049	8
Long-term loans from banks and financial institutions	0.056	6
Private resources of the founders	0.007	21
Funding from friends and family	0.024	17
Financing through local centers	0.052	7
Funding from donors	0.036	11
Reduction of bureaucracy	0.039	10
The company's relationship with other companies	0.022	18
Use of consulting services	0.014	20
Reducing collateral problems	0.033	12
Removal of legal restrictions	0.026	14

4 Conclusion

In the current research, the design of the financing model for knowledge-based small and medium-sized businesses was done using a mixed method, in which qualitative and quantitative methods were used together. After identifying the dimensions and indicators of the model and designing the final research model, qualitative data has been used to develop and localize the indicators of the conceptual model. Then, this conceptual model was quantitatively tested using a comparative approach. In-depth interviews and coding analysis have been used to design the financing model for small and medium-sized knowledge-based businesses. In the first part, open coding of the interview data has been done. In this section, the concepts and categories presented in the interviews with experts were identified and extracted.

Financing is the process of providing financial resources necessary for the business activities of a company. Financing is done in two main ways, which include creating debt and equity. Decisions related to the financing of companies are some of the most important decisions made by managers of economic units. These types of decisions are related to the capital structure and determining and choosing the best financing method.

In the next step, axial coding is done. At this stage, after performing open coding and determining financing methods in small and medium-sized companies, the extracted codes that are similar are placed in a group or category. The results of axial coding showed that financing methods for small and medium-sized knowledge-based companies are divided into six main methods, which include financing through the company's internal resources, financing through capital, financing through debt, financing from private sources, financing through public participation and new methods of financing. Due to the existence of internal relationships between criteria, the ANP network analysis method was used for weighting and ranking. First, pairwise comparisons were created and provided to 15 experts. After collecting the paired comparisons, their inconsistency rate was calculated, all of which are less than 0.1, which indicates the consistency of the pairwise comparison matrix, then they were compared with the geometric mean method was integrated and entered into Superdesign software for weighting and ranking. The ANP model was created in the superdesign software and the integrated pairwise comparisons were entered into the software.

The results of prioritization of financing methods for small and medium-sized knowledge-based companies show that the method of financing through capital (sale of shares) with a weight of 0.198 is in the first place among financing methods. Also, after that, the method of financing through the company's internal resources with a weight of 0.180 is the second most important method of financing for small and medium-sized knowledge-based companies. Further, the results show that the debt financing method weights 0.152, modern financing methods have a weight of 0.150, the financing method has a weight of 0.147, and the financing method has a weight of 0.147. 0.136 ranks the most important financing methods for small and medium-sized knowledge-based companies.

References

[1] U.I. Atah, M.O. Mohammed, E.R. Adawiyya, and A.A. Adeyemi, *Proposed secured bay-salam model for financing agriculture by Islamic banks*, Int. J. Manag. Appl. Res. **6** (2019), no. 4, 181–195.

[2] M.M.S. Billah, *Sukuk Paradigm and Structure*, Chapter 23, Islamic Financial Products, Springer Press, 2019, pp. 299-325.

[3] L. Dandara, *The particularities of the social capital changes of joint stock companies according to national legislation*, J. Res. Trade Manag. Econ. Dev. **15** (2021), no. 1, 86–105.

[4] S. Darjay, *Performance of common stock market and relationship between common stock return and inflation: A Bhutanese case study*, Bhutan J. Bus. Manag. **15** (2022), no. 1, 15–26.

[5] A. Gibadullina, *Rent and financial accumulation: locating the profitability of American finance*, New Politic. Econ. **28** (2022), no. 2, 259–283.

[6] Y. Gong and X. Wei, *Asset quality, financing structure, and bank regulations*, Int. Rev. Econ. Finance **80** (2022), no. 4, 1061–1075.

[7] J.R. Graham, *Presidential address: Corporate finance and reality*, J. Finance **77** (2022), no. 4, 1975–2049.

[8] E. Hirsch and D.N. Gellner, *Introduction: Ethnography of Organizations and Organizations of Ethnography*, Routledge, 2020.

[9] R. M. Hull and J. B. Hull, *Taxpayer wealth and federal tax revenue under a tax policy that shields retained earnings used for growth from taxes*, eJTR **19** (2021), no. 1, 48-65.

[10] S.G. Jun and F.C. Jen, *Trade-off model of debt maturity structure*, Rev. Quant. Finance Account. **20** (2003), no. 3, 5–34.

[11] M. Klausner, M. Ohlrogge, and E. Ruan, *A sober look at SPACs*, Yale J. Regul.**39** (2022), no. 1, 20–48.

[12] A. Lahsasna, K.M. Hassan, and R. Ahmad, *Forward Lease Sukuk in Islamic Capital Markets*, Springer Books, 2018.

[13] E.M. Meemken and M.F. Bellemare, *Smallholder farmers and contract farming in developing countries*, Proc. Nat. Acad. Sci. **117** (2020), no. 1, 259–264.

[14] N. Ndjeck and N.G.O.M. Anita, *How do SMEs ensure a balanced financial structure despite bank credit rationing?*, J. Econ.Lib. **9** (2022), no. 1, 19–37.

[15] A.A. Saidi, E.B. Uchenna, and M.S. Ayodele, *Bank loans and small medium enterprises'(SMES) performance in Lagos, Nigeria*, Ilorin J. Human Resource Manag. **3** (2019), no. 1, 52–61.

[16] F. Vitolla, A. Salvi, N. Raimo, F. Petruzzella, and M. Rubino, *The impact on the cost of equity capital in the effects of integrated reporting quality*, Bus. Strategy Envir. **29** (2020), no. 2, 519–529.