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A STUDY OF INTELLECTUAL POTENTIAL OF A MICRO-BUSINESS

Abstract

The article presents approaches to analyzing the intellectual potential of entrepreneurial structures. The author proposes to carry out analysis of the intellectual potential of micro-business on the basis of fuzzy set techniques.

Key words:

Fuzzy logic, incidence matrix, intellectual potential, key entrepreneurial competences.

JEL: D0.

Introduction

In the context of speedy shaping of a new, «intellectual» economy, a need has risen to study the state and analysis of the intellectual potential in business structures of various types.

From the standpoint of the enterprise theory, a subject of entrepreneurial activity is defined as a specific entity which reveals private interests through entrepreneurial functions – initiative, management and risk [1]. The organizational

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form of the subject of entrepreneurial activity is understood as "an integral system of interdependent structural, cultural, spatial and technological components, which shape the specific nature, design and order of the event flow" [2: 4]. Proceeding from these definitions, we can consider modern entrepreneurial subjects as the structures with various degree of integration of internal and external flows of information, knowledge and materials. Therefore, the operation of entrepreneurial entities should be viewed through the prism of their intellectual capital, whereas integration opportunities – through the prism of intellectual potential [3].

Intellectual potential of entrepreneurial structures is the possibilities provided by intellectual resources at the given time and in the future that can used to solve a set task or reach a specific goal. This means that *intellectual potential* consists not of the elements of intellectual capital by themselves, but of their combination and the ability to manage the knowledge about their potentials [3].

Proceeding from the above-mentioned considerations, we suggest to view intellectual potential as a system of inherent elements (intellectual capital and knowledge management system), ties and properties (innovativeness, competitive capacity, energy and information), and a support system (informational, functional and organizational support) [3].

The study and analysis of intellectual potential in aspect of its element structure stipulates for the definition of, for example, resource potential on the stages of production and sales, intellectual resource of management on these stages, etc. [4, 5, 6].

Therefore, the problem consists in both the selection of the element base for the analysis and in the choice of its goals and methods. When quantitative measurement of separate properties of intellectual potential is impossible to realize, it is necessary to use expert methods and fuzzy set logic.

The abovementioned preliminary investigation of the scope of research devoted to analysis of the intellectual potential in business structures brings us to following conclusions:

- the influence of information and intellectual factors on the performance of separate economic subjects and economic growth in general is of peculiar nature, and it constantly increases in response to the development of productive forces and complication of market agents' interaction mechanisms;

- the most theoretically and methodologically developed directions are the studies that investigate the influence of separate information and intellectual factors on the performance of business entities within the framework of the human capital concept and the theory of economic potentials;

- the problems of forming the firm's intellectual assets as an aggregate of all information and intellectual development factors are being actively discussed recently in academic and applied literature, although

the mechanisms of forming and using such assets, as well as their influence on the economic performance of enterprises and economic growth in general require deeper theoretical consideration and methodological formalization.

The development of theoretical thought under the conditions of knowledge economy proliferation stipulates for the research of collective, individual and institutional knowledge. These studies are realized along economic, financial, sociological, and information dimensions as reflected in the following theories:

- dialectics of social systems development (A. Bogdanov, V. Kuzmin, I. Blauberg, Ye. Yudin, V. Fofanov);

- theories of intellectual capital and human capital (A. Brooking, T. Steward, M. Marynycheva, N.V. Perepelytsya);

- managerial theories of constructing new, key competence-based organizational structures (Prahalad and Hamel, T. Bilorus, H. Rampersad).

For the analysis of intellectual potential of business structures at the micro-level, we suggest to use a complex method formed by means of integrating expert and formalized methods based on fuzzy logic.

Let us consider separate elements of the theory of fuzzy sets, which are used for algorithm of revealing hidden influences on the effectiveness of business-plan realization at the level of micro-business (start-up entrepreneur) [7; 8; 9].

A fuzzy set of studied elements A

$$A = \{(x, \mu_a(x)\} \tag{1}$$

is mathematically defined as a set of ordered pairs consisting of the elements x of ground set X and respective grades of membership $\mu_a(x)$

$$\mu_a(x) : X \rightarrow [0,1] \tag{2}$$

A fuzzy connection R between sets X and Y will be called a function

$$R : X \times Y \rightarrow L, \tag{3}$$

where L is a complete distributive lattice.

If sets X and Y are finite, the fuzzy relationship R between X and Y can be presented by a relationship set. The rows and columns in such a set represent elements X and Y, whereas an intersection of row x and column y defines element $R(x, y)$.

The diagnostics of the realization of intellectual potential of an entrepreneur and indicators of intellectual potential of a business and their relationships in a formalized form can be presented as

$$S = \{P_i, V_j\}, \tag{4}$$

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where P_i is the list of analyzed attributes: entrepreneur's managerial competences (K), indicators of intellectual potential of a business (B), business-plan activities (E);

$$P_i = \{K, B, E\} \tag{5}$$

V_j – dependences between the attributes of the 1st and 2nd grades.

The influences of some attributes upon the others $K \to B$, $B \to E$, $K \to E$ are defined by expert techniques.

The sets of intellectual potential attributes are described in the following way:

$$K = \{k_1, \ldots k_i, \ldots k_n\} \tag{6}$$

$$B = \{в_1, \ldots в_j, \ldots в_m\} \tag{7}$$

$$E = \{e_1, \ldots e_l, \ldots e_d\} \tag{8}$$

Attributes are interdependent, i. e. the value of attribute «k» can be determining for a certain element of attribute «b», the value of «b» is determining for elements of attribute «e».

The **objective** of investigating the intellectual potential of a micro-business with the help of complex methods (expert methods and fuzzy logic) is to determine the characteristics of intellectual potential and to reveal the level of dependences between them.

Presentation of Main Material

Summarizing the experience of foreign and Ukrainian scientists in using various methods of measuring economic performance and intellectual assets, we propose a methodology of assessing the intellectual potential of a start-up entrepreneur, which combines quantitative and qualitative parameters of measurement and reflects it element selection requirements.

In order to combine the quantitative parameters of measurement with qualitative parameters of element-wise evaluation of intellectual potential of entrepreneurial structures, a stage-by-stage methodology of intellectual potential analysis methodology is offered.

Stage 1. Analysis on the basis of external public reporting data with the help of quantitative and financial indicators of business activity.

Stage 2. Analysis and measurement of qualitative parameters of intellectual capital on the basis of personnel interviewing data and expert data.

Stage 3. Establishment of the relationship between the indicators and characteristics on the basis of matrix measurement and analysis techniques.

Stage 4. Calculations of integral evaluation indices and econometric measures of intellectual potential's influence on performance.

The analysis of micro-business's intellectual potential requires that the specifics of the element structure of this potential be taken into account. In its simplified version, the intellectual potential (IP_M) of the micro-business has the following structure: the intellectual potential of a start-up entrepreneur ($I\Pi_n$) and the intellectual potential of the business idea realized on the given location ($I\Pi_{6i}$).

$$I\Pi_M = I\Pi_n + I\Pi_{6i} \qquad (9)$$

The intellectual potential of a beginner entrepreneur is formed by his key competences. It is feasible to use the term «key competences» in several aspects: 1) to designate the presence of skills and knowledge in some sphere of activity (or personnel competence as such); 2) to denote the conformity of the requirements of enterprise development strategies with market requirements [7].

Therefore, let us consider three sets of attributes of enterprise's intellectual potential R: K, B, $E \subset R$ (micro-business intellectual potential).

The entrepreneur's competences «k» include:

1. Planning and forecasting of business activity;

2. Personnel management skills;

3. Creative innovative thinking;

4. Goal-setting and task-forming skills;

5. Knowledge obtaining and formulation skills;

6. Ability to organize the realization of tasks;

7. Knowledge of product competitiveness depending on its properties;

8. Knowledge of business competitiveness depending on its location;

9. Knowledge of customer needs;

10. Knowledge of marketing channels.

Business characteristics are described in Table 1.

Mutual influences of these attributes can be presented with an incidence matrix:

$$A = \{a_{ij}\} \qquad a_{ij} = k_i / \text{в}_j \qquad (10)$$

$$D = \{d_{jl}\} \qquad d_{jl} = \text{в}_j / e_l \qquad (11)$$

$$C = \{c_{il}\} \qquad c_{il} = k_i / e_l \qquad (12)$$

Table 1.

Business characteristics list

Intellectual potential of business «*b*»	Activities of business-plan «e»
State support of business	«Expenses-profits» production planning
Partnership relations among employees and in business	Determining a system of solvency risks
Level of competition within the territory	Determining competitive advantages of business and supplier location
High consumption level	Competitive advantages of sales
Strategic character of business activity	Competitive advantages of production
Level of employee professionalism Strategy of using licenses (franchising)	Personnel management (rewards, wages, training, etc) Organizing sales(discounts, merchandising, etc)
Strategy of selecting a business of optimally small size	Short payback period, employing a minimal number of personnel
Strategy of participating in the product of a large business	Organizing deliveries and distribution
Developed sales network	Accounting for sales and researching custormer needs, long-term supplier contracts

If one attribute produces influence on another one, it is designated by 1, if such influence is absent – by 0 [1]. Expert techniques are used to assess how the key managerial competences influence the indicators of intellectual potential, and how the level of intellectual potential affects the effectiveness of business-plan realization; fuzzy logic transformations are used to reveal the hidden influences of managerial competence on business realization [1].

The tasks of the expert method aided by fuzzy logic techniques are the following:

1. To design a list of intellectual characteristics of an entrepreneur and business ideas.

2. To design a list of business-plan activities which ensure business success.

3. To assess – with the help of expert dimensions -- the influence of strategic business characteristics, managerial competences and beginner-entrepreneur's knowledge on the outcomes of business-plan activities realization.

The algorithm of implementation requires that the following dependences be defined.

1. To determine the correlation between intellectual potential indicators and business-plan activities (numerical correlation matrix 10x10).

2. To determine the correlation between entrepreneur's characteristics and business-plan activities (matrix 10 x 10);

3. To construct respective matrices for:

- expert competences assessment (divergence of valuations);

- determinations of characteristics that produce key influence on business success;

- estimation of the most effective cost allocation among business-plan activities.

In order to implement the tasks, experts should be interviewed:

1) on the degree of influence of each entrepreneur's characteristic (competences) on each business-plan activity;

2) on the effective distribution of costs among business-plan activities, i.e. on the degree of influence of each business-plan activity on business performance.

The application of matrix operations algorithms [8; 9] allows defining the matrix of hidden influences Δ_{il}.

Conclusions

The peculiarities of business activity under the conditions of knowledge economy demand changes in the methods of solving complex problems of business structures' operation and development, and appearance of new approaches to the analysis of business practice.

Research methods are techniques of carrying out a study. The selection of research methods, integration of different research methods allows to realize an adequate diagnostics of the state of the complex economic system and reveal the directions of change.

It is impossible to assess and describe the relationship between key competences, elements of intellectual potential and business-plan activities with the help of mathematical apparatus of statistics or other numerical techniques due to absence of quantitative measurements of these influences. The models of fuzzy logic, which apply the notion of incidence (influence), and incidences matrices, which describe the quantitative expert valuations of the influence of some factors upon the others, allow making a numerical description of the researched influences and revealing hidden (implicit) influences.

We suggest using the apparatus of fuzzy logic. Based on the notions of incidence (influence) and incidence matrices, which describe quantitative expert valuations of the influence of some factors on other factors, we can determine

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the degree of their influence and reveal hidden influences. The quantitative values will be a measure of business-plan implementation risk.

The proposed model is of scientific and practical interest, and can be used to develop practical techniques of firm's intellectual potential analysis and assessment of the risk of its crediting or financing.

Practical application of the proposed technique of analyzing the intellectual potential of business structures requires that the specifics and directions of business activity, potential of the location and reliability of expert valuations be taken into account.

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