

# Business sustainability management in the current scientific and technical climate

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**Abstract.** The article presents the indicators of managing modern business sustainability, based on the relevant innovative factor of its conduct at the current stage of management evolution. The choice of indicators is based on the postulates of the school of management science, which are most significantly manifested in the system of economic relations, including the commercial sector of the economy, and, accordingly, such resulting and factor indicators as changes in income and expenses, direct (direct) and indirect - a given (indirect) ratio of income and profit to process costs for the development, implementation, and application of innovations by entrepreneurs for the implementation of commercial projects. These relationships between changes in income and expenses were plotted through a combination of their various types (additive, multiplicative, multiple), which help to identify the degree of influence of each factor indicator (element of process costs) on the resulting indicators and take measures to maximize the result and minimize such costs using the computational-constructive method in its interaction with individual elements of mathematical analysis. The material is useful for entrepreneurs regardless of their commercial interests and organizational mechanism of economic management, for educational and scientific institutions and their students in economic and management programs, specialties, and profiles.

## 1 Introduction

The current economic climate has high and constantly accelerating rates of scientific and technological achievements, requiring all-encompassing creativity from the commercial sector, which, to a greater extent, exert influence on the state and development of the national economy. This, in turn, forces entrepreneurs to know the patterns of doing business, based on modern scientific and technical realities, which must be considered to achieve optimal results. These patterns relate, primarily, to innovative developments used in the implementation of business processes that have spread to all elements of entrepreneurship (main and secondary activities), as the effective use of resources consumed in the commercial sector of the economy depends on the technological factor, which is a fundamental condition for maximizing profits and profitability. Thus, a need

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arises in indicators that serve as a toolkit for analyzing business sustainability management, based on the above, for which the authors will consider the principles of its conduct, according to the development conditions of mod-ern science.

The works by researchers involved in business development in the context of scientific and technological advances served as information sources. These, according to the authors, include publications by E.G. Abramov [1], E.A. Berezina [2], A.I. Gromov [3], A.S. Krasnikova [4], V.V. Maslennikov [5], I. A. Mandych and A.V. Bykova [6], G.Ia. Ostaev [7], K. Pavlov [8], V.L. Tambovtsev [9], and N.M. Khubulava [10], containing the prerequisites for the indicators of business sustainability management formed by authors following the stage of management science.

The purpose of the formation of indicators of business sustainability management is to recommend entrepreneurs to apply their calculation method for their comprehensive business assessment based on the innovation factor and to obtain an objective result on the effective-ness and cost of commercial projects. Its achievement is based on solving several problems:

1. Presentation of the business principles, reflecting modern scientific and technical conditions.
2. Consideration of the elements of entrepreneurial expenses, based on the structure of technology costs.
3. Integration of the elements of process costs and the compared result into a single economic chain when calculating the financial benefits from entrepreneurial actions (the business sustainability assessment basis).

The tasks will be solved using methods and techniques most suitable for the selected research topic.

## **2 Methods**

The research is based on the calculation-constructive method, which integrates additive, multiplicative, and multiple combination when forming economic relationships between the resulting and factor indicators. This approach ensures the complexity and consistency of the analysis of changes in the result and costs, which serve as assessment criteria for business sustainability (quality of doing), and it should be combined with elements of mathematical analysis to detail the relationship of the investigated resulting and factor indicators.

Entrepreneurs, using the chosen methods to evaluate the indicators of business sustainability management, will be able to obtain, in general, and in particular, accurate information about the influence of factor indicators on the resulting indicators (for individual innovative elements) affecting the result and costs, which, in their turn, determine the efficiency and competitiveness of their activities.

## **3 Results**

The formation of indicators of business sustainability management should consider the prin-ciples of business management in terms of the development of modern science:

1. An in-depth division of labor between specialists engaged in innovative developments. In technical areas (mechanics, materials science, electrical engineering, electronics, comput-er science, robotics), information is actively consumed from related fields, which include both exact and natural sciences (mathematics, physics, chemistry, biology, ecology) and so-cio-economic and humanitarian sciences (economics, management, history, philosophy, po-litical science, sociology).

2. Differentiation of forms of innovation structure. These forms include test centers and laboratories, business incubators, industrial parks, technology parks and villages, technology transfer centers, consulting technologies, venture funds, engineering centers, industrial de-sign centers, and certification bodies.

3. Diversity of innovative works. Among these are fundamental innovative works (expanding theoretical knowledge, obtaining new information about the methodology of research (their final and intermediate desired landmarks, fundamental rules, methods, and techniques), search work (detailing subject knowledge, predicting performance indicators), applied innovative works (solving specific research problems in the development of new op-erational processes, obtaining instructions, techniques, recommendations, calculation, and graphic materials), and design and development works (obtaining models and modifications, applying research results)).

Using these principles as a reference, we will phase innovative works on doing business, during which the costs of technology are calculated:

1. Innovation development costs (collection of information on operational processes, on the features of product release and sale, preparation of project documentation, a study of technical and economic standards).

2. Innovation implementation costs (creation and testing of product samples, market seg-menting with fundamentally new methods).

3. Innovation application costs (mass testing of the production and marketing processes).

All these costs are subject to comparison with the results of business (income and profits) to calculate the effectiveness and cost of commercial projects, as both of them determine the quality of entrepreneurial actions. Accordingly, the fundamental component of business sus-tainability management indicators should be indicators related to the business performance (formulas (1), (2), (3), (4)):

$$Ef_{b(i)} = \frac{I_b}{C_{ind}+C_{ini}+C_{ina}} \tag{1}$$

Where: $Ef_{b(i)}$  is business income efficiency;  
 $I_b$  is business income, rub.;;  
 $C_{ind}$  is innovation development costs, rub.;;  
 $C_{ini}$  is innovation implementation costs, rub.;;  
 $C_{ina}$  is innovation application costs, rub.;;

$$Ef_{b(i)} = \frac{I_b}{C_{ind}+C_{ini}+C_{ina}} \tag{2}$$

Where: $Ef_{b(p)}$  is business profit efficiency;  
 $P_b$  is business profit, rub.;;  
 $C_{ind}$  is innovation development costs, rub.;;  
 $C_{ini}$  is innovation implementation costs, rub.;;  
 $C_{ina}$  is innovation application costs, rub.;;

$$Ef_{indb(i)} = \frac{C_{ind}+C_{ini}+C_{ina}}{I_b} \tag{3}$$

Where: $Ef_{indb(i)}$  is indirect business income efficiency;  
 $C_{ind}$  is innovation development costs, rub.;;  
 $C_{ini}$  is innovation implementation costs, rub.;;  
 $C_{ina}$  is innovation application costs, rub.;;  
 $I_b$  is business income, rub.;;

$$Ef_{indb(p)} = \frac{C_{ind}+C_{ini}+C_{ina}}{I_b} \tag{4}$$

Where  $E_{f_{indb(p)}}$  is indirect business profit efficiency;  
 $C_{ind}$  is innovation development costs, rub.;  
 $C_{ini}$  is innovation implementation costs, rub.;  
 $C_{ina}$  is innovation application costs, rub.;  
 $P_b$  is business profit, rub.

Next, we will form indicators of business sustainability management, focusing on their essence, which means maximizing the result and qualitatively minimizing costs (formulas (5), (6), (7), (8)):

$$\Delta I_b = \left[ \frac{I_{b1}}{C_{ind1} + C_{ini1} + C_{ina1}} - \frac{I_{b0}}{C_{ind0} + C_{ini0} + C_{ina0}} \right] * (C_{ind1} + C_{ini1} + C_{ina1}), \quad (5)$$

Where:  $\Delta I_b$  is the change in income due to changes in the direct business income efficiency, rub.;  
 $I_{b1}$  is business income in the reporting period, rub.;  
 $C_{ind1}$  is innovation development costs in the reporting period, rub.;  
 $C_{ini1}$  is innovation implementation costs in the reporting period, rub.;  
 $C_{ina1}$  is innovation application costs in the reporting period, rub.;  
 $I_{b0}$  is business income in the reference period, rub.;  
 $C_{ind0}$  is innovation development costs in the reference period, rub.;  
 $C_{ini0}$  is innovation implementation costs in the reference period, rub.;  
 $C_{ina0}$  is innovation application costs in the reference period, rub.;

$$\Delta I_b = \left[ \frac{I_{b1}}{C_{ind1} + C_{ini1} + C_{ina1}} - \frac{I_{b0}}{C_{ind0} + C_{ini0} + C_{ina0}} \right] * (C_{ind1} + C_{ini1} + C_{ina1}), \quad (6)$$

Where:  $\Delta P_b$  is the change in profit due to changes in the direct business profit efficiency, rub.;  
 $P_{b1}$  is business profit in the reporting period, rub.;  
 $C_{ind1}$  is innovation development costs in the reporting period, rub.;  
 $C_{ini1}$  is innovation implementation costs in the reporting period, rub.;  
 $C_{ina1}$  is innovation application costs in the reporting period, rub.;  
 $P_{b0}$  is business profit in the reference period, rub.;  
 $C_{ind0}$  is innovation development costs in the reference period, rub.;  
 $C_{ini0}$  is innovation implementation costs in the reference period, rub.;  
 $C_{ina0}$  is innovation application costs in the reference period, rub.;

$$\Delta PC_{b/i} = \left[ \frac{C_{ind1} + C_{ini1} + C_{ina1}}{I_{b1}} - \frac{C_{ind0} + C_{ini0} + C_{ina0}}{I_{b0}} \right] * I_{b1}, \quad (7)$$

Where:  $\Delta PC_{b/i}$  is the change in process costs due to changes in the indirect business income efficiency, rub.;  
 $C_{ind1}$  is innovation development costs in the reporting period, rub.;  
 $C_{ini1}$  is innovation implementation costs in the reporting period, rub.;  
 $C_{ina1}$  is innovation application costs in the reporting period, rub.;  
 $I_{b1}$  is business income in the reporting period, rub.;  
 $C_{ind0}$  is innovation development costs in the reference period, rub.;  
 $C_{ini0}$  is innovation implementation costs in the reference period, rub.;  
 $C_{ina0}$  is innovation application costs in the reference period, rub.;  
 $I_{b0}$  is business income in the reference period, rub.;

$$\Delta PC_{b/p} = \left[ \frac{C_{ind1} + C_{ini1} + C_{ina1}}{I_{b1}} - \frac{C_{ind0} + C_{ini0} + C_{ina0}}{I_{b0}} \right] * I_{b1}, \quad (8)$$

Where:  $\Delta PC_{b/p}$  is the change in process costs due to changes in the indirect business profit efficiency, rub.;  
 $C_{ind1}$  is innovation development costs in the reporting period, rub.;  
 $C_{ini1}$  is innovation implementation costs in the reporting period, rub.;  
 $C_{ina1}$  is innovation application costs in the reporting period, rub.;

$P_{b1}$  is business profit in the reporting period, rub.;  
 $C_{ind0}$  is innovation development costs in the reference period, rub.;  
 $C_{ini0}$  is innovation implementation costs in the reference period, rub.;  
 $C_{ina0}$  is innovation application costs in the reference period, rub.;  
 $P_{b0}$  is business profit in the reference period, rub.

The formed indicators fully correspond to the traditional understanding of assessing the degree of influence of qualitative parameters on the result and costs, as the change in both income and profit and costs depends on both direct and indirect indicators of business efficiency and at the same time consists of elements adapted to the newest social formation built on the key role of the technological factor.

## 4 Discussion

Table 1 and 2 presents the interpretation of the formed indicators of business sustainability management.

**Table 1.** Interpretation of business sustainability management indicators by income

| Indicator   | Content   |
|---|---|
| The change in income due to changes in the direct business income efficiency  | An increase/decrease in income due to an increase/decrease in the result (income) concerning the total costs of business technologies, including the costs of development, implementation, and application of innovations |
| The change in costs due to changes in the indirect business income efficiency | Saving (cost overrun) of funds by increasing/reducing the cost of business technologies, including the cost of development, implementation, and application of innovations, concerning the result (income)                |

**Table 2.** Interpretation of business sustainability management indicators by profit

| Indicator   | Content   |
|---|---|
| The change in profit due to changes in the direct business profit efficiency  | An increase/decrease in profit due to an increase/decrease in the result (profit) concerning the total costs of business technologies, including the costs of development, implementation, and application of innovations |
| The change in costs due to changes in the indirect business profit efficiency | Saving (cost overrun) of funds by increasing/reducing the cost of business technologies, including the cost of development, implementation, and application of innovations, concerning the result (profit)                |

They reflect the following advantages of the proposed indicators of business sustainability management:

1. Compliance with modern management based on innovative entrepreneurial actions, consisting of a set of innovative processes necessary to achieve financial benefits.
2. The presence of elements that entirely and comprehensively reflect the requirements for the good business activity.
3. A potential for making timely decisions to improve the results and costs of technologies for the implementation of commercial projects.

Using these advantages, entrepreneurs can objectively calculate the level of business efficiency and take all the necessary measures to maximize income and profits and minimize the relevant innovative costs.

## 5 Conclusion

The author's indicators of business sustainability management are adapted to modern scientific and technical conditions, as they correspond to the realities of the current management evolution stage, at which the priority of science in the use of human and investment re-sources is undeniable. For entrepreneurs, they will serve as a toolkit for a comprehensive and systematic assessment of the quality of doing business and implementing innovative procedures that optimize commercial efforts.

These indicators cover the entire list of process costs, consisting of procedures for the de-velopment, implementation, and application of business innovations necessary to obtain the required amount of profit and profitability in the course of business processes.

Thus, the authors have achieved the set objective, completed the tasks by meeting all requirements for the formation of business sustainability management indicators related to the mandatory consideration of the primacy of the technological factor in the successful implementation of entrepreneurial ideas and optimization of the result and costs of commercial projects.

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