ASSESSMENT OF RISKS ASSOCIATED WITH STRATEGIC MANAGEMENT INFORMATION SUPPORT

ОЦІНКА РИЗИКІВ, ЩО ПОВ'ЯЗАНІ З РІВНЕМ ІНФОРМАЦІЙНОГО ЗАБЕЗПЕЧЕННЯ СТРАТЕГІЧНОГО УПРАВЛІННЯ

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In the article, it has been suggested to assess the efficiency of adoption and implementation of strategic decisions with the information component taken into account. The most important risk factors associated with strategic management information support have been identified. Methodological approaches to determining the probability of "information" risk factors affecting the resulting performance of the strategic-direction investment project implementation have been substantiated.
Key words: *strategic managerial decisions, "information" risks, strategic information, strategic investment project.*

У статті запропоновано оцінювати ефективність прийняття та реалізації стратегічних рішень з урахуванням інформаційного складника. Визначено найбільш впливові чинники ризиків, що пов'язані з інформаційним забезпеченням стратегічного управління. Обґрунтовано методичні підходи до визначення ймовірності впливу «інформаційних» ризикових чинників на результуючі показники реалізації інвестиційного проекту стратегічного спрямування.
Ключові слова: *стратегічні управлінські рішення, «інформаційні» ризики, стратегічна інформація, стратегічний інвестиційний проект.*

В статье предложена оценка эффективности принятия и реализации стратегических решений с учетом информационной составляющей. Определены наиболее влиятельные факторы рисков, связанных с информационным обеспечением стратегического управления. Обоснованы методические подходы к определению вероятности влияния «информационных» факторов рисков на результирующие показатели реализации инвестиционного проекта стратегического направления.
Ключевые слова: *стратегические управленческие решения, «информационные» риски, стратегическая информация, стратегический инвестиционный проект.*

Problem statement. An important factor that affects the assessment of strategic management efficiency of companies is different types of risks. During the implementation of strategic processes, important are economic, financial, competitive and other risks that arise depending on economic conditions, objects of investment, and characteristics of corporal activity, as well as sector-related markets. Of particular importance are the risks associated with the preparation, adoption and implementation of strategic managerial decisions (SMDs).

The fact is that it is almost impossible to completely avoid risk, but knowing its source it is possible to lower its threat and to reduce the effects of adverse factors. Under present-day conditions, a need has arisen to study a wide range of risks including those related to information support for the SMD preparation, adoption and implementation.

The basis of strategic management is long-term decision-making, whose quality and efficiency are largely determined by the information used therefor. In this study, strategic information is regarded as an organized collection of strategic data bases (SDB), which were formed by specialists of a company in accordance with the conformity of those bases to the decision-making in a certain area, which were analytically processed and which were prepared for a repeated use during the process of strategic managerial activities.

Without gathering multifaceted information after certain levels and stages of strategic management process, it is impossible to develop a quality strategy and to implement it efficiently in the future.

The authors of many scholarly papers V. Kuybida [1;2], T. Lepeyko [3], I. Litvin [4] believe that the management efficiency largely depends on the completeness, timeliness and reliability of the information used in managerial decision making. The amount of the relevant information reaches thousands of indicators that describe the quantitative and qualitative state of the elements of the environment, and that are collected, processed and accumulated for the needs of various management levels.

Providing managerial decisions with more quality information delays the development and implementation of a new business project at a company, thus extending the functionality of existing information systems. It is clear that to form an efficient information support for strategic management, a separate subsystem within the company information system should be created.

Later on, we will see that strategic information used in managerial decision-making related to the large amounts of investment intended for the implementation of projects at ore mining and processing complexes (MPCs) not always meets the quality criteria. That usually leads to negative consequences in the process of the SMD implementation and obtaining end results. That is why there are risks associated with inadequate information support during the SMD preparation, adoption and implementation. They should be taken into account and assessed.

Analysis of the recent research. A significant contribution to the risk theory in strategic management was made by American researcher A. Damodaran [5],

who reflects the organizational relationship between the risk management functions in the company, that is, by combining strategy, finance and current activities. This allows assessing risks in the process of making managerial decisions, for example, on innovative projects. Risks in a greater degree are determined in accordance with the reasons associated with insufficient forecasting of projects cash flows.

The American scientist J. Kallman [6; 7] in his studies focuses on controlling losses in decision-making, as well as risk management.

The work by English scientists T. Bedford and R. Coock [8], which develops a quantitative risk assessment and pays attention to the use of expert judgment on the uncertainty of events worth mentioning as well. In general, the mechanisms for conducting qualitative and quantitative risk analysis in the implementation of strategic investment projects have been studied in the monograph by native scientist L. Varava [9]. In this paper, we propose the formation of a complex approach to a project risk based on the most influential risks and forms of their manifestation. At the same time, the sources of risks are considered: financial, economic, social, technical, environmental.

In domestic economic and managerial science, the theories regarding strategic approaches to risk assessment and recommendations on how to reduce them are still not enough systematized. At the present time, a number of Ukrainian and foreign authors whose works have a significant contribution to the development of the theory of risks should be noted, namely I. Blank [10], V. Vitlinsky [11]. M. Gracheva [12], A. Ustenko [13]. The concept of risk management in the activities of industrial enterprises is developed in the work by L. Taranyuk and K. Taranyuk [14].

The evaluation of investment risks got its development in the works by A. Solodova [15], V. Hobta [16, 17]. However, in order to increase the effectiveness of taking managerial decisions, especially strategic decisions, enterprises need to use information that contains as little risk as possible on its value and reliability. Therefore, the study of “information” risks is of particular importance.

The purpose of this study is to identify the specific risks associated with the strategic management information support, to display the probability of their manifestation and to assess their impact on the results of a strategic investment project implementation in the context of an ore mining and processing company.

Key research findings. Let us take a look at the entire process of the information support formation for a company, with that support's elements taken into account, on the basis of the economic efficiency assessment algorithm of the SMD adoption and implementation (Figure 1).

When forming the information component (Figure 1), the following is taken into account: 1) setting up a strategic management information subsystem (SMIS) within the company information system to improve the quality of strategic information; 2) identifying the risk factors associated with the level of information support in the processes of the SMD preparation, adoption and implementation; 3) determining the probability of “information” risk factors affecting the planned resulting performance of the SMD.

Setting up a SMIS belongs to the company's organizational project decisions, whereby the positive result obtained may not always be subject to direct quantification. If the project measure provides for creating a separate division (strategic information office), which is charged with forming quality information support for strategic management, this process is related to the need of funds. Most of these funds are meant for creating facilities and logistical support, as well as for covering labor costs. The end result of this project measure is defined by an overall indicator (overall indicators) of putting into practice strategic decisions (such as the net present value *NPV*, the economic value added *EVA*, an increase in total revenue from product sales, etc.).

When an SMIS was functioning in the MPC environment, the effect of the first order was also determined, which manifested itself in overall cost savings by reducing managers' time spent on the preparation and adoption of an SMD, in an increase in the probability of making an efficient SMD, and in enhancing efficiency of strategic control.

It is the efficiency of the SMDs adoption and their subsequent realization through implementing investment projects that condition the need to identify risk factors associated with the supply of the required information and the level of its quality, which factors are highly likely to affect the achievement of the planned resulting performance.

In order to implement a particular measure or a particular project, an appropriate managerial decision should be taken. When a strategic investment project is implemented at an MPC, an SMD is also adopted, during the preparation of which information was used. The less the said information meets all those quality criteria, the higher the risk is of a wrong SMD being adopted, which will lead to worsening of the resulting performance and thus to increasing payback period and other negative consequences. Thus, when preparing and adopting SMDs, systematic, accurate, consistent over time information should be used, whose application must be reflected in the resulting performance while the probability of achieving it increases in the long run.

The difficulty of choosing an SMD and predicting its effects is exacerbated by the fact that that process is almost always performed under conditions of uncertainty and risk that characterize market relations. That significantly increases the responsibility of decision makers, exerts great demands on their competence and personal qualities.

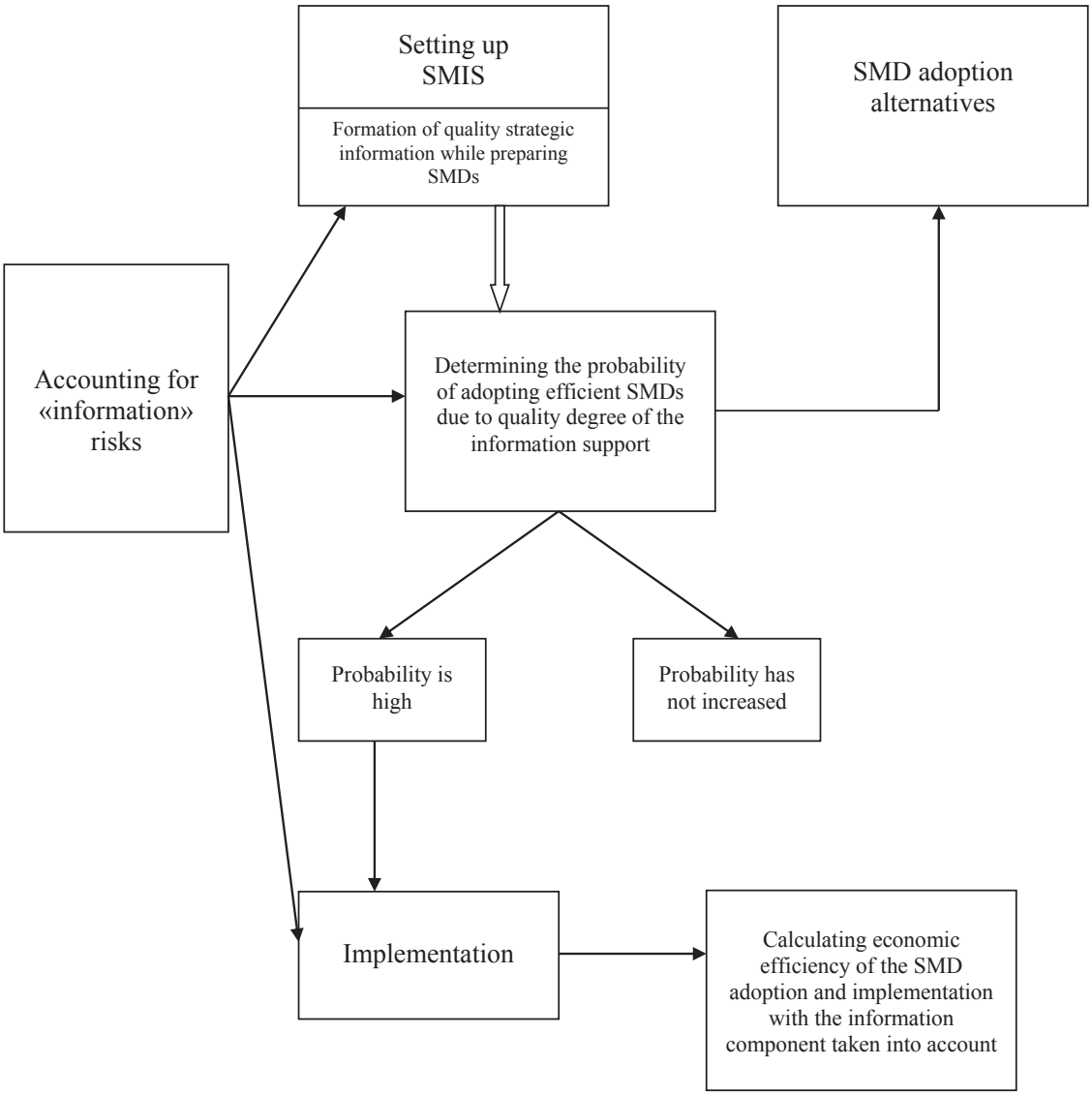

Fig. 1. The SMD adoption and implementation economic efficiency assessment algorithm diagram with "information" risks taken into account – authoring

A risk is regarded as the uncertainty of obtaining any income or any intended result. In this case, the risks associated with the information support for the SMD adoption and implementation, i.e. "information" risks, are regarded in connection with the possibility of deterioration of the planned resulting performance during the process of implementation of strategic decisions.

To reduce the level of uncertainty and to avoid making an inefficient managerial decision regarding the achievement of long-term performance, managers need to engage more relevant information in areas relating to a given issue. The more qualitative and systematic that information is, the lower the uncertainty regarding the achievement of the planned resulting performance will be.

To assess the "information" risks when adopting and realizing SMDs, let us consider the implementation of a strategic investment project aimed at increasing an MPC's sales of iron ore concentrate by enhancing its quality and producing two its varieties. The resulting performance indices are the profit from the concentrate sales and the net present value of the project. The SMD implementation time frame is 5 years.

The efficiency of the SMD adoption and realization (regarding the implementation of a strategic investment project) is defined by the following formula:

$$e_{SMD} = \sum_{t=1}^{T_p} \frac{P_{pt}}{B_{3t}} \cdot \frac{1}{(1+r)^t} = \sum_{t=1}^{T_p} \left(\frac{P_{Pt}}{(B'_{nt} + E_n K_{SMDt}) + (B_{ist} + в_{SMDt} - E_{зt})} \right) \cdot \frac{1}{(1+r)^t}, \quad (1)$$

$$B_{3t} = B_{npt} + B_{SMDt} = (B'_{nt} + E_H K_{SMDt}) + (B_{ist} + в_{SMDt} - E_{зt})$$

where P_{pt} – resulting index obtained after implementing an SMD, UAH (numerical units); B_{3t} – total cost of the SMD adoption and implementation in the t-th year, UAH; B'_{nt} – annual operating costs for the SMD implementation in the t-th year, UAH; E_n – capital investment economic efficiency factor taken as

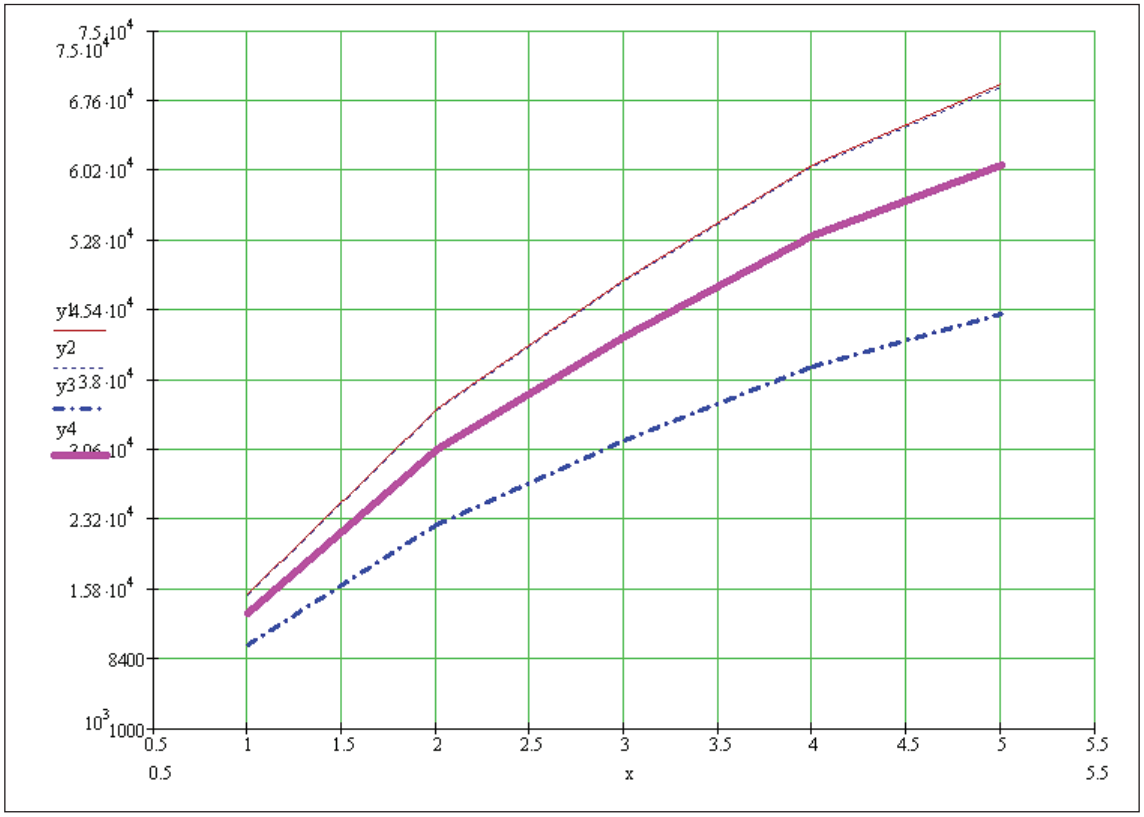

Figure 2. Net present value of the SMD adoption project with and without the risk associated with the information support taken into account – authoring

a standard; K_{SMDt} – capital investment to implement the SMD in the t-th year, UAH; B_{ist} – information support costs for the SMD implementation in the t-th year, UAH; $в_{SMDt}$ – labor costs of the top managers and company management apparatus for the SMD preparation and adoption, UAH; $E_{зt}$ – total annual savings achieved through the introduction of SMIS in the t-th year, UAH; $B_{прt}$ – present costs of the SMD implementation in the t-th year, UAH; B_{SMDt} – costs of the SMD preparation and adoption in the t-th year, UAH; t – the year of the project coming on stream, r – discount rate, numerical units.

When determining the impact of the information support quality level on a resulting performance index, lowering the risk of adopting a wrong SMD by increasing the probability of obtaining the planned value of that index should be taken into account.

The degree of certainty of strategic information becomes lower with each year of the strategic investment project finalization. That degree is characterized by the quality group index ($П_q$ takes into account the total weight, after estimation factors, of amount, reliability, value, saturation, timeliness and stability) and the efficient use factor (i_{eu} takes into account the sufficiency and the priority of information after experts' empirical data regarding individual SDBs when adopting specific SMDs). The overall strategic information quality index ($I_{яі}$) can be calculated by using the following formula:

$$I_{qi} = П_q \cdot i_{eu} \quad (2)$$

I_{qi} can be used in retrospect when determining the impact of strategic information quality level on the probability of achieving the planned resulting performance of managerial decisions.

The value of the overall index I_{qi}, with the efficient use factor i_{eu} taken into account, should tend to 1, i.e. to the best quality and usefulness of the SMD.

The studies at MPCs revealed certain deviations from the planned resulting index at certain stages of the project implementation before setting up an SMIS (basic version) and under the conditions of the subsystem operation (new version) with specific risks at play. Table 1 demonstrates specific risks associated with the information support for the SMD preparation, adoption and implementation, which were investigated by the author in the context of MPCs.

In order to assess the strategic information that comes in the SMD preparation, adoption and implementation after its quantity and quality, it is advisable to choose the method of peer review. The study used the sampling method. It makes it possible to obtain sound conclusions on the basis of the survey of only some part of the employees of mining and processing companies. The sampling method makes it possible to quickly obtain the necessary results provided that experts and a survey mechanism are selected impartially.

Table 1

Specific risks associated with the level of information support for the SMD preparation, adoption and implementation at the existing ore mining companies

Risks	Consequences of risks	Manifestation probability q_n, numerical units, basic version / new version				
		Years of the strategic investment project implementation				
		1	2	3	4	5
SMD preparation						
1. Inflow of significant amount of unnecessary strategic information for the given SMD adoption, R_1	Professionals and managers cannot concentrate on the priority factors that make a significant impact on the SMD adoption	0,10 / 0,10	0,15 / 0,10	0,15 / 0,10	0,15 / 0,10	0,10 / 0,10
2. Large amount of unaccounted-for strategic information that has an impact on the end results of an SMD, R_2	An SMD was prepared and adopted without important information taken into account	0,10 / 0,10	0,05 / 0,10	0,10 / 0,10	0,05 / 0,10	0,05 / 0,10
3. Errors while forming SDBs, R_3	Lowers the probability of adopting an efficient SMD	0,20 / 0,05	0,20 / 0,05	0,15 / 0,10	0,15 / 0,10	0,10 / 0,10
4. Information overload of specialists employed at units that prepare SMDs, R_4	Lowers the quality of strategic information for the SMD adoption	0,20 / 0,20	0,20 / 0,15	0,15 / 0,10	0,15 / 0,10	0,10 / 0,10
5. Information costs, R_5	No studies and analysis of strategic information that can have a significant impact on the SMD results are conducted	0,05 / 0,15	0 / 0,20	0 / 0,20	0 / 0,20	0 / 0,20
SMD adoption						
6. Availability of strategic information that does not meet its formation quality score as per the strategic information quality group index and the efficient use factor, R_6	Increased costs of gathering and processing strategic information	0,25 / 0,05	0,30 / 0,05	0,35 / 0,05	0,40 / 0,05	0,45 / 0,05
7. Mistakes by strategic information office manager in predicting strategic events, R_7	When adopting SMDs, situations are examined, which the company cannot really find itself in	0 / 0,25	0 / 0,25	0 / 0,25	0 / 0,25	0 / 0,25
SMD implementation						
8. Formation of ill-timed and inaccurate strategic information after the results of strategic control, R_8	Adoption of the wrong SMDs regarding adjustments to the areas of strategic development	0,10 / 0,10	0,10 / 0,10	0,10 / 0,10	0,10 / 0,10	0,15 / 0,10

Strategic information can be formed in various amounts and at various levels of quality. Its use over the entire period of the investment project implementation is associated with certain risks. It is advisable to identify: the manifestation probability of various factors of "information" risks; the weight of each n-th factor of the risk; the changes in the resulting SMD implementation indices during each t-th period both in the basic and the new versions under the influence of the n-th factor of "information" risks; the changes in the resulting overall index for the entire strategic decision implementation period under the influence of "information" risks. Thus, the effect of the second order can be estimated when setting up an SMIS.

When determining factors of "information" risks and the probability of their manifestation, the following persons may act as experts: 1) heads of strategic management departments of corporations or individual companies, experienced practitioners in the field; 2) prominent scientists who conduct research towards improving strategic management and its information support at a corporation's divisions; 3) representatives of consulting firms, who provide relevant services to improve the efficiency and quality of work at different stages of strategic management; 4) heads and specialists of the functional divisions in the system of corporate management and of individual companies that prepare SMDs in certain areas of activity; 5) specialists of information technology departments of a corporation or individual companies that form strategic information for the SMD preparation, adoption and implementation.

In order to determine the risk factors associated with information support for the SMD preparation,

adoption and implementation, experts assessed the probability of certain negative consequences with regard to the deterioration of the planned resulting performance indices (Table 1).

Over a period of the SMD development, adoption and implementation, the results of a strategic investment project change under the influence of risk factors. Those factors have a different probability of impact, as well as different weight in the overall change pattern of the planned results. In fact, the risks have a negative impact, which affects the SMD implementation results. The assessment of the impact of all risk factors is impossible, since the process is labour-intensive, and requires additional costs. In order to achieve the planned resulting performance indices of the project implementation, it is, however, necessary to determine the most important risk factors, to assess their probability and, if necessary, to reduce their negative impact.

The first step in the assessment of the probability of a change in the degree of the resulting indices of the strategic investment project implementation is the creation of their factor models, based on which the risk factors are determined that affect the achievement of the planned results.

The second step is to determine the weight of the n-th risk factor, associated with the level of information support for the adoption of a strategic decision, in the overall change of the resulting performance indices. Drawing on the results of the factor analysis, we can argue that the weight of each risk factor equals its share in the total change of the value of the planned resulting index of the strategic investment project implementation. In order to establish the weight of each of the risk factors, their impact is initially calculated on the change in the resulting index for each year (stage) of the strategic investment project implementation. For that purpose, their imputed values are determined that take into account the succession of each factor. If summarized, the formula for determining changes in the resulting index due to the n-th factor (f_n) during the t-th year of the strategic investment project implementation ($\Delta РП_{fn}$) can be represented as follows:

$$\Delta РП_{fn} = РП_{nt} - РП_{yt-1}, \quad (3)$$

where $РП_{nt}$ – resulting index value for the t-th year of the strategic investment project implementation; $РП_{ук-1}$ – resulting index imputed value for the $(t-1)^{th}$ year of the strategic investment project implementation with the change in the n-th risk factor taken into account.

The weight of the n-th risk factor b_{fn} in the overall change of the resulting index for the entire period of the project implementation can be calculated as:

$$b_{fn} = \frac{|\Delta РП_{fn}|}{\Delta РП_{зу}}, \quad (4)$$

where $\Delta РП_{fn}$ – value by which the resulting index of the strategic investment project implementation changed under the influence of the i-th risk factor; $\Delta РП_{зу}$ – total imputed value by which the resulting index changed over the entire period of the strategic investment project implementation under the influence of all risk factors.

The third step of the assessment of the level changes in the resulting indices of the strategic investment project is to determine the probability of the impact of the "information" risks' factors, which impact is considered to have negative consequences. The probability of negative impact of the "information" risks' factors (τ_R) on the results of the project implementation is calculated as

$$\tau_R = \frac{T_{Ri}}{T}, \quad (5)$$

where T_{Ri} – number of periods (years), during which an impact of the "information" risk's n-th factor on the relevant resulting indices of the strategic investment project was observed; T – total number of years of the strategic investment project implementation.

It should be noted that each of the risk factors makes a certain probability impact on the implementation of a strategic investment project for several periods, and has a specific weight in changing the resulting performance. Based on that, the weighted probability of negative impact of the "information" risk's i-factor ($\tau^з_{Ri}$) is defined as follows:

$$\tau^з_{Rn} = \tau_{Rn} \cdot b_{fn}, \quad (6)$$

where τ_{Rn} – probability of negative effects of the "information" risk's i-th factor on the results of the strategic investment project implementation; b_{fn} – weight of the "information" risk's n-th factor.

As a result of the studies, the risk factors have been summarized after the factual data of the monitoring process conducted over several years of the strategic investment project development and implementation. The most important "information" risks are defined according to formulas (3) – (6). The factors of those risks have been established as reasons, which correspond to the information that was poorly formed at the stages of preparation, adoption and implementation of strategic decisions, and cause deviation of the planned resulting indices.

The values of deviation from planned resulting indices have been ranged after the actual data, which was researched by the author of the article together with the companies' experts.

As shown in Table 1, the R_7 risk factor equals zero in the basic version due to the absence of a strategic information office. In the new version, the probability of the R_6 risk is virtually non-existent, because setting up a strategic information office is already provided for within the SMIS of the MPC.

Conclusions and prospects for further research. Calculation results of the SMD adoption

and implementation project are shown in Figure 2. When assessing the efficiency of the strategic investment project, the index of the net present value *NPV* was used. The graph (Figure 2) shows the changes in the net present value of the strategic investment project by the years of its implementation as per the basic version without the risk taken into account (Curve 1), with the underlying risk associated with the information support taken into account (Curve 2), as per the new version, under the SMIS introduction, with the risk taken into account (Curve 3).

The risk of obtaining the expected results from the implementation of a given SMD was reduced by 26.5% through the use of higher quality strategic information that was formed by an MPC's SMIS.

In the future, it is important to improve information support with a view to creating new SDBs necessary to make specific strategic decisions, on the basis of which high level quality strategic information can be formed. It is advisable to perform weight predictions for various factors of "information" risks regarding their impact on the project implementation resulting performance.

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