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Peculiarities of Building of the Risk Management System of an Industrial Enterprise

Svetlana S. Golubeva, Julia O. Glushkova, Alla V. Pakhomova,
Lyudmila V. Slavnetskova and Ramila R. Bashirzade
Yuri Gagarin State Technical University of Saratov, Politechnicheskaya St. 77, Saratov, Russia

Abstract: As of today, the main issue is tending to import substitution of products of industrial enterprises the operation of which is influenced by numerous factors of the external and internal environment is attended by risks arising at different stages of formation of the finished product: from purchases of the raw materials and components to the output of the finished products. At the same time, one of the issues is loss in effect of the risk factor of non-execution of agreements which is especially, topical for production and supply of the high-priced finished products in the necessary quantity and in time. During this study, the theoretical fundamentals of management of industrial enterprises risks were studied on the basis of which the pre-requisites for building of the risk management system for an industrial enterprise which allowed structuring the risks and ensure identification and ranking of risks with account for the industrial specifics. The study also provides the analysis and offers classification of the industrial enterprise risks based on the use of the new attributes such as risks determined by the cooperation with the suppliers that differs through more comprehensive coverage of classifying attributes and allows thoroughly analyzing the kinds of risks and considering them by design of the risk management system. The structuring of the process and methods of the industrial risks management based on identification of potential risk areas has been performed. The result of the study is the cost-effectiveness analysis of the organizational-engineering measures aimed at reducing the risk effect on the performance results.

Key words: Risk management, industrial enterprise, system, classification, probability, loss

INTRODUCTION

The critical situation in the modern economy, makes the issue of risk management particularly topical. It is especially crucial to industrial enterprises the operation of which is characterized by numerous cooperation relationships with enterprises of the chemical, metallurgical, machine engineering and other industries.

Tending to import substitution of products of industrial enterprises the operation of which is influenced by numerous factors of the external and internal environment is attended by risks arising at different stages of formation of the finished product: from purchases of the raw materials and components to the output of the finished products. At the same time, one of the topical issues is loss in effect of the risk factor of non-execution of agreements which is especially topical for production and supply of the high-priced finished products in the necessary quantity and in time.

The manufacturing-financial activity of any company including also industrial enterprises producing PE pipes is related to various risks the probability of occurrence of which increases due to economic sanctions, competition at the market for finished products as well as insufficiently substantiated risk management on the part of the enterprises manufacturers of the products. As a result, the fails and untimeliness of delivery of products, financial loss of customers arise.

If we take into account the scope of tasks set for the industries consumers of pipe products, increase in demand for pipes for housing services and utilities, pipe lining one should state the increased role of enterprises manufacturing tubular in meeting the demands of in particular, housing and utilities infrastructure, chemical industry, etc. Along with that the risks relating to peculiarities of risk management by industrial enterprises upon cooperation with the market entities are increased.

This implies the necessity of solving the task of increasing the scientific validation of taking managerial decisions concerning risk mitigation by organization of operation of enterprises in this industry. In order to solve this task is needed to design the risk management system taking into account the industrial specifics of an enterprise.

Although, the issues of risk management in different industries of economy were reflected in the studies of

Corresponding Author: Svetlana S. Golubeva, Yuri Gagarin State Technical University of Saratov, Politechnicheskaya St. 77, Saratov, Russia

researchers concerning the risk management no such studies have been performed in respect of the pipe-producing enterprises. Along with that it shall be noted that increase in topicality and practical relevance of this subject considering the increases demand at the piping market is determined by extension of demand in the housing and utilities infrastructure, development of the chemical industry in the conditions of import substitution.

In the sphere of the theory and practice of risk management, there are famous studies of such researchers as: M.I. Bakanova, D.G. Bauersox, A.P. Irkhin, V.I. Kogan, V.G. Sankov, A.G. Schelkanova, A. Schaerf, G. Wambach, etc. Besides, the researches concerning risk management by S.N. Vorobyev, V.M. Granaturov, M.G. Lapusta, S.I. Poltavtsev, N.V. Khokhlov are of special interest. However in the studies of these researchers the processes of formation of the risk management in industrial enterprises have not been considered.

MAIN PART

None even the best forecasts can not completely exclude the uncertainty of the market. And where there is uncertainty the risk cannot be avoided.

The impact of risk on the entrepreneur and business activity is beyond dispute. A risk is always related to a particular individual or group of people. For different persons the same event and the consequences thereof may have different evaluation this implies the subjective nature of risk. At the same time, the risk exists independently from us our evaluation and our perception this is the objective nature of it.

Risk as an economic phenomenon began attracting attention of researchers and entrepreneurs not so long ago slightly more than a century ago in the USA and Western Europe and in our country even later about half a century ago. This explains the not well-established concept and definition of the risk in the scientific world, under-investigation of all edges of this aspect and the range of possible clarifications, additions, discoveries. Risk is interesting due to its complexity, uncertainty and variance.

The main causes of risk occurrence at an industrial enterprise include: increase in costs; reduction of the planned volumes of output as the result of increase in percentage; reduction of the planned volumes of output as the result of lack of the necessary quantity of products; decreases in prices at which products are intended to be sold; wear and tear of equipment (Goncharenko, 2006; Granaturov, 2002).

Having analyzed the existing systems of risk classification one may draw the conclusion that as of today there is no single risk classification. Every author or group of authors offers their own criteria of classification, select the area of the risk operation on their own (Damodaran, 2010; Yermasova, 2010; Thomas, 2008). The main characteristics of the author's classification of the industrial enterprise risks:

- The basis of classification is the activity of enterprises performed at the foreign markets, i.e., all risks are related to the Foreign economy in one way or another
- Classification is applied to domestic enterprises dealing with industry, thus, traditions of different countries determine the variety of the number and names of risks
- The correlations between separate kinds of risks are shown
- The position of a particular risk in the general system of the industrial enterprise risks is specified
- The industrial enterprise risks were grouped into two large groups depending on the kinds of business activity which in their turn were divided into risks of the second order

In Fig. 1, the researchers classification of the industrial enterprise risks is presented. It shall be noted that the risks arising at an industrial enterprise substantially affect the operation of the chemical enterprises at foreign markets and therefore, require comprehensive analysis the first and important stage of which is development of the industrial enterprise classification (Baturina, 2009).

In order to evaluate the risk acceptance rate the following risk areas depending on the expected loss value shall be distinguished: risk-free, acceptable risk area, critical risk area, catastrophic risk area (Malashikhina, 2004; Thomas, 2008).

Risk management may be applied at different levels of organization: strategic, tactical (level of managers of second level) as well as organizational one. It may be used within the frameworks of separate projects by searching for necessary solutions and by managing particular risk areas.

At each stage of the process, the records shall be kept that allow recording information concerning the progress of the risk management process that is required for monitoring and improvement of the process.

The limited liability company 'Saratovsky Pipe Plant' one of the most stable and developing enterprises of the Saratov region keeping with the dynamic market for polymers in our country. The enterprise is included in the group of companies Polyplastic' one of the leading

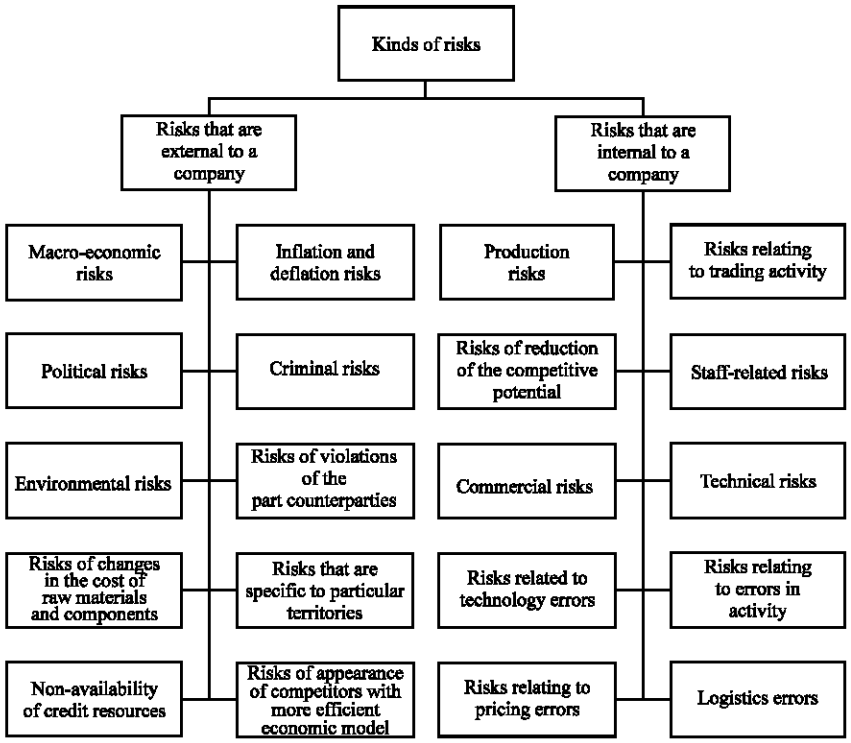

Fig. 1: Researcher's classification of the industrial enterprise risks

manufacturers of the competitive high-quality tubulars of wide range and high quality. For the benefit, thereof the principle of sustainable development and improvement of the manufacturing technology and mastering the new kinds of products has been taken as the basis of the technical policy of the plant.

However in order to ensure security and reliability or the products manufactured it is important to maintain the required specifications during operation. In order to assess the actual state of polymer products and be able to forecast the potential worsening of the state it is needed to perform diagnostic activities from time to time. However, any organization regardless of the sphere and form of activity can not operate if management is poor. This is why, we will focus most of our attention on the management sphere. The internal risks of an enterprise may include:

- Drop in orders
- Increase in the raw materials cost
- Risk of delivery of raw materials of poor quality
- Large-scale wear of the fixed production assets
- Drop in the planned output and sale of products due to the lost productivity
- Absence of the required quantity of the source materials, increased percentage of defective products
- Occurrence of emergency situations (may take place at industrial facilities as the results of events of various nature)
- Risks relating to insufficient funding (for example, if the current situation requires more significant costs)
- Risks relating to insufficient level of the staff qualification since the main value of the department created consists in the experience and skills of employees

Besides, there are risks relating to the external enterprise environment that are beyond control and management:

- Worsening of the economic situation in the country including decline in production, drop in the real income of the population and unemployment growth
- Competition on the part of the new technologies including alternative kinds of pipes
- Change in the ruble exchange rate

For identification of risks of the enterprise being analyzed the questionnaire was designed and the social research in the form of an interview with the specialists experts was performed. Totally over 80 persons were polled.

The processing of information allowed identifying the main hazards and threats for an enterprise (Table 1). The results of the study are presented in Table 1.

Let's consider the main risks of an enterprise being analyzed in details. Drop in volumes of the oil transferred/increase in price of raw materials.

The 'Saratovsky Pipe Plant' LLC performs its activity at the market for oil refining and output of oil products at the Russian market where prices are traditionally lower than across the world.

Let's define the weights of group with the minimum priority. For this purpose the following formula is used:

$$W_k = \frac{2}{k \times (f+1)} \quad (1)$$

where, f is the ratio between the weights of the first and last priority:

$$f = \frac{W_1}{W_7} = \frac{0.2}{0.05} = 4$$

Then:

$$W_2 = \frac{2}{2 \times (4+1)} = 0.2$$

While, $W_k = W_2$. The second stage defining the weight of the first group. For this purpose the following formula is applied:

$$W_1 = W_k \frac{(k-1) \times f + 1 - 1}{k-1} \quad (2)$$

Or:

$$W_1 = 0.2 \times \frac{(2-1) \times 4 + 1 - 1}{2-1} = 0.8$$

The second stage is defining the weight of simple risks in this priority group. For this purpose, the following formula is used:

$$W_i = \frac{W_1}{M_i} \quad (3)$$

For example, for the group 1 the weights equal to W_1 = 0.8/4 = 0.2; for the group 2 W_2 = 0.2/3 = 0.07. The results obtained are presented in Table 2.

Using the probabilistic estimates of risks obtained during experiments one may provide the scores of the risk occurrence. For this purpose the following formula is applied:

$$R = \sum_{i=1}^{n} W_i \times V_i \quad (4)$$

where, R scores by all risks (Table 3). Let's take R = 0.6072 for 100 points. Then the risk values will be the following (Table 4). Therefore, the most relevant risks for an enterprise are:

- Increase in price of the raw materials
- Technological risks
- Risk of delivery of raw material of poor quality

Having performed the ranking of risks, we found out that the most relevant risks for an enterprise are: increase in price of the raw materials; risk of cooperative interaction; risk of delivery of raw material of poor quality.

Table 1: Expert assessment of the degree of risk importance and probability

Kind of risk	Risk weight	Average probability of risk occurrence
Increase in price of raw materials	0.20	0.9
Risk of cooperative interaction	0.19	0.7
Risk of delivery of raw material of poor quality	0.17	0.5
Economic currency risk	0.15	0.4
Changes in the taxation procedure	0.13	0.8
Technological risks	0.11	0.3
Production accidents	0.05	0.5
Total	1	-

Table 2: Risk weights by groups

Kinds of risks	Priorities	Weights of risks in the specified group
Increase in price of raw materials	P_1	0.200
Technological risks		0.200
Risk of delivery of raw material of poor quality		0.200
Production accidents		0.200
Changes in the taxation procedure	P_2	0.067
Environmental risk		0.067
Economic currency risk		0.067
Total	-	1.000

Table 3: Score appraisals of risks

Risks S_i	Weights W_i	Probability of risk occurrence V_i	Scores $W_i \times V_i$
Increase in price of raw materials	0.2	0.9	0.1800
Technological risks	0.2	0.7	0.1400
Risk of delivery of raw material of poor quality	0.2	0.5	0.1000
Production accidents	0.2	0.4	0.0800
Changes in the taxation procedure	0.067	0.8	0.0536
Environmental risk	0.067	0.3	0.0201
Economic currency risk	0.067	0.5	0.0335
Total	-	-	0.6072

Therefore, the performed identification and ranking of risks of industrial enterprises based on the methods of risk assessment, identification of factors characterizing the level of risks of the decision made, differing through focusing attention on the production risks as the most sensitive to changes in the volumes of output and sales of products, material and other expenditures the management of which is aimed at improving the economic position of an enterprise (Khodarev, 2008).

For managing risk at enterprise significant organizational efforts, expenditures of time and other resources are required. The most appropriate way is to perform this function with the use of the specialized department in the organizational structure of the plant management.

The organizational structure of the department created is presented in Fig. 2 where thin arrows show the command links between the structural elements and thick ones informational links. The main executive groups monitoring of the enterprise and operating environment, risks analysts, planning of anti-risk measures and management in critical situations as we can see are involved in the risk management process and connected by means of information flows.

Figure 3 represents the algorithm of risk management in the management system of the 'Saratov Pipe Plant' LLC being a chain with feedback.

The feedback here is completed by the function 'Coordination of the risk management process'. The circuits of interaction with other subsystems are also indicated in the diagram.

For efficient operation of the Service for database administering and updating the implementation of the dedicated software Primavera Project Planner is suggested. This system not only allows assessing the efficiency of the project implementation but due to the integrated function of the risk analysis based on the Monte Carlo Method the optimistic and pessimistic estimations of the design solution are provided. Moreover, the system features the option of estimation of probability of unfavorable events, scheduling with account for risks.

The core of the department is the 'Planning and coordination service' which by performing planning and organization of the entire operation fulfills the following set of tasks: maintaining relationships with the plant management and other subsystems of the plant management; determining the frequency of performance of works on controlling the risks of the enterprise operation; defining the scope of works for regular control and management (selection of the risks analysis type,

Table 4: Ranking of risks by the most relevant kinds

Risks	Risk values in points	Ranking of risks by the most relevant kinds
Increase in price of raw materials	29.6	1
Technological risks	23.1	2
Risk of delivery of raw material of poor quality	16.5	3
Production accidents	13.2	4
Changes in the taxation procedure	8.8	5
Environmental risk	3.3	7
Economic currency risk	5.5	6
Total	100	-

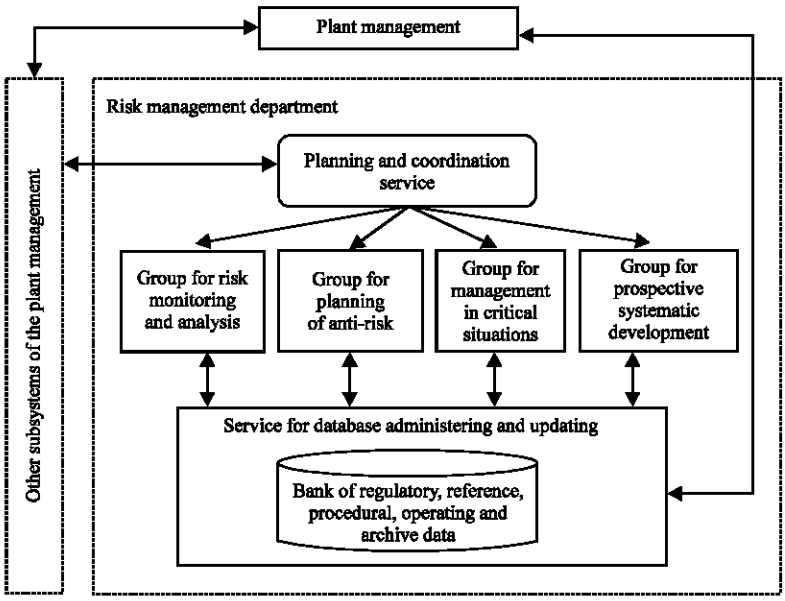

Fig. 2: Organizational structure of the risks management department being designed

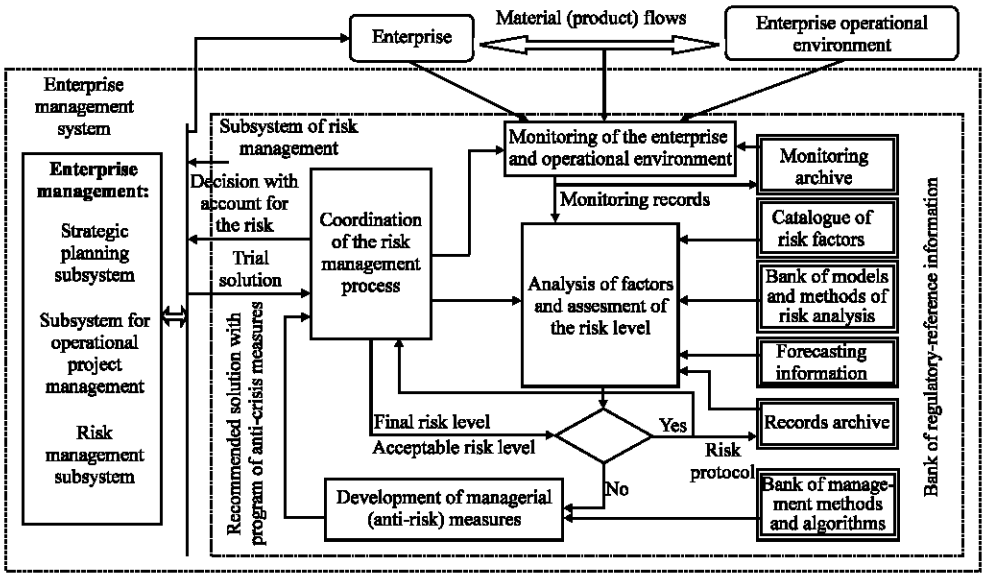

Fig. 3: Flowchart of the risk management algorithm in the management system of the 'Saratov Pipe Plant' LLC

procedures, methods of recording the results, etc.); specifying the date of commencement of work on analyzing the trial solution risks; organization of cooperation between the executive and information groups. The plant management plays the key role in solving the risk management issues as it approves the plans of actions aimed at risk mitigation, takes decisions as to implementation thereof in critical situations, accepts the proposed solutions with anti-risk programs if it considers them to be fit or rejects them.

SUMMARY

Thus, the proposed guidelines concerning improvement of the risk management system validated by the example of the 'Saratov Pipe Plant' LLC presented as a step-by-step process of formation of the content and interaction of the system components that include such additional element as the system of the information support of risk management. This allows evaluating the economic efficiency of the organizational-engineering measures aimed at reducing the risk effect on the performance results.

CONCLUSION

Thus, the proposed recommendations concerning the improvement of the risk management system of an enterprise have been valeted by the example of the 'Saratov Pipe Plant' LLC may be used for mitigation of the industrial enterprise risks as the result of formation of the risk management system based on classification of the risk kinds and analysis of the risk management methods. The practical relevance consists in application of the proposed recommendations concerning mitigation of the industrial enterprise risks due to implementation of the operating risk management on the basis of the information-supporting subsystem.

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