Information and analytical support for internal audit of inventories

M Safonova[1] and A Alekseenko[1*]

[1] Kuban State Agrarian University named after I. T. Trubilin, 13 Kalinina str., Krasnodar 350004 Russia

E-mail: alekseenkoaleks@gmail.com

Abstract. The contemporary business conditions and high competition in the market for goods and services forces many companies to increase the efficiency of using material resources. An important tool for reducing non-production losses is an internal audit of inventories, the effectiveness of which is directly related to the level of information and analytical support for the planning and inspection process.

Keywords: audit, inventories, internal audit of inventories, information and analytical support, risk event

1. Introduction

An important event that determines cost reduction is the rationalization of the use of inventories, which form about 15-60% of the cost of goods production, the provision of services by domestic commercial companies, categories of big business. Inventories of both liquid and marketable assets are subject to the risks of unlawful actions on the part of both company personnel and third parties. This fact indicates the need to organize an effective system of internal control and risk management in relation to transactions with material values. To assess the effectiveness of this system, including in respect of inventories, many researchers have noted the need to introduce an independent internal audit function within the business entity [1].

The effectiveness of the internal audit of inventories correlates with the level of information and analytical support for this function of an economic entity. The presence of information and analytical support should lead to an increase in the value of the business, and not just be a tool for detecting control [2].

According to the authors of the article, an important direction for the development of information and analytical support for the internal audit of inventories is the development of a risk-based method of accounting for the investigated assets, the use of statistical tools to identify significant risks, as well as the development of methods for valuing them and determining the likelihood of occurrence.

2. Materials and Methods

In preparing this paper, the authors used the existing basic research methods, including observation and collection of facts, scientific abstraction, analysis and synthesis, induction and deduction, economic and statistical, graphic, modeling, process, risk-oriented and graphical methods of data interpretation. Also, the authors used special methods in the field of accounting and internal audit: monetary valuation,

documenting the facts of economic life, reporting, calculation, summarizing accounting information, sampling, applying analytical procedures, etc.

As a statistical material for building a multiple linear regression model, the accounting data of companies operating in the marine terminals of the Krasnodar Territory were used.

3. Results

The basis of an effective internal audit review is the preparation of a risk-based internal audit plan based on a formalized risk assessment [3]. International standards of internal audit allow an internal auditor to conduct an independent risk assessment for the preparation of the audit plan.

An important source of information for drawing up a plan of inspections is determining the criticality of the identified risk based on its valuation, on the author's methodology, and the probability of occurrence calculated using current standards [4]. According to the authors, an effective method of applying the categories discussed above is the calculation of probable damage (determination of risk status) by making a cost estimate of risk and the probability of its occurrence.

To accumulate information on the change in risk status in order to plan the audit of operations with inventories and assess its effectiveness, the following special accounting methods should be used: assessment, use of accounts [5]. This allows using the off-balance sheet accounts to reflect the valuation of risks and their probabilistic damage as objects of accounting-contingent liability [6].

In the future, the information can be used to build a linear model of multiple regression for the formation of a risk-based plan for internal audit of inventories, the selection of analytical procedures and the establishment of a causal relationship between the identified deviations and the probability of damage from the occurrence of risk [7, 8].

In order to carry out a cost estimate of production idle risks due to a shortage of inventories, the authors developed a method for calculating it for operators of sea terminals, based on the key parameters of their activities.

Table 1. Cost estimate of production downtime risk.

Indicator	Value of the indicator	Note
D_1	441,000 tons	Cargo handling of Handysize type vessels and minibalkers
D_2	$ 16 t	Average rate = $ 16 / t
D_3	8219 tons per day	The volume of the separated cargo (3 000 000 t) / 365
D_4	2 days	Supply chain analysis
D_5	15 ship calls	Expert ratings
D_6	$ 6,000 per day	Expert ratings

Based on the values of the key parameters, we estimated the cost of the vessel's downtime based on three negative scenarios:

$$\text{A fine for a simple vessel } (I_1) = D_4 \times D_5 \times D_6 \quad (1)$$

Calculation: 2 days x 15 ship calls x 6000 dollars a day = 180 000 dollars.

$$\text{Intensity reduction } (I_2) = D_2 \times D_3 \times D_4 \times D_5 \quad (2)$$

Calculation: $ 16 t x 8219 t x 2 days x 15 ship calls = $ 3,945,205.

$$\text{Loss of turnover } (I_3) = D_1 \times D_2 \quad (3)$$

Calculation = $ 441,000 t x $ 16 t = $ 7,056,000.

Having determined the basic cost estimate of the risk of production downtime, we will determine possible scenarios for its occurrence, using the failure tree [9].

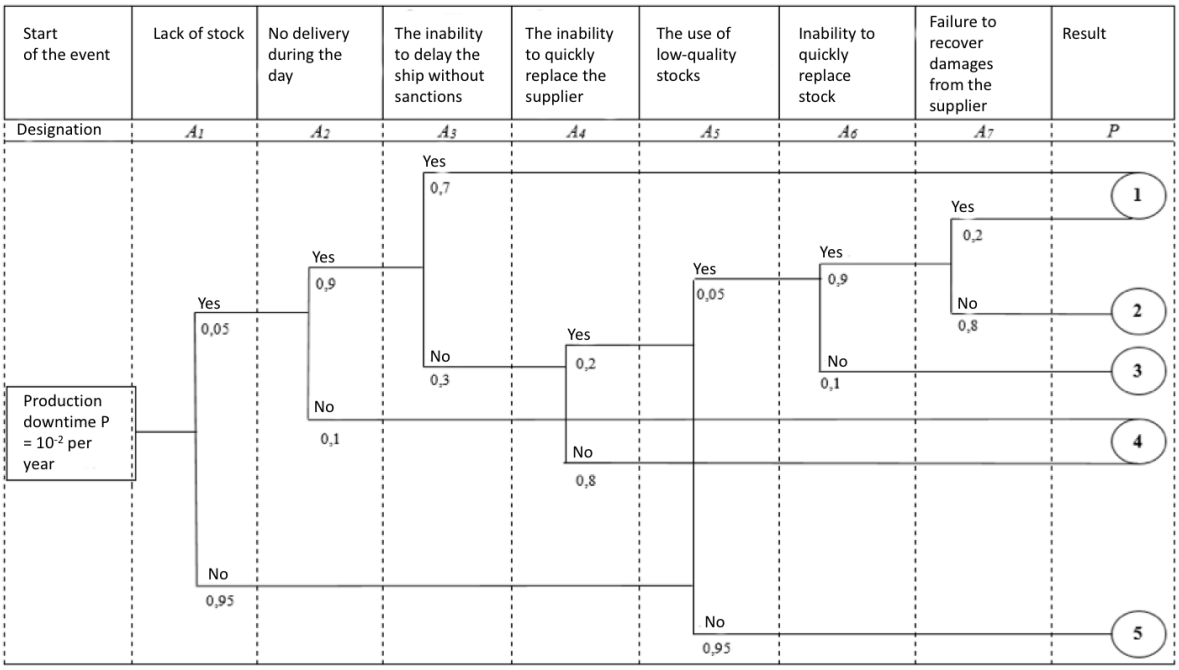

Figure 1. Identifying the negative production downtime scenarios and their likelihood.

The above image of the failure tree describes five main results, ranked by degree of criticality, and the implementation of risk events.

Table 2. Analyzing the consequences of implementing risk events.

No.	Effects[1]
1	A fine for a simple vessel, uncompensated at the expense of the supplier, a decrease in the intensity of loading operations, a reputational loss of 100% (customer's withdrawal or withdrawal of a part of cargo traffic)
2	A fine for a simple vessel compensated for by the supplier, a decrease in the intensity of loading operations, a reputational loss of 80% (customer's withdrawal or withdrawal of a part of cargo traffic)
3	The absence of a penalty, a decrease in the intensity of loading operations, reputational losses of 50% are likely (customer's withdrawal or withdrawal of a part of cargo traffic)
4	The absence of a fine, a decrease in the intensity of loading operations, the almost complete absence of reputational losses of 10% (customer's withdrawal or withdrawal of a part of cargo traffic)
5	Normal loading conditions

Knowing the cost estimates of the consequences of the vessel outage risks, we can determine the final cost estimates of the results of the implementation of a set of risk events presented in the form of a failure tree in Figure 1.

Table 3. Calculating the valuation of risk event collections.

Result (R)	Calculation	The valuation, USD
R_1	180000 +3945205 + 7056000	11181205
R_2	0 + 3945205 + 7056000 * 0.8	9590005
R_3	0 + 3945205 + 7056 000 * 0.5	7473205
R_4	0 + 3945205 + 7056 000 * 0.1	4650805

Taking into account the probability of risk determined on the basis of the failure tree, we will calculate the probability of damage from production downtime due to a shortage of inventories.

Table 4. Calculation the probability of damage in the occurrence of negative results (R_1-R_4).

Result (R)	Probability	Valuation, $	Probabilistic damage, $
R_{1a}	0,0315		352208
$R_{1б}$	0,0003	11181205	3354
Total R_1:		X	355562
R_2	0,0004	9590005	3836
R_3	0,0090	7473205	67259
$R4_a$	0,0500		232540
$R_{4б}$	0,0500	4650805	232540
Total R_4:		X	465080
Probabilistic damage (R_1-R_4):			891737

The necessary information on the valuation of risks at the reporting date itself describes the current state of the internal control and risk management system. To determine their effectiveness, the authors recommend complementing the work plan of accounts of an economic entity with two the off-balance accounts (012 "Financial risk assessment on operations with inventories" and 013 "Probabilistic damage from realization of risk events on operations with inventories") to reflect the dynamics of indicators, with the object of accounting a contingent liability [10].

Table 5. Justification for the possibility of accounting for cost risks as a contingent liability.

Attribute	Features of risk
Past events	The customs of business turnover
	The absence of significant contractual sanctions for violation of the terms and procedures for the supply of stocks
The presence of future uncontrolled events	Failure of key stock suppliers
	Changes in phytosanitary requirements
	Amendments to the conventions for the safety of navigation
Estimated value	Cost estimate risk

Information about any probable damage caused by the production risk generated and accumulated in the accounting system allowed us to construct a multiple linear regression model as a tool for determining the relationship between damage by factors characterizing the use of stocks. The multiple linear regression model is built for the selection of analytical procedures and planning of internal audit of inventories [11].

As a result of the calculations and the application of *f*-statistics methods and determination of the significance of individual indicators of the equation through the mechanism of Student's t-values, we obtained the model:

$$y = 0{,}7786x_6 + 4{,}9635x_7 + 0{,}5966x_9 + 88, \text{ where} \quad (4)$$

y – probable damage;
x_6 – the average amount of inventories balances (without reserve);
x_7 – the turnover rate of warehouse;
x_9 – the average value of receivables of suppliers of inventories.

An effective analytical procedure for internal audit of inventories allowed to form a model of analytical procedures for internal audit of inventories and analysis of cause-effect relationships.

Table 6. Methods of analytical procedures for the internal audit of inventories and analysis of cause-effect relationships.

No	Recommended analytical procedures
X_6	- Developing guidelines for planning the need for inventories; - Developing a procedure for evaluating the effectiveness of the use of storage space; - Introducing the disciplinary liability for excessive accumulation of residual inventories;
X_7	- Evaluating the employee incentive policies for optimizing the "storage of inventories" business process; - Corporate trainings;
X_9	- Monitoring the implementation of contractual terms; - Analyzing the coefficients of variation and rhythm of purchases and use of stocks.

4. Discussion

As a result of the study, we developed a methodology for valuing risk and its reflection in the accounting records of an economic entity using off-balance sheet accounts.

Correlation and regression analysis allowed to establish the relationship between the probable damage from the occurrence of the risk of interruption of production activities due to lack of inventories, the average value of inventories, the value of the turnover ratio of warehouse management and the average value of accounts receivables of inventory.

Based on the data obtained, we have identified a list of typical analytical procedures for building a plan for risk-based internal audit of inventories and conducting a business process audit.

5. Conclusion

As a result of applying the proposed risk valuation methodology for operations with inventories and their reflection in accounting (using the off-balance accounting method) for the purpose of conducting an internal audit of the studied assets, it is possible to achieve the following results: reduction of labor costs for building a risk-based audit plan, effective selection of analytical procedures for the implementation of control measures.

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