

# Leading methods for promoting finished product quality

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**Abstract** Modern leading theoretical and methodological studies demonstrate that the issue of bonuses significance in the production and economic mechanism is not controversial. Currently, an order has been established where economic incentive funds are formed according to fixed standards, approved in differentiated amounts by year of economic development cycle; the main fund-forming indicators are performance to the supply plan of finished products under the concluded contracts, increase in labour productivity, improvement of finished product quality and volume growth net profit. The introduction of long-term wage standards for the hryvnia finished product strengthens the economic interest of labour collectives in increasing labour productivity and reducing staff turnover, improving the procedure of material incentives for combining professions, high rates and criteria for evaluating quality in labour, introducing technologically founded standards.

This paper focuses on the issue of assessing and determining leading methods for promoting finished product quality. We employ both theoretical and empirical tools for achieving this goal and for deriving relevant outcomes and policy implications.

## 1 Introduction

In practice, the issue of economic incentives is paid specific interest to. After all, the issues of economic incentive funds formation are fully worked out, and, moreover, they are regulated by the current procedure for fund formation. The following list of key issues, which is fully considered and reviewed in the given study, is rather arguable: distribution of the material incentive fund; forming the size of bonus payments to individual structural units; forming the size of bonus payments to specific employees.

Therefore, the goal of the given study is to present one of the possible options for promoting the complex of set tasks and individual employees in the quality provision system of the finished product in the context of increasing the responsibility of specific employees for the final results of work. As a result, it should be noted that the above-mentioned approach to the system of distribution of bonuses for the labour quality allows for relaying the incentive system, focused on the final results, from an industrial enterprise and a research-production association in general to each individual employee (Čábelková et al. 2015; Eddelani et al. 2019). It is recommended for employees with decentralized formation of material incentive fund for the main production workshops to increase the size of the material incentive fund for each workshop, providing an increase in the number of employees with a personal stamp and in the number of employees, supplying finished products from the first presentation during certain long period of time (several months). The offered mechanism of the control system is quite universal. It can find its full application in industrial enterprises and research- production associations, regardless of their sectoral and structural profile, and it makes possible to solve the control issue by the criterion for estimating the optimal mismatch. The selection of labour quality parameters as criteria for evaluating bonus payments simultaneously ensures a reduction or streamlining of costs associated with the quality of finished products provision.

Given all the variety of impact factors affecting the economic efficiency of modern industrial production, improving and providing the quality of finished products is the most important task faced by employees of the national economic system at the present time (Svatoš and Smutka 2010; Abrham et al. 2015; or Maitah et al. 2016; Zeibote et al. 2019).

Solving the issue of increasing economic efficiency and quality, an important role is played by the improvement of the production and economic mechanism of the quality management system of the finished products.

The need to improve the efficiency of modern, functionally developed production process and quality of labour sets the task for economics to develop such a theory and management system technology that would focus on solving the problem of quality improvement with the best combination of interests of the national economic system and interests of industries and enterprises (associations) with the complex influence of organizational, technical, economic factors on industrial manufacturing plant and beyond. Therefore, the issues of improving the quality of finished products should be resolved on the basis of integrated management systems while strengthening the information-guiding apparatus and the role of economic indicators in their composition (Akhmetova et al. 2019).

The performance to plan is based on the acceleration of scientific and technological progress (innovative development). Modern prospective studies have shown the need and possibility of accelerating the socio-economic development of the country, based on the reorientation of each enterprise (association), industry, an entire national economic system, towards intensive development path, activating all reserves to increase the efficiency of the production process and quality of the finished products. At the same time, the quality, technical and economic levels of products remain as one of the most vulnerable issues in the economy of our country. In order to address the complex issues of quality provision and improvement, it is necessary to set and solve not only scientific, but also practical tasks of achieving a given level of quality with minimal costs. In general, the complexity of the restructuring the mechanism for controlling the quality of finished products has got its own specific reasons:

I. The increasing role of the market basis of the management system increases the role of the cost parameters of the economy, in the given case the cost indicators of the quality of the finished product.

II. In connection with the prevalence of all-natural parameters of the economy in all elements of the management system, including coordination of the quality of the finished product, the task is to find methods for their determination.

III. While solving a set of economic issues of the quality management system in modern economic conditions, the importance of scientifically based standards of natural and cost quality parameters is increasing.

IV. The significance of cost accounting for all components of the production process rises to a new level in the context of improving the production and economic mechanism. Along with the living labour saving, the increasing application of all resources, reducing the costs of the production process is becoming drastically important.

V. There are significant changes in the methods of management of the production process. First of all, it is expressed in the increasing importance of direct control methods, in the development of these methods - from taking into account the modern demand for finished products to affecting certain management functions, including one of the most difficult, i.e. the purpose of controlling the quality of the finished product. The task is to establish direct methods for controlling the quality of labour, the quality of finished products, the cost of quality provision and indirect management methods through the organizational aspects of the process of coordinating the quality of finished products, improving the planning mechanism, accounting, comprehensive economic analysis and evaluation, incentives in the quality management system of the finished products.

The theory and methods of assessing the economic efficiency of improving and providing the quality of finished products are the most developed in the volume and complex problem of the quality management system of finished products. However, a number of aspects of this problem remain underexplored. Such questions of determining demand more in-depth development: the cost of ensuring the quality of the finished product; the role, place and mechanism of quality costs in the quality management system of finished products based on cost indicators; the impact factors affecting the cost of quality; the mechanism for managing the cost of quality provision in the system of coordinating the quality of the finished product.

## **2 Literature review**

In the conditions of industrial enterprises activities at the present stage of market relations and management of production and economic activity, when each component of the property is billed, when the wholesale

price of the finished product, and hence the income (revenue) from the sale of the enterprise (association), is directly dependent on the quality of the finished product, a more in-depth development of the above mentioned list of issues becomes particularly relevant.

Modern theoretical studies performed by such authors as Alfie (2017), Bordea et al. (2017), Golovina (2016), Strielkowski et al. (2016), Dorofeeva (2015), Kizim et al. (2007), Kostyshina (2008), Lisogor (2005), Lukyanchenko and Doronina (2006), Malyarets and Shtereverya (2008), Miloradova and Ishkov (2014), Petrov (2015), Sirotkin (2015), Shapiro (2016), Jandov? (2012), Goddess et al. (1997), Thurow (1970), Schultz (1971), Bowen (1978), Mincer (1974) quite reasonably proved that the issue of the bonuses significance in the production and economic mechanism is not controversial.

Currently, an order has been established where economic incentive funds are formed according to fixed standards, approved in differentiated amounts by year of economic development cycle; the main fund-forming indicators are performance to the supply plan of finished products under the concluded contracts, increase in labour productivity, improvement of finished product quality and volume growth net profit. Therefore, there is every reason to believe that the introduction of long-term wage standards for the hryvnia finished product allows for strengthening the economic interest of labour collectives in increasing labour productivity and reducing staff turnover, improving the procedure of material incentives for combining professions, high rates and criteria for evaluating quality in labour, introducing technologically founded standards. In practice, the issue of economic incentives is paid specific interest to.

### **3 Distribution of material incentive fund**

The issues of forming the economic incentive funds have been worked out, and, moreover, they are regulated by the current procedure for fund formation. The distribution of the material incentive fund, the formation of the size of the bonus payments to the divisions and employees is quite arguable.

Considering bonuses as a form of feedback, as an incentive to work diligently and prevent damage from an unfair attitude, this task, along with general requirements, aims to stimulate the final results on the quality provision criterion for the finished product at optimal costs. The premium will only be adequate to real achievements in labour under genuine conditions, if it is based on accurate and full consideration of the characteristics and working conditions of the units and employees, and its mechanism of action is subordinated to the main goal of the production process - to achieve the final results, in the context of the given task - to provide quality of the finished products with minimal cost.

While accepting the order of incentives for quality of labour adopted at enterprises and acting within the framework of recommendations, it seems appropriate to offer such an incentive tool that would fit the nature of the quality provision process better than within the framework of the existing incentive system, while preserving its sources, payment limits, but changing the criteria and mechanism of action of the incentive system. Our paper considers the combination of these elements of the method in the offered incentive scheme.

The criterion for bonus payments to employees of the quality management service is the achievement of an optimal mismatch of the performance indicator.

### **4 Forming the size of bonus payments to units**

The most important and underexplored issue in the theory of material incentives is the issue of the size of the material incentives fund, allocated to the unit. In this case, an economically feasible approach is to construct a scale of bonuses, on the basis of which the size of the bonus fund, received by the unit, will be carried out by means of an economic and mathematical substantiation of the incentive function. This approach is well-known in the literature (e.g. Grinyova and Vlasenko 2005; Vnukovskaya 2015; or Zhuk 2015). However, its application is recommended for the distribution of bonus payments between employees. In the given case, this method is appropriate to apply for the formation of the encouragement fund. Among all possible types of incentive functions, the exponential function is the most reasonable. Curves of this type can be approximated by functions of the type, formula (1):

$$P = e^{aQ} - b, \quad (1)$$

where  $a$  and  $b$  are the constant coefficients of the bonus fund function and  $e$  is the basis of natural logarithms.

The exponential function stimulates the unit to achieve an optimal quality performance indicator, since as the unit performance quality indicator  $Q_{cal}$  approaches  $Q_{max}$ , equal to 100 %, the size of bonus payments progressively increases.

This approach needs clarification. It would be logical in our case to direct the calculated indicator of the quality of the unit's labour to the optimal one, but one cannot abstract from the mathematical specifics

of the generalized indicator of the quality of labour of an industrial enterprise. It is formed according to a logical chain of consecutive works on quality provision, as the product of power functions of the indicators of the quality of a unit's labour, formula (2):

$$Q = Q_1^{I_1} \cdot Q_2^{I_2} \cdot Q_3^{I_3} \dots \dots \quad (2)$$

Such construction is very sensitive to the  $Q$  slightest decrease - with an insignificant  $Q_i^{I_i}$  decrease in individual labour, there is a sharp  $Q$  drop for the enterprise as a whole. Therefore, the individual indicators of the units' labour should be adjusted, if possible, to 0,99-0,98, and then the cumulative indicator of the quality of labour will be achievable.

$a$  and  $b$  constant coefficients are determined from the  $P_{min}$  boundary conditions at  $Q_{cal}$  and  $P_{max}$ , at  $Q_{max} = 100 \%$ , where  $Q_{cal}$  for each unit and, accordingly, for each type of labour is defined as a complex indicator of the quality of the unit, taking into account the corresponding weighting factor according to the tables.

Taking  $Q_{max} = 100 \%$   $P_{max}$  for the unit at up to 100 % of the total wage fund is to increase interest in high quality indicators. The step scale with a change in bonuses at intervals, according to the exponential law of changing the bonuses fund function is given in Table 1.

**Table 1.** The scale of the formation of the material incentives fund for unit on the basis of exponential function

Unit performance indicator	The size of the bonus to the unit's payroll fund
1,00-0,99	0,967
0,99-0,98	0,934
0,98-0,97	0,901
0,97-0,96	0,869
0,96-0,95	0,837
0,95-0,94	0,806
0,94-0,93	0,78
0,93-0,92	0,74
0,92-0,91	0,713
0,91-0,90	0,698
0,90-0,89	0,66
0,89-0,88	0,64
0,88-0,87	0,59
0,87-0,86	0,56
0,86-0,85	0,53
0,85-0,84	0,52
0,84-0,83	0,48
0,83-0,82	0,45
0,82-0,81	0,42
0,81-0,80	0,4

Source: Own results

#### 4 Forming the size of bonus payments to employees

In connection with the change in the criteria for stimulating the labour of the departments, certain changes also occur in the mechanism for encouraging those who work in the quality provision system of the finished products. In order to increase the effectiveness of the stimulating mechanism, it is necessary to preserve the structure of the unit quality indicator, its elements, summarizing such labour properties as defect-free, productivity, rhythm, technical level, qualification level, and then, giving appropriate value to each property, to apply its valued coefficients for the formation of the standard of the corresponding bonus payments.

The nature of the properties represented by the quality indicator of labour suggests that, while estimating the size of bonus payments to employees, it is necessary to organize data collection of relevant content on the previously provided forms, and then apply this data in order to distribute bonuses among employees. Since the indicator of the unit labour quality and the indicator of the performer labour quality have the same structure, the creation of an informational basis for the distribution of bonuses among employees is simplified.

Within the framework of the standard list of functions of quality assurance services, consideration should be given to the fulfilment of duties by everyone working according to the form given in Table 2.

**Table 2.** The record of the performance of professional tasks by employees

Index	Task content	Completion schedule	Task completion mark	Timeliness mark
	.	.	.	.
	.	.	.	.
	.	.	.	.
<i>n</i>	Total number of tasks		x	
<i>n+1</i>	Total number of outstanding tasks		x	
<i>n+2</i>	Number of tasks not completed on time			x

Source: Own results

The presence of such documents allows for organizing information for the formation of a defect-free indicator and an indicator of the timeliness of performing tasks (functions) or rhythm.

The indicator of the defect-free performance of the performer (*B*) is formed as follows, formula (3):

$$B = n_4 - (n-1)4 / n_4, \tag{3}$$

where: *n*<sub>4</sub> – data *n* lines and 4 graph;  
 (*n+1*)<sub>4</sub> - data *n+1* lines and 4 graph.

The indicator of timeliness or rhythm (*K*) is determined by the formula (4):

$$K = n_4 - (n-2)5 / n_4, \tag{4}$$

where (*n+2*)<sub>5</sub> are the data *n+2* lines and 5 graph.

In order to determine the productivity indicator, it is necessary to organize in each of the services the accounting of defects in finished products by performers according to the form given in Table 3.

**Table 3.** The record of defects in finished products by performers (blank form)

No.	Defect types	Number of defects in the finished product	Responsible for defects	Term detection of defects
X	XX	XX	XX	XX

Source: Own results

The fact of the presence of a defect in the finished product due to someone's fault is estimated at 10 points for reducing the premium, and each defect is equivalent to one point for reducing the premium.

In addition, the cost value of defects (Table 4) can be applied, which characterizes the cost side of the damage caused by defects.

**Table 4.** Cost value coefficients for defects in finished products

Defect name	Value coefficients
Defects due to the fault of designers	0,057
Defects due to the fault of technologists	0,012
Defects of components	0,145
Defects caused by the actions of employees	0,207
Defects caused by the actions of master	0,074
Defects related to the violation of technological discipline	0,049
Defects detected during manufacturing	0,216
Defects detected during testing	0,041
Defects detected during warranty service	0,095

Source: Own results

It is possible, due to the correlation of the cost on providing quality characteristics and technical parameters, to calculate which increase in costs corresponds to the appearance of defects of one kind or another from the data Table 5.

**Table 5.** Information model of forming the optimal value of the cost on the quality provision of the finished product

Source address	Source Data	Output Data (optimal cost on the finished product quality)	Information Consumers
Planning and Economic Department	Cost of quality provision at enterprises	$20,21\delta^{-0,460}$	Product Quality Department
	Economic effect due to quality provision at enterprises-consumers of finished products	$13,480e^{-0,0436\delta}$	
Sub-industry department of the finished products quality	Indicators of the labor quality at enterprises. Total economic effect	$E = 20,21\delta^{-0,460} + 13,480e^{-0,0436\delta}$	Planning and Economic Department
	Optimal value of the mismatch	$\delta = 8,6 \%$	
Calculation Results	Optimal value of the cost on quality	$C = 7,51 \%$	

Source: Own results

It is possible, therefore, to calculate the absolute amount of losses caused by defects in production and deduct this amount from the value of the premium of the performer.

The integral indicator of the labour quality of each performer ( $K_i$ ) can be calculated by the formula (5):

$$K_i = B \cdot P \cdot K_r, \quad (5)$$

where  $B$ ,  $P$ ,  $K_r$  - respectively, the coefficients of defect-free, productivity and rhythm.

Flawless performance of functions, work without defects, as well as the absence of violations of the labour terms means a high-quality work. In this case, the quality factor of labour will be equal to one. Each failure to perform a function or presence of defects in the finished product, as well as untimely performance, will cause a significant decrease in the integral index. Then fairly the share of payments to a certain performer ( $P_p$ ) will be determined by the formula (6):

$$P_p = (P_s / N_p) \cdot K_{q,p}, \quad (6)$$

where:  $P_s$  - the value of the bonus fund received by the service;

$N_p$  - the number of performers in the service;

$K_{q,p}$  - the quality coefficient of the performer.

Such approach to the system of distribution of bonus payments for the labour quality allows for relaying the incentive system, focused on the final results, from the enterprise in general to each employee.

For employees with a decentralized formation of a material incentive fund for the main production workshops, it is recommended to increase the size of the material incentive fund for each workshop, providing an increase in the number of employees with a personal stamp and in the number of employees, supplying finished products from the first presentation during certain long period of time (several months).

The offered mechanism of the control system is quite universal. It can find its full application in industrial enterprises and research-production associations, regardless of their sectoral and structural profile, and it makes possible to solve the control issue by the criterion for estimating the optimal mismatch. The selection of labour quality parameters as criteria for evaluating bonus payments simultaneously ensures a reduction or streamlining of costs associated with the quality of finished products provision.

## 5 Conclusions

The research question of managing quality expenditures is highlighted by the need to include all reserves and opportunities, to improve economic efficiency and qualities, including the ability to calculate, analyse, evaluate and measure costs and results in a correct way. The general idea of our paper justifies the need for an interconnected system of the quality management cost indicators. The paper follows the tasks on resource

saving, a sharp increase in the economic efficiency of the production process and an increase in the quality of products, set by such authorities as, for example, the president and the government.

We explored the role of costs as a balancer of the economic efficiency in the functioning mode of the finished product quality management system, the determination algorithm, the calculation methods, identification, accounting, forecasting and coordination of the costs on the quality provision of finished product.

Along with theoretical studies, we presented some practical calculations, confirming the correctness of our scientific and methodological results and conclusions. Taking into account, however, the sufficient novelty of the approaches to the problem of managing the costs of providing the quality of finished products described in the given article, we would be grateful to the readers interested in solving the above-mentioned issues for their comments on this topic.

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