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	GIF (Australia) = 0.564	ESJI (KZ) = 8.997	IBI (India) = 4.260
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D.O. Borduch
Institute of service sector and entrepre-neurship
(branch) DGTU (Shakhty,Russia)

A.A. Blagorodov
Institute of service and entrepreneurship
(branch) of DSTU (Shakhty, Russia)

V. T. Prokhorov
Institute of service and entrepreneurship
(branch) of DSTU (Shakhty, Russia)

G.Y. Volkova
OOO SPOSN "Ortomoda"
Moscow

HOW TO ENSURE SUSTAINABLE DEMAND FOR THE PRODUCTS OF THE FASHION INDUSTRY CONSUMERS IN THE REGIONS OF SFD AND NCFD

Abstract*: In the article, the authors suggest ways to solve the problems of reviving the domestic light industry and creating conditions in the regions of the country to improve both the economic and social situation. This is especially justified for the districts of the southern Federal district and the Northern Federal district.The authors ' article is also interesting what is written on the basis of deep analysis of the real situation in the SFD and NCFD, where today a particularly high percentage of unemployment among women, which requires the creation of new jobs, to reduce social tensions in these regions. This is possible if we establish the production of shoes and other fashion products taking into account national and climatic characteristics in these regions, that is, the authors emphasize the need to look for a niche where import-substituting products will always have a steady demand, and enterprises will ensure that they receive stable TEP from their activities.The authors ' article is of scientific and practical interest for teachers, employees and students of universities and colleges, as well as for a wide range of readers and practitioners engaged in the production of fashion industry products.*

Key words*: import substitution, competitiveness, demand, fashion industry, innovation, regional, municipal, Federal, branches of government, product range, demand, market, profit, discounts, returns, profitability, technical and economic indicators (TEP), financial condition.*

Language*: English*

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Introduction

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The life cycle of any product (including a pair of shoes) is a concept that describes the sales of products, profits, consumers, competitors, and marketing strategy from the moment the product enters the market until it is removed from the market.

At present, companies operating in a competitive environment with changing external

influences, increasingly attach importance to conducting marketing research of their products. It is also important that the information acquired in the process of such research is used in the multivariate analysis and justification of management decisions on the range of products, their quantity, prices, consumer properties, etc. When the value of performance is underestimated the marketing system at the enterprise becomes unclaimed its production capacity, intellectual and human potential. The dynamics of the impact of market demand on manufactured goods should be monitored by the marketing service at all stages of their life cycle and taken into account in systems responsible for the quality and quantity of products produced, their price, innovation, and development of new types of products. Thus, all types of products, technologies and services have a certain life cycle. The success of an enterprise depends on the degree of consistency of various stages of the main life processes.

The market situation changes at every stage of the life cycle and requires a corresponding change in the strategy and tactics of the company's behavior in the market, which is of particular importance.

The main types of products go through 4-5 stages before disappearing from the market:

- presentation (introduction to the market);
- growth (development);maturity (stabilization);
- decline (the decline and renewal of products);
- dying (dying and beginning of the product update cycle).

Figure 1 shows a graphic illustration of the product's life cycle on the market.

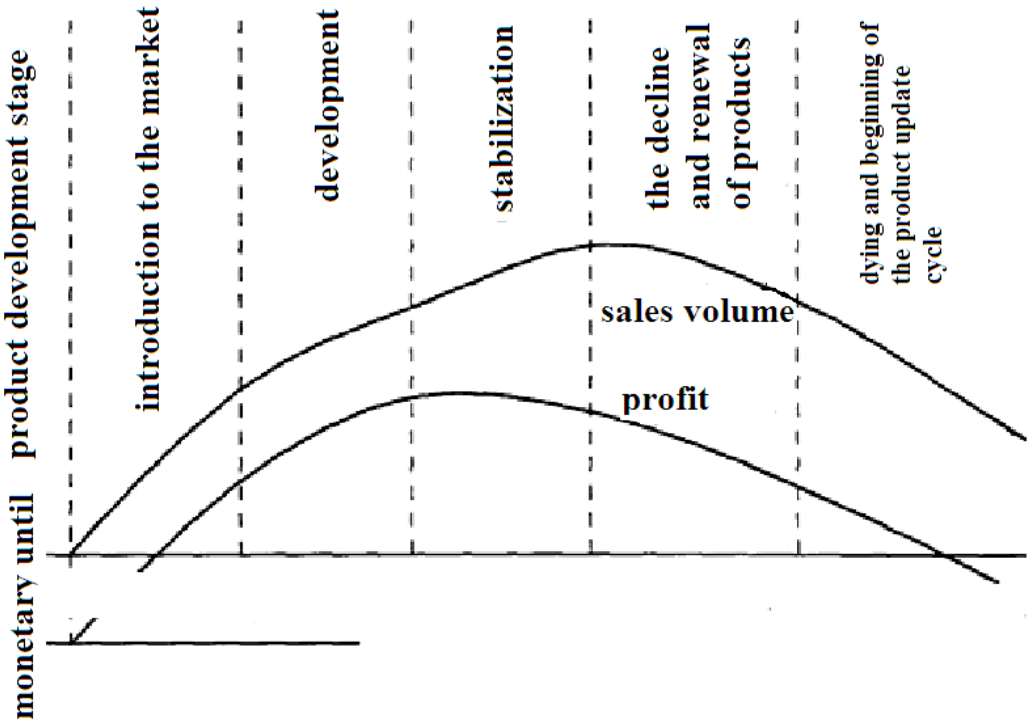

Fig. 1. Life-cycle product on the market

The above graphic illustration is conditional. Each product has its own life cycle characteristics.

So, we can distinguish the following stages of the product lifecycle.

The first stage is the presentation stage (the period when the product is introduced to the market). At this stage, the demand for the product increases slowly. This is due to the fact that the period when a new type of product is introduced to the market is not yet known to most prospective buyers.

At this stage, the company makes a small profit. Often, the entrepreneur calculates losses, sometimes even very large. Sellers are usually very careful in adding to their assortment of products that are at the presentation stage. They are aware that most regular customers are not familiar with this type of product, so it is always difficult to sell these products. As a result, sellers can claim various privileges for themselves, which include: free delivery of billboards and other materials, joint advertising expenses, and so on. D. a Powerful firm for the retail sale of goods may even require exclusive rights of distribution of products in your shopping region. At

this stage, prices are set to the minimum, the company has little or no profit.

The second stage is the growth stage. If the product survives at the first stage, it continues to develop. At this stage, sales increase rapidly. Modified versions of the basic model must be offered to meet the growing market. Relative profits are high.

The third stage is the stage of maturity. At this stage, the product has its own market and is in demand. At the stage of maturity, competition increases and reaches its maximum, as many firms enter the market. As a result, profits in General and per unit of product are reduced, since discounts are widely used.

The fourth stage is the decline stage. At this stage, the product that does not undergo any changes becomes boring to consumers, or the need that it was intended to satisfy disappears. An unpredictable reason for declining sales during a downturn may be technical obsolescence of the product. During the downturn, sales across the industry are declining and many firms are leaving the market as the number of consumers decreases and the product range focuses on the best-selling models.

The fifth stage – the stages of decline and death, i.e., the decline and renewal of the product, as well as the death and beginning of the product renewal cycle, are characterized by a slow, and then a sharp drop in demand. In the face of declining sales and profits, manufacturers sometimes struggle to restore demand for a particular product. These include the following steps:

- new type of packaging;
- special advertising;
- changed price.

Although it is quite difficult to give up products, sooner or later, as sales continue to decline, entrepreneurs are forced to make this decision. At this stage, the following measures are being taken:

- decommissioning of this type of product;
- the gradual narrowing of the investment;
- development of private organizational changes in relations with the intermediaries, so that they do not suffer losses along the way, and inventory of surpluses.

In relation to products that are clearly in decline, sales representatives begin to reduce the number of deliveries, strive to minimize repeat orders, and then gradually refuse to deliver the product. They can even reduce the price of the remaining items in order to completely reject the product.

Thus, each stage of the product lifecycle is a variable that determines marketing actions in the target market.o

The product life cycle depends on the number of substitute products, their competitiveness, as well as on correct management decisions aimed at developing support measures to optimize the structure of the product life cycle. The main measures to optimize the product lifecycle structure include:

Proper use of various marketing elements at different stages of the product lifecycle;

The company's production strategy.

Table 1 shows the main elements of marketing at different stages of the life cycle.

It is very important to maintain the optimal life cycle, to determine the initial price for the product produced and the maximum possible amount of price reduction, provided that the production break-even is maintained. To optimize this factor, the company should work out discount systems that allow attracting various consumer segments to purchase the company's products and thereby reduce the inventory of manufactured but not yet sold products at the moment when it becomes clear that this product is losing its previously occupied market niche.

In the practice of pricing, a large number of discounts are known, which are used at various levels: enterprises, sales organizations and trade. The following types of discounts are most common for companies in the footwear industry:

Table 1. The basic components of marketing at different stagesproduct life cycle

Elements of marketing	Stage of the product life cycle				
	performance	**height**	**maturity**	**Decline**	**dying**
Goals	Bring the product to market	Gain a strong position	Hold positions in the market	Bring all your inventory into circulation	Go to a new lifecycle without loss
Price	High	High, then slowly begins to decline	Stabilizes, then decreases	Continues to fall	Minimal (up to minuscule)
Distribution channel	Agents who supply the trial	Channels are used to increase sales, and	All possible channels are involved	The number of sales channels is decreasing	Only channels that provide the minimum

	batch of the product	wholesalers are included			supply are available
Advertising	About the consumer properties of the new product, its advantages, its prestige is emphasized	Advertising is enhanced and focuses on a variety of shopping motives	Supportive, persuasive	Supportive, reminding	Reminiscent

 bonus-a price discount of up to 10%, which is provided to a large wholesale buyer for a specified volume of turnover during a certain period;

seasonal-provided to the consumer when the shoes are sold

outside of the main sales season, the purpose of introducing discounts of this type is to maintain a constant level of sales throughout the year, in addition, this discount saves the manufacturer from part of the warehouse costs and reduces the risk of non-liquidity;

 dealership-available to wholesale and retail merchants, agents and intermediaries to cover their expenses;

 special-provided to regular customers;

 sales promotion discount-a measure to reduce the sales price shoes that are guaranteed to Resellers if they take for sale new types of shoes or Vice versa types of shoes that are at the stage of decline in the life cycle;

 discount on trial batches and product orders-setmanu facturer in order to interest the buyer in new models of shoes;discount for speeding up payment-a measure of reducing the price for each

the" saved " week against the agreed period in the contract;

 a discount for paying real money – the consumer, those who pay for deliveries on time with real money, and not their substitutes, can get a discount from the base price, since the last price is usually set by the company for possible losses from non-payments;

 discount for regular orders.by the manufacturer in order to retain a regular customer;

 advertising-discount from the price of shoes provided by the company to a retailer so that the latter can organize local advertising of shoes;

 sales – discount from the wholesale price provided by a supply and sales organization that performs the functions of selling shoes in transit with participation in calculations;

 trade-part of the retail price of shoes remaining in the

disposal of trade organizations and enterprises to cover the costs of circulation and profit generation;

 discount from the price-applies if you buy shoesreduced quality.

In addition, the company can take the initiative to reduce the price when underloading production capacity, reducing the market share under the onslaught of an aggressive competitive environment, etc.

If an enterprise uses proactive periodic price reduction as a tool to influence consumers, taking care of their costs, developing measures to reduce them by improving equipment and technology, introducing new types of materials into production, constantly improving the quality of shoes, then you should be afraid of a premature or sharp decrease in the price of products. And as a result, the company will not receive an increase in profit due to an increase in sales due to a decrease in price, but a sharp drop in demand for this type of footwear and as a result, a reduction in sales and a negative financial result for this type of product.Such phenomena of time as: style, fashion, and fetish significantly affect the Shoe shopping center.Style is the main peculiar form of expression that occurs in a particular sphere of human activity. Once created, a style can exist for many generations, sometimes gaining wide popularity, then losing it. Figure 2 shows the standard curve for the effect of a product's style on its lifecycle.

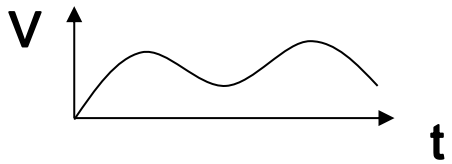

Fig. 2. Influence of style on the product lifecycle

Fashion is the most popular or widespread style in a given period of time in a given field of activity.

Figure 3 shows the impact of fashion on the product lifecycle.

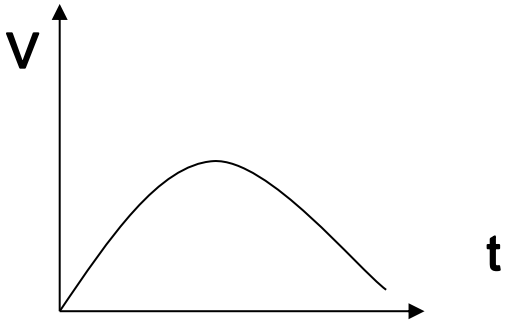

Fig. 3. Influence of fashion on the product lifecycle

Fetishes are particular manifestations of fashion that win everyone's attention, are perceived with great enthusiasm, quickly reach the peak of popularity and very quickly pass to the stage of decline. The cycle of their recognition is short and, as a rule, the number of their adherents is limited. Figure 4 shows the effect of the fetish factor on changes in the product lifecycle.

Thus, the Shoe manufacturer should plan its production strategy based on the possibility of using marketing elements to optimize the structure of the product lifecycle.

Different companies have different approaches to determining the strategy for the production of goods and services, depending on the needs of customers, available resources, market conditions, and so on. Moreover, the same company may use different strategies for different products. The choice of strategy is usually based on the product's competitiveness.

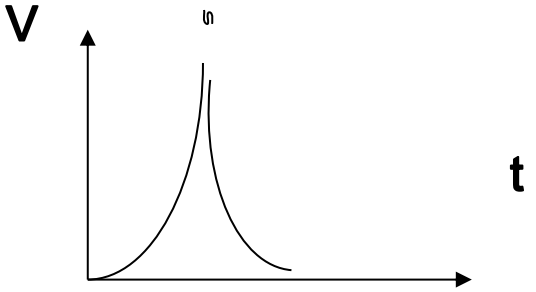

Fig. 4. Influence of a fetish on product lifecycle changes

Various approaches or methods of analyzing the order portfolio have also been developed that allow evaluating the range of production assortment in terms of profitability of its individual elements.

One such approach, by which the sales and marketing Manager can make decisions about the firm's strategy when selling certain products or services, was proposed by the Boston group. This method allows you to classify various combinations of goods and services of a firm with a differentiated production program based on the so-called growth matrix, or "portfolio of business development directions" (Fig. 5).

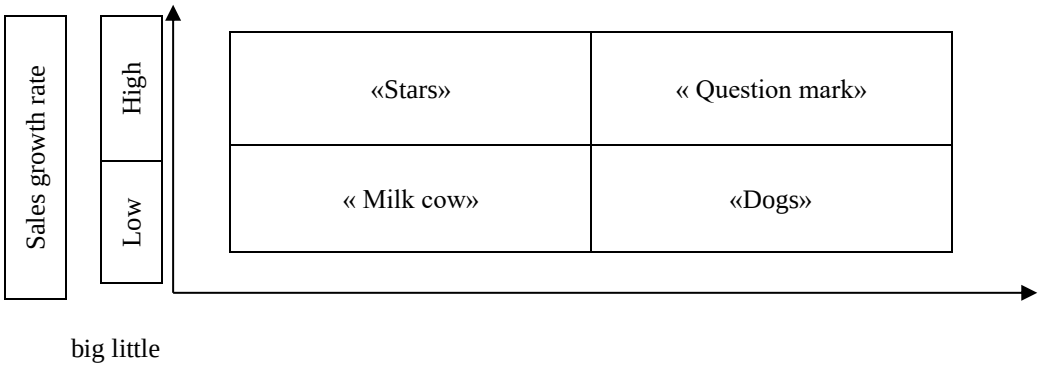

Figure 5. Boston consulting group Matrix

Applying this classification requires taking into account current and potential market segmentation, various temporary aspects of profitability of a particular combination of goods and services, as well

as the impact of competition. For example, a company may be the largest in its industry, but it does not take a leading position in one of the market segments.

In figure 5, the combinations of products and services that belong to the category of “stars " are located in the upper-left quadrant. These products are characterized by rapid sales growth, which requires large amounts of working capital, but cash flow is also high, since these combinations of goods and services are leading in their market segments. Usually in this case, there is a balance of money turnover within the company. Sales agents are willing to sell such combinations of goods and services: their production volumes are large, they are leading the market and are in high demand, but, as a rule, do not bring profit to the manufacturer. Over time, but as their life cycle progresses, sales dynamics slow down, and they turn either into " cash cows "or, if their market share declines and they lose their competitiveness, into" dogs", i.e., unviable combinations of goods.

Combinations of goods and services that belong to the category of "cash cows" are characterized by low dynamics of sales growth. However, their market share is usually high and they can be “milked” because they can generate more revenue than is required to invest in production. These product combinations are particularly popular with sales agents because of the high demand for them and are attractive to the sales and marketing Manager, as they are able to generate the real money needed to develop and support the sale of new or upgraded products and services.

The really difficult problems are posed to the company's management, marketing and sales managers by products that belong to the “question mark” category (“difficult children”), which are located in the upper right quadrant of the matrix. They tend to have a small market share, often need support, and are far behind the leading products in terms of market positions and customer confidence. Those who deal with them inevitably have the following questions: will they become "stars” or" cash cows”; how much time and money will it take for them to “get back on their feet”; what are their prospects in the market? Such combinations of goods and services are usually not favored by sales agents. A small market share and weak demand, often a low degree of trust and ignorance of customers, and weak advantages over competing products make it difficult to sell them. However, if they turn into “stars” or “cash cows”, sales agents should devote maximum effort to organizing their sales. However, the sales and marketing Manager may need to introduce a special incentive Commission rate and provide personal guidance to support sales agents ' efforts to market these combinations of products and services.

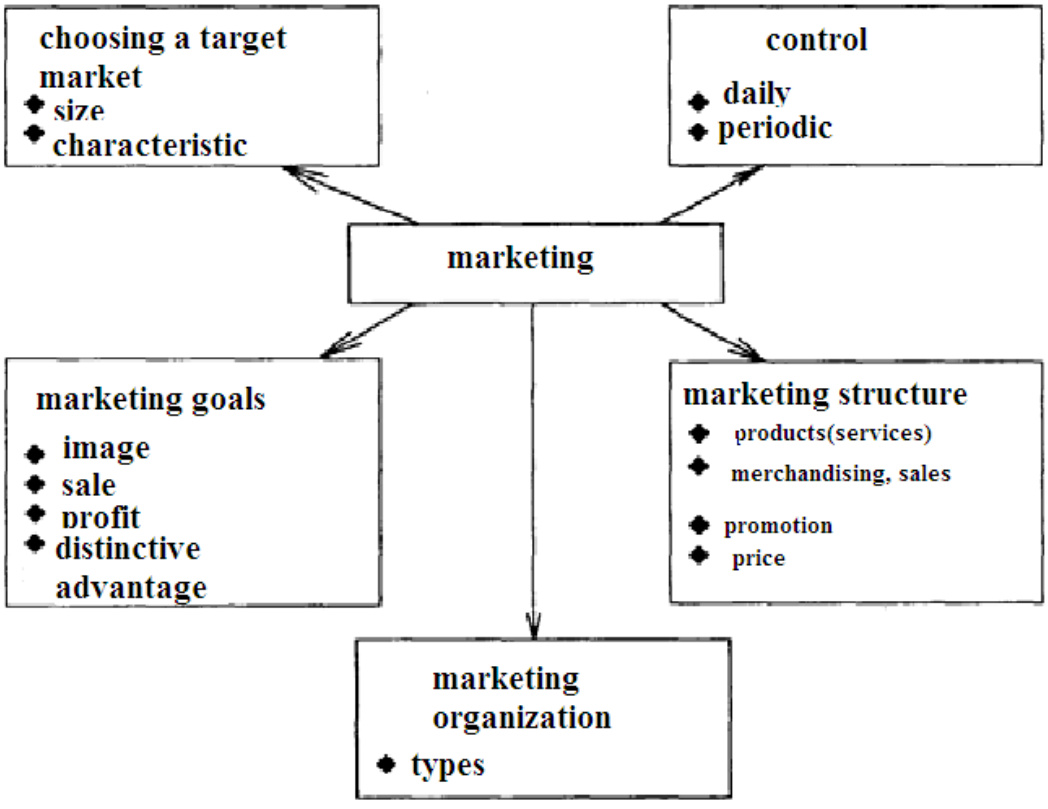

Figure 6. Factors controlled by marketing

The development of new combinations of goods and services is carried out taking into account the goals and strategies of enterprises and is accompanied by an analysis of the company's position, which results in a decision on possible diversification of activities. When developing a strategy, it is mandatory to take into account factors that are controlled by marketing (Fig. 6). As well as factors that are not controlled by marketing (Fig. 7).

Marketing research and the study of the profitability of new product concepts are conducted separately from the assessment of technological capabilities, since it may be appropriate to transfer production partially or completely to the contractor. After evaluating the results of production, a decision can be made to resume it.

So, product lifecycle management is the process of managing a product from concept development to disposal. When this process works effectively, the company is able to manage profitable innovations — accelerate the development of new products, quickly bring them to market and constantly improve quality, while reducing costs.

At the same time, in order to stay competitive, Shoe companies are forced to constantly improve the consumer properties of their products and expand the range of terms of supply and services, although all this is more or less taken into account in the price and ultimately paid by the consumer. When setting the price of a product, the company must also take into account the level of already established prices for other products that are similar in purpose and quality on the market.

The presence of stages in the life cycle of shoes requires constant changes in the pricing strategy. The product life cycle is characterized by fluctuations in sales volume and profit from its sale. Accordingly, the price will change depending on the stage of the product's life cycle. Therefore, it can be concluded that the price set by an enterprise for a product depends on production costs, supply and demand, as well as on the solvency of the population, the price policy and market strategy of the firm, the quality of the product, additional services and services, interchangeability of goods and their life cycle.

Main part

The development of a market economy sets the task of developing new approaches to managing microeconomic systems. Usually, the functioning of any enterprise in a market economy is aimed at obtaining maximum profit, the amount of which is significantly influenced by the rationality of decisions made by the company's management based on external and internal factors, as well as the analysis of the economic situation in the market. Recently, the direction related to maintaining profits at a certain level that satisfies the company's management has become relevant.

At present, many phenomena of the real economic situation can be explained using economic and mathematical models. Therefore, to make an adequate decision based on forecasting the company's profit, it is necessary to develop an economic and mathematical model of the process of its change, which takes into account both external and internal factors. In addition, in a changing economic situation, it is useful to apply dynamic models that reflect the process of production, storage and sale of products over time. The constructed models of such processes are more complex due to the need to take into account many local factors. However, the potential use of these models is much broader. For example, the construction of an economic and mathematical model of the process of changing the company's profit is primarily necessary for management to make informed management decisions on regulating the levels of manufactured and sold products. The model will allow you to reflect not only the periods of time for increasing the volume of output and getting more profit, but also the periods associated with its reduction and the sale of only products stored in the warehouse. In addition, the company's management will be able to make correct economic decisions based on the economic and mathematical model of the profit change process in cases when the forecast value of the company's profit is very small or not at all.

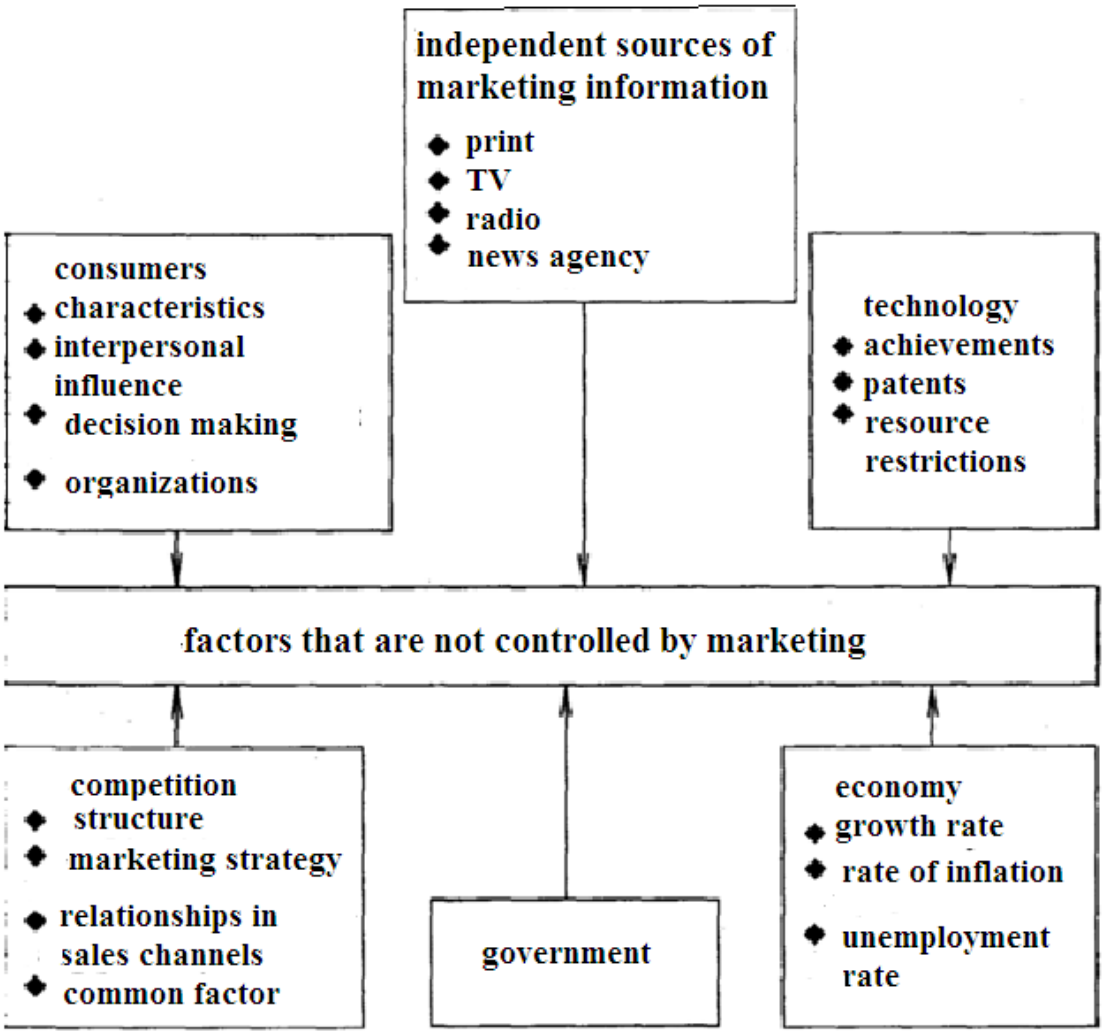

Fig. 7. Factors that are not Controlled by marketing

The developed dynamic model allows you to determine the profit from the sold product, taking into account the seasonality of demand, the current price of the product, the cost price, and to regulate based on data on the number of goods produced and sold on the market. The built model takes into account the processes that occur in the production, sale and storage of finished products, as well as in the field of its repair. In addition, the model can form the basis of expert decision-making systems for calculations related to determining the company's profit, which will help to remove uncertainty in the process of establishing the company's profit when seasonal fluctuations in demand for products in a market economy.

Let's proceed to the consideration of the economic and mathematical model of the process of changing the company's profit, presented in the form of the following differential equation (1):

$$\frac{dW(t)}{dt} = p_1 \frac{dN_{np}(t)}{dt} - c\frac{dN(t)}{dt} - k_2 * N_p(t) * p_1 \quad (1)$$

The resulting equation is formed on the basis of the developed models for the number of goods sold TPR, the total number of goods Tr. The equation includes parameters such as cost-C, current product price P1, current time t, and the fee for storing units of goods per unit of time k2.

Integrating equation (1), we have(2):

$$W(t) = \int p_1 dN_{np}(t) - \int cdN(t) - \int k_2 N_p(t) p_1 dt \quad (2)$$

The resulting expression is represented in the following form (3):

$$W(t) = I_1(t) - I_2(t) - I_3(t) + C \qquad (3)$$

where C is the integration constant.

First, consider the integral I1 (t) included in the expression (4):

$$I_1(t) = \int p_1 dN_{np}(t) = \int p_1 \left(n_0 + \Delta p_1 \cos\left(\frac{m\pi t}{\tau} - \varphi_2 \right) \right) \left[I_{3'}(t) + I_{4'}(t) \right] dt \qquad (4)$$

Let's represent the integral in the following form (5):

$$I_1(t) = I_{14}(t) + I_{24}(t) + I_{34}(t) + I_{44}(t) + I_{54}(t) + I_{64}(t), \quad (5)$$

where

$$I_{14}(t) = \int p_1 n_0 I_3(t) dt$$

$$I_{24}(t) = \int p_1 \Delta p \cos\left(\frac{m\pi t}{\tau} \right) \cos(\varphi_2) I_{3'}(t) dt$$

$$I_{34}(t) = \int p_1 \Delta p \sin\left(\frac{m\pi t}{\tau} \right) \sin(\varphi_2) I_{3'}(t) dt$$

$$I_{44}(t) = \int p_1 n_0 I_{4'}(t) dt$$

$$I_{54}(t) = \int p_1 \Delta p \cos\left(\frac{m\pi t}{\tau} \right) \cos(\varphi 2) I_{4'}(t) dt$$

$$I_{64}(t) = \int p_1 \Delta p \sin\left(\frac{m\pi t}{\tau} \right) \sin(\varphi 2) I_{4'}(t) dt$$

$$I_{3'}(t) = -\frac{m\pi Na}{\tau} \left(\frac{(1-k)(n_0 + \Delta p \cos(\varphi_2))}{\left[(1-k)(n_0 + \Delta p \cos(\varphi_2))\right]^2 + \left(\frac{m\pi}{\tau} \right)^2} \times \cos\left(\frac{m\pi t}{\tau} \right) \sin\left(\frac{m\pi t}{\tau} \right) - \frac{\frac{m\pi}{\tau}}{\left[(1-k)(n_0 + \Delta p \cos(\varphi_2))\right]^2 + \left(\frac{m\pi}{\tau} \right)^2} \cos\left(\frac{m\pi t}{\tau} \right) \cos\left(\frac{m\pi t}{\tau} \right) \right)$$

$$I_{4'}(t) = \frac{m\pi Na}{\tau} \sin(\varphi_1) \times \left(\frac{\frac{m\pi}{\tau}}{\left[(1-k)(n_0 + \Delta p \cos(\varphi_2))\right]^2 + \left(\frac{m\pi}{\tau} \right)^2} \times \sin\left(\frac{m\pi t}{\tau} \right) - \frac{(1-k)(n_0 + \Delta p \cos(\varphi_2))}{\left[(1-k)(n_0 + \Delta p \cos(\varphi_2))\right]^2 + \left(\frac{m\pi}{\tau} \right)^2} \times \cos\left(\frac{m\pi t}{\tau} \right) \right)$$

Then we calculate the integrals (4) sequentially.

Let's start with the integral I 14 (t). As a result, we have:

$$I_{14}(t) = p_1 n_0 \left[\frac{m\pi Na}{\tau} \cos(\varphi_1) * \left[\frac{(1-k)(n_0 + \Delta p \cos(\varphi_2))}{\left[(1-k)(n_0 + \Delta p \cos(\varphi_2))\right]^2 + \left(\frac{m\pi}{\tau} \right)^2} \left(-\frac{\tau}{m\pi} \right) * \cos\left(\frac{m\pi t}{\tau} \right) - \frac{\frac{m\pi}{\tau}}{\left[(1-k)(n_0 + \Delta p \cos(\varphi_2))\right]^2 + \left(\frac{m\pi}{\tau} \right)^2} * \frac{\tau}{m\pi} * \sin\left(\frac{m\pi t}{\tau} \right) \right] \right]$$

Let's proceed to calculating the integral I 24(t). As a result, we get:

$$I_{24}(t) = p_1 \Delta p \cos(\varphi_2)\left[-\frac{m\pi Na}{\tau}\cos(\varphi_1) * \frac{(1-k)(n_0+\Delta p\cos(\varphi_2))}{\left[(1-k)(n_0+\Delta p\cos(\varphi_2))\right]^2+\left(\frac{m\pi}{\tau}\right)^2}\right] * \left[-\frac{1\cos\left(\frac{m\pi t}{\tau}\right)^2}{2m\pi}\tau\right] -$$

$$-\frac{\frac{m\pi}{\tau}}{\left[(1-k)(n_0+\Delta p\cos(\varphi_2))\right]^2+\left(\frac{m\pi}{\tau}\right)^2} \times \left[\frac{-\frac{1}{2}\sin\left(\frac{m\pi t}{\tau}\right)\cos\left(\frac{m\pi t}{\tau}\right)+\frac{1}{2}\left(\frac{m\pi t}{\tau}\right)}{(m\pi) * 1/\tau}\right]$$

Find the integral I 34(t):

$$I_{34}(t) = p_1 \Delta p \sin(\varphi_2)[-\frac{m\pi Na}{\tau}\cos(\varphi_1) * [\frac{(1-k)(n_0+\Delta p\cos(\varphi_2))}{\left[(1-k)(n_0+\Delta p\cos(\varphi_2))\right]^2+\left(\frac{m\pi}{\tau}\right)^2} *$$

$$* \left[\frac{-\frac{1}{2}\sin\left(\frac{m\pi t}{\tau}\right)\cos\left(\frac{m\pi t}{\tau}\right)+\frac{1}{2}\left(\frac{m\pi t}{\tau}\right)}{m\pi}\tau\right] - \frac{\frac{m\pi}{\tau}}{\left[(1-k)(n_0+\Delta p\cos(\varphi_2))\right]^2+\left(\frac{m\pi}{\tau}\right)^2} *$$

$$\left[-\frac{1\cos\left(\frac{m\pi t}{\tau}\right)^2}{2m\pi}\tau\right]]]$$

Let's proceed to calculating the integral I44(t):

$$I_{44}(t) = p_1 n_0[\frac{m\pi Na}{\tau}\sin(\varphi_1) * [\frac{\frac{m\pi}{\tau}}{\left[(1-k)(n_0+\Delta p\cos(\varphi_2))\right]^2+\left(\frac{m\pi}{\tau}\right)^2} * \left(-\frac{\tau}{m\pi}\right)\cos\left(\frac{m\pi t}{\tau}\right) -$$

$$-\frac{(1-k)(n_0+\Delta p\cos(\varphi_2))}{\left[(1-k)(n_0+\Delta p\cos(\varphi_2))\right]^2+\left(\frac{m\pi}{\tau}\right)^2} * \left(\frac{\tau}{m\pi}\right)\sin\left(\frac{m\pi t}{\tau}\right)]]$$

Calculate the integral I 54(t):

$$I_{54}(t) = p_1 \Delta p \cos(\varphi_2)[\frac{m\pi Na}{\tau}\sin(\varphi_1) * [\frac{\frac{m\pi}{\tau}}{\left[(1-k)(n_0+\Delta p\cos(\varphi_2))\right]^2+\left(\frac{m\pi}{\tau}\right)^2} * \left[-\frac{1\cos\left(\frac{m\pi t}{\tau}\right)^2}{2m\pi}\tau\right] -$$

$$-\frac{(1-k)(n_0+\Delta p\cos(\varphi_2))}{\left[(1-k)(n_0+\Delta p\cos(\varphi_2))\right]^2+\left(\frac{m\pi}{\tau}\right)^2} * \left[\frac{\frac{1}{2}\sin\left(\frac{m\pi t}{\tau}\right)\cos\left(\frac{m\pi t}{\tau}\right)+\frac{1}{2}\left(\frac{m\pi t}{\tau}\right)}{m\pi}\tau\right]]]$$

Consider the integral I64(t) as a result we get:

$$I_{54}(t) = p_1 \Delta p \cos(\varphi_2)[\frac{m\pi Na}{\tau}\sin(\varphi_1) * [\frac{\frac{m\pi}{\tau}}{[(1-k)(n_0+\Delta p\cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} *$$

$$* \left[\frac{\frac{1}{2}\sin\left(\frac{m\pi t}{\tau}\right)\cos\left(\frac{m\pi t}{\tau}\right) + \frac{1}{2}\left(\frac{m\pi t}{\tau}\right)}{m\pi}\tau\right] - \frac{(1-k)(n_0+\Delta p\cos(\varphi_2))}{[(1-k)(n_0+\Delta p\cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2}\left[-\frac{1\cos\left(\frac{m\pi t}{\tau}\right)^2}{2m\pi}\tau\right]$$

Next, we define the integrals I2(t), I3(t):

$$I_2(t) = cNa\left(\frac{m\pi}{\tau}\right)\sin\left(\frac{m\pi t}{\tau} - \varphi_1\right)$$

$$I_3(t) = \int k_2 p_1 N_p(t) dt\,,$$

where Np is the quantity of goods on the market determined from the expression:

$$N_p(t) = -\frac{m\pi Na}{\tau}\cos(\varphi_1) * [\frac{(1-k)(n_0+\Delta p\cos(\varphi_2))}{[(1-k)(n_0+\Delta p\cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \sin\left(\frac{m\pi t}{\tau}\right) -$$

$$- \frac{\frac{m\pi}{\tau}}{[(1-k)(n_0+\Delta p\cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \cos\left(\frac{m\pi t}{\tau}\right)] + \frac{m\pi Na}{\tau}\sin(\varphi_1) *$$

$$* \left[\frac{\frac{m\pi}{\tau}}{[(1-k)(n_0+\Delta p\cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2}\sin\left(\frac{m\pi t}{\tau}\right) + \frac{(1-k)(n_0+\Delta p\cos(\varphi_2))}{[(1-k)(n_0+\Delta p\cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2}\cos\left(\frac{m\pi t}{\tau}\right)\right]$$

As a result, we get:

$$I_3(t) = k_2 p_1 (\frac{m\pi Na}{\tau}\cos(\varphi_1) * [\frac{(1-k)(n_0+\Delta p\cos(\varphi_2))}{[(1-k)(n_0+\Delta p\cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2}\left(-\frac{\tau}{m\pi}\right)\cos\left(\frac{m\pi t}{\tau}\right) -$$

$$- \frac{\frac{m\pi}{\tau}}{[(1-k)(n_0+\Delta p\cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2}\left(\frac{\tau}{m\pi}\right)\sin\left(\frac{m\pi t}{\tau}\right)] + \frac{m\pi Na}{\tau}\sin(\varphi_1) *$$

$$* \left[\frac{\frac{m\pi}{\tau}}{[(1-k)(n_0+\Delta p\cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \left(-\frac{\tau}{m\pi}\right)\cos\left(\frac{m\pi t}{\tau}\right) + \frac{(1-k)(n_0+\Delta p\cos(\varphi_2))}{[(1-k)(n_0+\Delta p\cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2}\left(\frac{\tau}{m\pi}\right)\sin\left(\frac{m\pi t}{\tau}\right)\right]$$

The built model allows you to take into account the processes that occur in the production, sale and storage of finished products, as well as in the field of its repair. In addition, based on this mathematical model, the company's management can reasonably

make management decisions to regulate the level of output.

Let's consider an illustrated example based on the model considered. To do this, in table 2, we present the initial data for solving this economic and mathematical model.

Table 2 uses the following symbols:

t – current time, weeks;

C – the total cost of the product (pair of shoes) rub.;

R-return on sales, %;

P1-the originally planned selling price of a pair of shoes, rub.

P2-price at the discount (surcharge) entered, under the influence of market factors, in rubles.

DR1 – the difference between the original price p 1 and the price p 2, RUB.

S - the amount of the discount (surcharge) in %of the price;

k2-payment for storage of a unit of goods per unit of time t, in %of the cost price;

Na-the amplitude value of the Shoe production volume for the period, PCs.;

Nmax-production of footwear at maximum capacity utilization, PCs.;

Nmin-the expected production of shoes to meet the most likely needs of regular customers of the enterprise (set by the management of the enterprise based on the real situation on the market), PCs.;

t – the period of one turnover of the company's working capital, weeks;

k-coefficient of repaired products;

m, n0-constant coefficients;

φ1, φ2-phase angles.

Let's say a Shoe manufacturing company has an order for the production of 500 pairs of shoes at the price of 395 rubles per pair, 625 pairs at the price of 375 rubles per pair. The production capacity of the company allows you to produce 2000 pairs of shoes for a period of 4 months. The head of the company must decide how much it is possible to "fully load" the production capacity of the company in order to sell the remaining part of the possible production of shoes on their own.

Table 2. Initial data for calculating EMM-forecasting the company's profit in the conditions of unstable demand for children's shoes

t	C	p1	p2	Δp1	k2	Na	N_{min}	N_{max}	т	k	m	п	φ1	φ2	n0
1	305	395	350	45	0,3	112,5	100	125	12	0,01	-1	3,14	65	45	1
2	305	395	350	45	0,3	112,5	100	125			-1		60	45	
3	305	395	350	45	0,3	112,5	100	125			-1		60	45	
4	305	395	350	45	0,3	112,5	100	125			-1		45	45	
5	305	395	350	45	0,3	112,5	100	125			-1		45	45	
6	305	395	350	45	0,3	112,5	100	125			-1		45	45	
7	305	395	350	45	0,3	112,5	100	125			-1		45	45	
8	305	395	350	45	0,3	112,5	100	125			-1		45	45	
9	305	395	350	45	0,3	112,5	100	125			-1		50	50	
10	305	395	350	45	0,3	112,5	100	125			-1		55	55	
11	305	395	350	45	0,3	112,5	100	125			-1		60	60	
12	305	395	350	45	0,3	112,5	100	125			-1		65	65	
13	305	395	350	45	0,3	112,5	100	125			-1		70	70	
14	305	395	350	45	0,3	112,5	100	125			-1		75	75	
15	305	395	350	45	0,3	112,5	100	125			-1		80	80	
16	305	395	350	45	0,3	112,5	100	125			-1		85	85	

Let's say the company's management decided to additionally produce (in addition to orders) another 475 pairs of shoes and implement this volume independently.

Thus, the program for the production of children's shoes for the period will total 1625 pairs.

Solving this EMM model with basic conditions: production program-1600 pairs; possible discount up to the price level for a pair of up to 350 rubles, in MS Excel we get the following data, shown in figure 8.

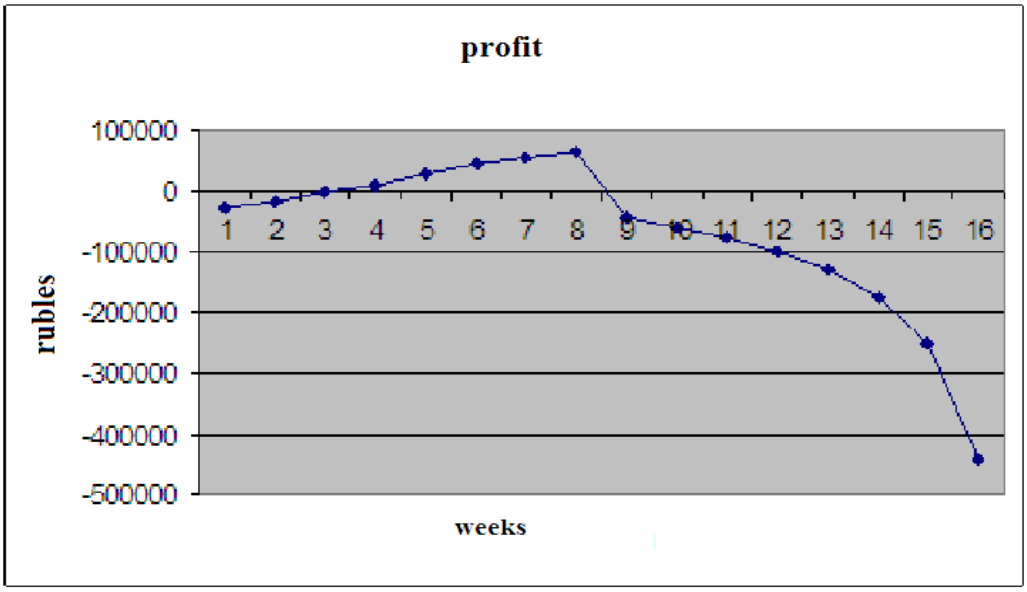

Fig. 8. Dynamics of the company's profit

Thus, from figure 8 it is clear that the company in the production of shoes under these conditions will make a profit for 5.5 weeks. Somewhere from the middle of the third week to the end of week 8, further production of children's shoes of this type becomes impractical. Table 3 shows the values of profit dynamics.

Table 3. Value net profit dynamics, RUB.

Недели	1	2	3	4	5	6	7	8	ИТОГО
При-быль	-28287,5	-17002,6	-1217,64	9667,719	27453,06	13956	17135,98	61241,57	82946,6

Table 3 shows that the total profit that can be achieved by the company under these conditions is 82946.6 rubles.

At the same time, when a product is sold at a price in the forecast period that exceeds the original price, for example, by 10 rubles (405 rubles), we get a completely different character of the schedule (figure 9)

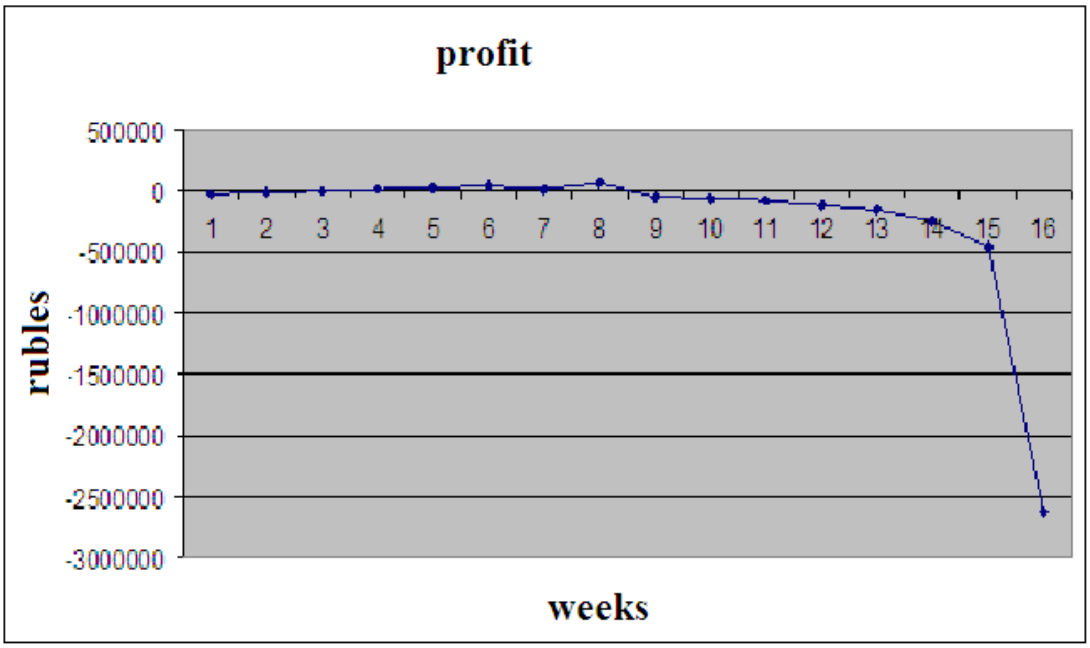

Fig. 9. Dynamics of the Shoe company's profit at the planning allowances

Figure 9 shows that the company under these conditions will make a profit for only 4.5 weeks. And the size of the total profit for this period will be reduced to 80464.5 rubles (table. 4)Thus, the period of economic life of children's shoes with the introduction of the surcharge will be reduced by 1 week, which will lead to a decrease in the company's profit by 2482.1 rubles.This is due to the fact that at a relatively high price of the product, there is a gradual drop in demand, and consequently, the volume of sales along. with profit

Table 4. Dynamics of profit at surcharge

weeks	Profit
1	-29116,3
2	-17881,4
3	-2158,25
4	9927,772
5	28222,75
6	11126,32
7	15034,23
8	65309,36
TOTAL	80464,5

Obviously, in this situation, you should not increase the price of the product, and the better solution is to reduce the cost of production. The model equation calculation optimization prices of a specific production program allows us to trace, in what period of time the company's management, it is better to set a maximum price for the products or sell products as the company may incur losses.

When analyzing and predicting socio-economic phenomena, the researcher is often faced with the multidimensional nature of their description. This happens when solving the problem of market segmentation, building a typology of countries based on a fairly large number of indicators, forecasting the market conditions of individual products, studying and forecasting economic depression and many other problems.

The purpose of calculating this economic and mathematical model is to justify the creation of a cluster in the southern Federal district and the Northern Federal district.

Often in economic research there is a problem of analyzing heterogeneous data in some sense. In such cases, before proceeding to the construction of regression models, it is necessary to select homogeneous groups of objects and build regression dependencies within each group. The development of this approach is a variant of classification by several generalizing indicators (main components) obtained using the methods of factor and component analysis

Multidimensional analysis methods are the most effective quantitative tool for studying socio-economic processes described by a large number of characteristics. These include cluster analysis, taxonomy, pattern recognition, and factor analysis. Cluster analysis is one of the multidimensional methods of enterprise classification. It is a set of methods that allow classifying multidimensional observations, each of which is described by a set of initial variables X1, x2,..., XM.

The task of cluster analysis is to divide the initial set of objects into groups of similar, close objects. These groups are called clusters. The results of such classification should have a meaningful interpretation.

Cluster analysis methods allow you to solve the following problems:

- classification of objects based on features,

reflecting the essence and nature of objects. The solution of such a problem usually leads to a deeper knowledge of the set of classified objects;

- checking the assumptions made about the presence of some

structures in the studied set of objects, i.e. search for an existing structure;

- construction of new classifications for poorly studied phenomena,

when it is necessary to establish the presence of links within the population and try to bring structure to it.

Cluster analysis is a set of different algorithms for distributing objects across clusters. To date, a huge number of clustering algorithms are known.

One of the most common methods of cluster analysis is the K-means method, which refers to iterative methods of cluster analysis. It is often referred to as the reference method for cluster analysis. The number of clusters To is set by the user. The procedure is as follows. At the first step, you define the reference cluster Type. Then each object is attached to the nearest reference. The minimum distance within the cluster relative to the average is used as a criterion. As soon as the object is included in the cluster, the average is recalculated. After the reference is recalculated, objects are again distributed to the nearest clusters, and so on. The procedure ends when the process is stabilized, i.e. when the centers of gravity are stabilized.

The reference companies that are grouped into a cluster are shown in table 5.

Table 5. Reference companies

№	The name of the manufacturer	Release 2019	Volume of sales
1	LLC "Bris – Bosfor»	15064	14310,8
2	Mercury TV LLC»	89,3	84,835
3	OOO "the World»	175,7	166,91
4	CJSC Donobuv, Rostov region.	964,7	916,47
5	SE KBR " Narbek»	43,3	41,135
6	ZAO "Magical»	212	201,4

Find the distance between all six objects. The calculation is performed using the formula (6):

$$\rho(x_i, x_j) = \sqrt{x\sum_{e=1}^{k}(x_{ie} - x_{je})^2} \quad (6)$$

The results are presented in table 6.

It follows from the matrix that objects 3 and 6 are closest 3.6=50.07 and are therefore combined into a single cluster. In this case the company "the World" and ZAO "Magical".

At the next stage, you need to attach the object to the cluster instead of the object to the object. For example, to calculate the distance between an object and a cluster, use the following formula (7):

$$\rho(S_{l,}S_{(m,g)}) = ap_{lm} + \beta p_{\lg} + \gamma p_{mg} + \delta\left(p_{lm} - p_{\lg}\right) \quad (7)$$

Table 6. Distance between objects

X1	15064	89,3	175,7	964,7	43,3	212
X2	14310	84,83	166,91	916,47	41,1	201,4
		20654,23	20535,05	19446,77	20717,70	20484,98
	20654,23		119,17	1207,46	63,47	169,24
	20535,05	119,17		1088,28	182,64	50,07
	19446,77	1207,46	1088,28		1270,93	1038,21
	20717,70	63,47	182,64	1270,93		232,71
	20484,98	169,24	50,07	1038,21	232,71	
№	1	2	3	4	5	6

After the calculations, we get table 7.

Table 7. Distance between an object and a cluster

№1	№2,3,6	№4	№5
	20485,20	19447,30	20718,20
20485,20		1270,90	63,4
19447,30	1038,2		182,40
20718,20	63,4	182,40	

As a result of the model calculation, object #2 was added to the cluster, since they are the closest, 2.3, 6=50.7. In our case, this is the company "mercury TV" LLC.

In the future, the distance between clusters will be found using the "nearest neighbor" principle, using the recalculation formula

Distance between an object and a cluster

№1	№2	№3,6	№4	№5
	20654,70	20485,20	19447,30	20718,20
20654,70		50,70	1207,40	63,45
20485,20	50,07		1088,20	182,40
19447,30	1207,40	1038,2		1270,90
20718,20	63,40	182,40	1270,90	

As a result of the model calculation, object #5 was added to the cluster, since they are the closest, 5.2, 3, 6=63.4. In our case, this is the enterprise of the SE KBR "Narbek".

Table 8. Distance between an object and a cluster

№1	№2,3,6,5	№4
	20485,20	19447,30
20485,20		63,4
19447,30	63,4	

We will join the existing cluster enterprise No. 4 CJSC Donobuv, Rostov region.

The results of hierarchical classification of objects are shown in figure 10 as a dendrogram.

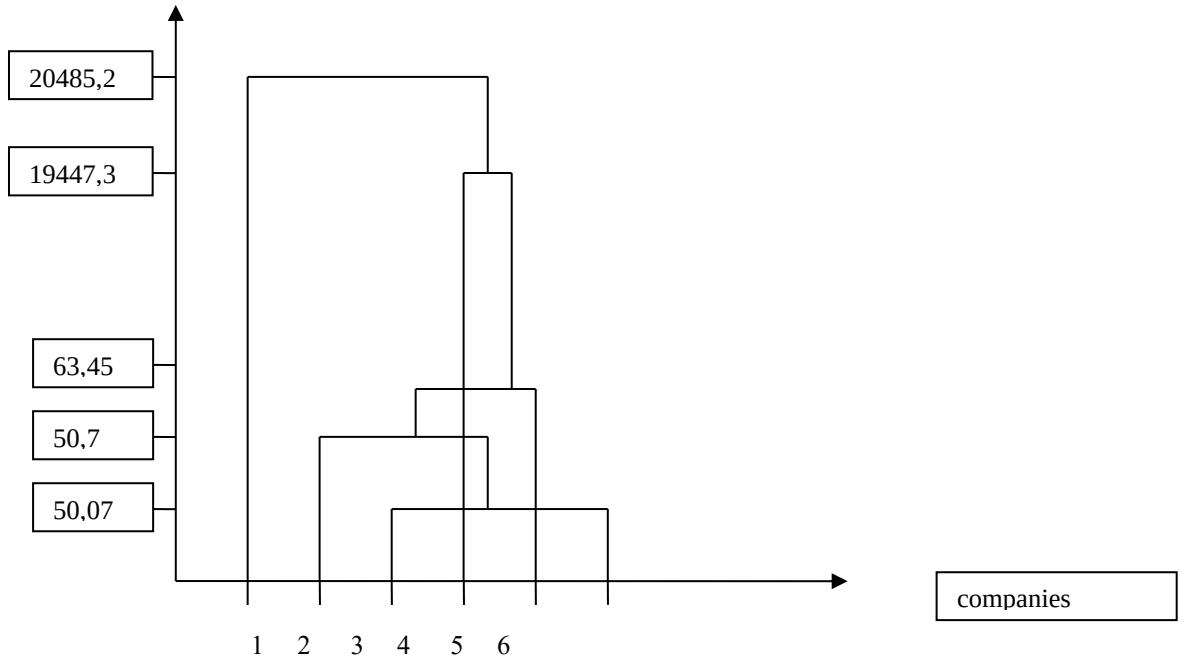

Fig. 10. Dendrogram

As a result of cluster analysis, we will get groups of similar objects. They are objects numbered 2,3,6, 1,4.

In conclusion, various cluster analysis methods allow you to get clusters that differ in size and shape.

A Shoe cluster can be formed in the southern Federal district and the Northern Federal district on a functional basis. When using a mathematical model, it should be taken into account that it groups homogeneous groups of enterprises, combining them according to the minimum distance criterion. Therefore, subclusters can be allocated within a cluster.

Any production of shoes or other goods must begin with a sales plan that is developed by the sales (marketing) Department. This financial forecast should include the planned sales volumes for the period, the planned sales price and the planned profit for this type of product.

For the mathematical model, we selected a type of product such as children's shoes. In the southern Federal district and the Northern Federal district, there is no production of this type of product, and, consequently, all products are imported. Setting up production in our region is considered cost-effective and appropriate.

But in industrial production, you need to know the time when you should stop producing this model of shoes and switch to a new model or sew another model in large volumes (product diversification).

For this purpose, you can use an indicator such as price elasticity. It shows the percentage change in sales as a result of a 1% price change and can be compared for different product brands. Price elasticity, which is related to the sales function considered here, has the following properties:

- its absolute value increases as it increases

positive or negative values of deviation from the price of competitors;

- the sales function in question does not prescribe an unambiguous

dynamics of price elasticity over time (it may increase, decrease, or remain unchanged);

- since the impact of absolute prices is not significant,

that is, price changes do not lead to a decrease in primary demand, but to a change in market share.direct price elasticity and cross - price elasticity (the percentage change in sales with a one-percent change in the price of competitors) are the same in size and there is no need to distinguish them.

At the first stage of building the model, we predict the ideal scheme for the sale of children's shoes by the manufacturer through the store. The company incurs additional costs for hiring staff and renting a trade pavilion. The amount of additional costs may vary depending on market conditions.

The initial data of the ideal model is summarized in table 9.

Table 9. Source data

Indicator, rubles:	The amount
Variable costs	302,95
Fixed costs	5598,13
Sales price	395
Number of units sold	2000
Sales volume at the point of sale	5000
The wages of the seller	5000
Number of sellers	2
The sales area, sq m	100
Rent per 1 sq. m	100

Sales volume forecast for 1 month (25 business days).

Sales volume increases by 5 pairs per day. The company will start making a profit on the 10th day of sales, when the volume of sales per day reaches 65 pairs of shoes. Until then, the company must sell 360 pairs.

If the company's additional costs increase, the break-even point will move to the right, so the company will receive a smaller amount of profit (the profit is shown as a shaded triangle on the graph).

Let's build a break-even chart based on table 10.

Using the break-even chart in this form, you should keep in mind the following:

-calculating break-even conditions and plotting charts

break-even rates are just tools for analyzing price decisions, but not a tool for predicting future commercial results;

-the break-even chart as shown in figure 11 is based on the possibility of a linear increase in production (sales) without any consideration for seasonality. Meanwhile, for many types of products, ignoring the seasonality is illegal. For example, for production, where the costs are carried out mainly at the beginning of a long production cycle, and the sale of finished products-only after its completion (this can work, for example, a Shoe company that prepares the entire batch of products for wholesale to trading firms on the eve of the new season);

-Analyzing the conditions for achieving break-even, we must not forget that this is just an intermediate finish on the way to the main goal – to achieve the highest profitability of sales.

When calculating break-even conditions or building appropriate schedules, it is important to correctly set data on the degree of capacity utilization and sales conditions for products. For example, the above graph was built for the conditions of full, one-hundred-percent use of production capacity and full sale of all manufactured products, that is, it characterized the company's result at all maximums: output, sales, revenue.

In practice, such an overly optimistic approach is simply dangerous to adhere to, and all conditions must be adjusted downward. Thus, the use of production capacity should be taken at the level of 75-80 %. The calculations should also take into account the possibility of some of the manufactured products settling in the inventory due to the slow implementation process.

Table 10. Sales volume of children's shoes

Numbe r	Number of prod. Pairs	Sales volume	Post. cost	AC. cost	Total costs	Profit	Add. Cost.
1	20	7820,00	5598,13	6059	11657,13	-3837,13	80
2	25	9775,00	5598,13	7573,75	13171,88	-3396,88	100
3	30	11730,00	5598,13	9088,5	14686,63	-2956,63	120
4	35	13685,00	5598,13	10603,25	16201,38	-2516,38	140
5	40	15640,00	5598,13	12118	17716,13	-2076,13	160
6	45	17595,00	5598,13	13632,75	19230,88	-1635,88	180

7	50	19550,00	5598,13	15147,5	20745,63	-1195,63	200
8	55	21505,00	5598,13	16662,25	22260,38	-755,38	220
9	60	23460,00	5598,13	18177	23775,13	-315,13	240
10	65	25415,00	5598,13	19691,75	25289,88	125,12	260
11	70	27370,00	5598,13	21206,5	26804,63	565,37	280
12	75	29325,00	5598,13	22721,25	28319,38	1005,62	300
13	80	31280,00	5598,13	24236	29834,13	1445,87	320
14	85	33235,00	5598,13	25750,75	31348,88	1886,12	340
15	90	35190,00	5598,13	27265,5	32863,63	2326,37	360
16	95	37145,00	5598,13	28780,25	34378,38	2766,62	380
17	100	39100,00	5598,13	30295	35893,13	3206,87	400
18	105	41055,00	5598,13	31809,75	37407,88	3647,12	420
19	110	43010,00	5598,13	33324,5	38922,63	4087,37	440
20	115	44965,00	5598,13	34839,25	40437,38	4527,62	460
21	120	46920,00	5598,13	36354	41952,13	4967,87	480
22	125	48875,00	5598,13	37868,75	43466,88	5408,12	500
23	130	50830,00	5598,13	39383,5	44981,63	5848,37	520
24	135	52785,00	5598,13	40898,25	46496,38	6288,62	540
25	140	54740,00	5598,13	42413	48011,13	6728,87	560
∑	2000	782000		605900	745853,25	36146,75	8000

Downward adjustments are also desirable in order to take into account possible failures in the process of production, transportation, or organization of sales of goods.

Let's take the built ideal model as a forecast presented by the company's marketers. Let's see how the profit value will change depending on the influence of seasonality.

Sales of shoes are growing disproportionately (faster) than in the previously reviewed model (table 11).

With increased sales growth by the end of the month, the company will have to produce about 4,000 pairs of children's shoes of this model, but the production program is designed for 2000 pairs. In order to reach a new level of production and sales, it is necessary to invest in the purchase of additional equipment and the construction of a new shop.

Table 11. Sales growth

day	Number of prod. units., steam	Price, RUB	Sales volume	Additional costs	Post. cost	AC. cost	Total expenses	Profit
1	20	395	7820	80	5598,13	6059	11657,13	-3837,13
2	25	395	9775	100	5598,13	7573,75	13171,88	-3396,88
3	30	395	11730	120	5598,13	9088,5	14686,63	-2956,63
4	35	395	13685	140	5598,13	10603,25	16201,38	-2516,38
5	40	395	15640	160	5598,13	12118	17716,13	-2076,13
6	46	395	17986	184	5598,13	13935,7	19533,83	-1547,83
7	53	395	20723	212	5598,13	16056,35	21654,48	-931,48
8	61	395	23851	244	5598,13	18479,95	24078,08	-227,08
9	71	395	27761	284	5598,13	21509,45	27107,58	653,42

Therefore, the firm's management should consider increasing the price by 10 % instead of increasing the scale of output, in order to reduce the amount of demand to the level provided by the current capacity of the firm. Naturally, the company's management hopes to gain profit by selling at prices with a higher unit gain (sales price minus variable costs). As it is easy to calculate, it will increase accordingly by 39.5 rubles, that is, it reaches the value of 131.55 rubles or 30.28 % of the new price. You need to check the conditions for successful implementation of this policy.

First, we will determine the extent of the break-even reduction in sales after the price increase. The relative break-even change in sales will be (%):

BSCp = -□P / (CM + □P)100 = -39,5 / (92,05+39,5)100 = -30,

where BSCp is the break-even increase in sales as a result of price changes,%;

□P-price change;

CM-specific gain.

When we determine the break-even change in sales in absolute terms, we take the expected sales volume as the starting point, not the one that has already been achieved (after all, we want to prevent it from being achieved). Then the break-even change in sales is equal to (par):

Bssa = 4000(-0.3) = 1200.

Thus, if after increasing the price of shoes, the volume of its sales decreases by less than 1200 pairs, the company will receive a larger profit than before. If the volume of sales falls by more than 1200 pairs, the firm will face a reduction in profit from sales (the price effect will be less than the volume effect).

We must also take into account the benefits of the prevented increase in fixed costs. According to the company's engineering service, the purchase of equipment that would allow the company to produce up to 4,000 pairs of shoes per month would require expenses in the amount of 100,000 rubles. Hence, based on prevented the need to bear these costs, the firm with higher prices will lose and in that case, if its sales decline even more than 30 %, namely 30% plus reduction in break-even sales, which nullifies the winning firms are prevented from increase of fixed costs. The calculation of such a complex break-even reduction in sales (in which we show the amount of costs for non-purchased equipment, respectively, with a minus sign) gives us the following result:

BSCp = - 30 + (-100000) / (131,554000)100 = - 30 – 19 = - 49 %;

Bssa = -0.494000 = -1960 (pair of shoes).

To make the economic boundaries of the decision to reduce the price more obvious to us, we will summarize them in table 13.

Let's pay attention, first of all, to options 3, 6 and 8. Option 3 corresponds to a situation when a decline in sales after a price increase allows the company to produce the same volume of products, that is, investing in additional equipment is unnecessary. From this point on, the company begins to earn additional profit by saving on fixed costs. Therefore, from this level of sales reduction, the value of equipment purchase costs equal to 100,000 rubles appears in column G. Since these are saved costs, we show them with a minus sign.

Option 6 corresponds to a situation where the price effect and the scale effect balance each other and the gain gain becomes zero. In other words, the increase in winnings after the price increase (39.5 rubles), multiplied by the entire volume of possible future sales (4000 pairs), is equal to the reduction in winnings, defined as the product of the new absolute value of the winnings (131.55 rubles) by the reduction in sales compared to the possible future level (1200 = 40000.3).

But since the firm also saves conditional fixed costs, in fact, at this point, its profit change has not yet become zero. It still receives a profit increase in the amount of the amount of notional fixed costs saved (100,000 rubles).

Table 12. Determining break-even sales volume when the price increases

Options	The scale possible reduction sales volume		Change the total amount of the company's gain from sales, RUB.			Prevented the growth conditionally fixed costs, RUB	Change total amount of profit after price changes (HEDGEHOG)
	%	couples (4000* %) /100	Increase based on possible future sales volume (39.5*4000)	Decrease based on reduced sales (131.55*In)	TOTAL (G+D)		
А	Б	В	Г	Д	Е	Ж	З
1	0	0	158000	0	158000	0	158000
2	10	400	158000	-52620	105380	0	105380

3	15	600	158000	-78930	79070	0	79070
4	20	800	158000	-105240	52760	-100000	152760
5	25	1000	158000	-131550	26450	-100000	126450
6	30	1201	158000	-158000	0	-100000	100000
7	40	1600	158000	-210480	-52480	-100000	47520
8	49	1961	158000	-258000	-100000	-100000	0
9	50	2000	158000	-263100	-105100	-100000	-5100
10	60	2400	158000	-315720	-157720	-100000	-57720

And only in option 8, the company's profit growth really becomes zero. Only with such a drop in sales volumes – by 1,961 pairs against a possible future level of 4,000 pairs – does the volume effect fully balance both the price effect and the savings in fixed costs.

This means that if a 10% increase in the price causes a 50% or more drop in the number of sales, then the company should look for another price solution.

This is even more clearly seen in figure 12.

As we can see, when sales are reduced in the range of 0-800 pairs, the firm receives an additional profit (+□P) due to the fact that for each unit sold, it receives a greater gain than at the previous price, and its amount exceeds the loss of winnings as a result of reduced sales. When the reduction in sales reaches 800 pairs, the situation changes: the company's profit growth is also affected by savings on unrealized fixed costs. Therefore, the break-even point is actually shifted from the position of 1201 pairs to the position of 1961 pairs of sales reduction. At this point, losses due to the volume effect cancel out all gains from the price effect and prevent the growth of fixed costs.

If, however, the drop in sales exceeds this threshold, the firm will start to suffer direct losses (-□P).

As a result of the 10% price increase, sales of children's shoes increased by 15 % from the previously planned sales of 2,000 pairs to 2,300 units. Since the company had a stock of production capacity, it was able to increase production without additional fixed costs. For more information on Shoe sales, see the App.

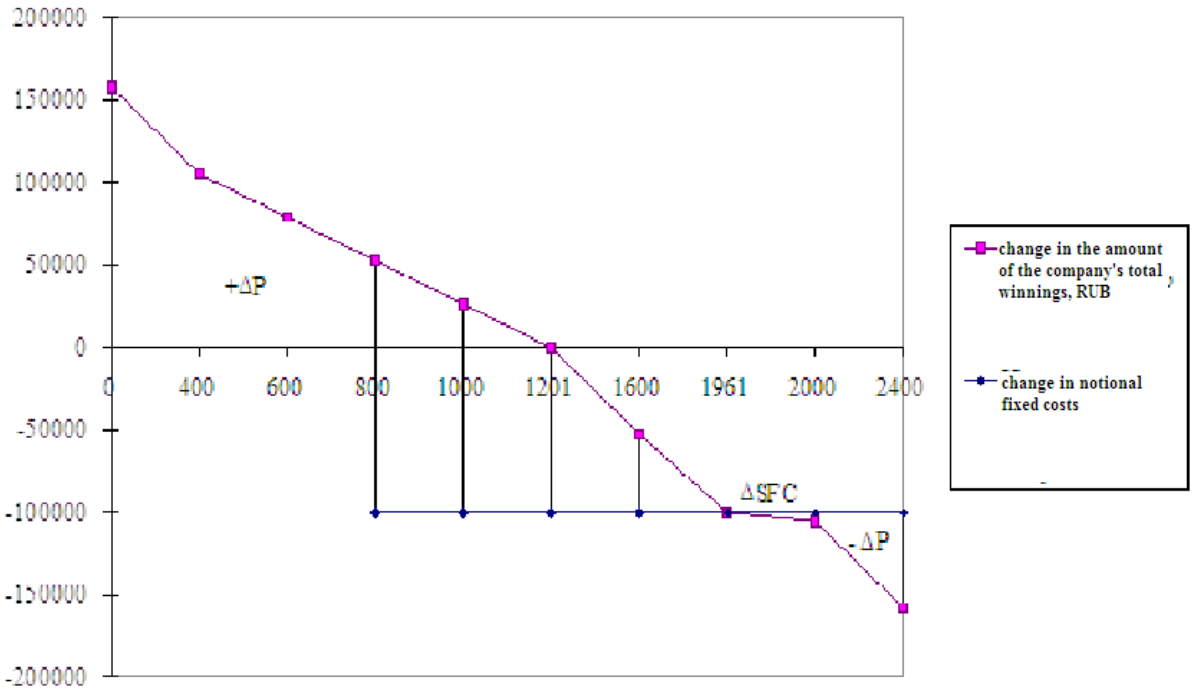

Fig. 12. the Economic consequences of raising the price and preventing investment in capacity expansion: +□P, -□P – respectively increase and decrease in the firm's profit □s SFC-change in fixed costsNow let's look at a situation where a company is forced to reduce the price of shoes, as well as incur additional fixed costs.

First, let's consider the case when the demand for shoes has an elasticity equal to one, and therefore the sales volume increases by exactly the same percentage as the price decreases (table 13).

Table 13. Conditions for a firm to break even with a price reductionby 5 %

Change indicators conditions of the company's activity	Value	
	Source	After price reduction
Price for a pair, RUB.	434,5	412,8
Price change, %	-	5%
The firm's specific gain, RUB.	131,55	109,8
Winnings, % of the price	30,28%	26,61%
Break-even change in sales volume, %	-	19,8%
Break-even change in sales volume, pairs	-	455
Total sales, pairs	2300	2755
The company's total winnings, RUB.	302565	302565

The break-even change in sales volume is equal to:

BSCp = - (-21,7) / (131,55+(-21,7)100 = 18,9 %

Thus, a 5% reduction in the price will pay off for the company only if the number of pairs of shoes sold increases by 18.9 % or 455 pairs.

Let's model several scenarios, including different levels of demand elasticity-both less and more than one (table 15). This will help us analyze the financial consequences for the company of a combined decision: to reduce the price and purchase additional equipment in order to increase the production of shoes to meet the increase in demand after the price decrease.

To make the logic of its construction more clear, let's analyze for example option 3, in which the increase in the number of pairs of shoes sold (after a single 5% price reduction for all the analyzed options) will be 15 %. Without calculations, we would estimate this elastic change in demand as a very favorable scenario. But we'll do the math.

So, an increase in the number of sales by 15 % will mean that the company will be able to sell 345 more pairs of shoes every month, that is, the number of sales will increase to 2645 pairs. But since they will now be sold at 21.7 rubles cheaper (not at 434.5 rubles, but only at 412.8 rubles), then based on the previous sales volume (2300), the company's losses (the price effect) will be -49967.5 rubles. Obviously, this value is the same for all the options under consideration.

But the increase in sales will also bring the company an increase in winnings. Since variable costs are not affected by changes in prices and remain at the same level – 302.95 rubles, the new value of the specific gain after the price reduction will be 109.8 rubles (412.8-302.95). Multiplying it by the increase in the number of pairs of shoes sold, we get an increase in the company's winnings (the volume effect). It will be 37889.63 rubles (109.8345) for this option.

In total, the resulting change in the value of the firm's gain under the influence of the price effect and the scale effect will be -12077.9 rubles.

(-49967.5 +37889.63).

Since the company could not provide such an increase in output on the existing fleet of equipment, it purchased additional equipment, which led to an increase in the amount of its fixed expenses per month by 10,000 rubles. This leads to an even greater reduction in the amount of her winnings. It will be -22077.88 rubles for this option.

Table 14. Modeling the financial consequences of reducing the price and purchasing additional equipment

Options	Scope of the possible changes in sales volumes, %	Increase in the number of products sold, pairs, 2300*B / 100	Change in the total amount of the company's gain from sales, RUB.			Incremental fixed costs per month, RUB.	Change in total profit after the price changes, RUB. (E-W)
			Reduction based on previous sales volume (21.7*2300)	Increase in calculation on sales growth (109.8*V)	TOTAL (G+D)		
А	Б	В	Г	Д	Е	Ж	З
1	0	0	-49967,5	0	-49967,5	0	-49967,5
2	10	230	-49967,5	25259,75	-24707,8	10000	-34707,75
3	15	345	-49967,5	37889,63	-12077,9	10000	-22077,88
4	19,8	455	-49967,5	49967,5	0	10000	-10000
5	23,7	546	-49967,5	59967,5	10000	10000	0
6	30	690	-49967,5	75779,25	25811,75	10000	15811,75
7	40	920	-49967,5	101039	51071,5	20000	31071,5

Therefore, this option, despite a 15 % increase in the number of pairs of shoes sold, will be unsuccessful for the company. Her monthly winnings will be reduced by -22077.88 rubles.

The company will only be able to get an increase in winnings if the increase in the number of sales is more than 23.7 %.

But let's pay attention to option 7, where we modeled the most favorable development of the situation – an increase in the number of sales by 40%, or 920 pairs of shoes. This increase in volume can be achieved by the enterprise at an additional fixed cost of 20,000 rubles. But the gain will also be the largest of all the options under consideration, which will be provided by an extremely large amount of the volume effect – it will bring the company an increase in winnings in the amount of 3,1071. 5 rubles.

Let's look at our sales forecast again. As a result of the 5% price reduction, sales increased by 39.1 % to 3,200 pairs of shoes per month. The company was also forced to purchase additional equipment (10,000 rubles) to ensure sales growth

Let's look at another situation when variable costs for products (a pair of shoes) change. Let's look at the above BSCp formula. To do this, we need to simply subtract the variable cost change from the price change before calculating the break-even change in sales (%). Please also note that, in contrast to the calculation that we performed for an isolated price change, in this case, the values used for the calculation must be expressed in absolute monetary units (in rubles or another currency). And then the equation will take the following form:

BSCp = - (□P-□VC) / (CM0 + (□P-□VC))100,

where BSCp is the value of break-even sales growth, %;

□P-price change;

CM0 – the previous absolute value of the specific gain;

□VC-change in the value of variable costs.

Returning to the problems of our company, we use this formula to calculate the required break-even sales growth. Let's say the changes in variable costs were 15 rubles Therefore, the change in the specific gain for it will be equal to:

□CM = (□P-□VC) = -21,7-(-15)= -6,7.

Since we previously established that the specific gain before the price change was equal to 131.55 rubles, now nothing prevents us from calculating the break-even change in sales volume.

BSCp = - (-6,7) / (131,55+(-6,7))100 = 4,85 %.

In real terms, this will amount to, respectively:

23000.0485 = 111 pairs.

Now let's look at the impact of possible changes in fixed costs on break-even sales growth. The formula for calculating this effect is as follows:

BSV = □FC / CMa,

where BSV is the break-even sales volume, NAT. units.

FC FC-increase in the amount of fixed costs, RUB.;

CMa-specific absolute winnings, rubles

Since we remember that the unit gain is equal to the price minus variable costs, we can easily find for this example that the break-even increase in sales required to compensate for this increase in fixed costs is equal to:

BSV = 10000 rubles/ (412.8 rubles / pair – 302.95 rubles/pair) = 91 pairs

Now the company's managers will be able to make a decision that will depend on the following conditions:

1. How likely is it in the current market situation that will you be able to sell the required volume of products on a monthly basis?

2. How big is the risk that the sales volume will be "and the firm will start to suffer losses?"

3. is it Possible to abandon the chosen pricing strategy and how can this be done quickly?

These are the questions that marketers will have to solve.

Let's turn back to the model. On the 60th day of Shoe sales, the price effect ceases to apply and sales begin to decrease. The company again decides to reduce the price of products, but demand is less responsive to this change. Here the firm must increase sales through marketing promotions, brand development, retail merchandising, etc. These activities will increase the maturity stage of the Shoe's life cycle and generate additional revenue.

But when the demand for shoes ceases to respond to price changes and other non-price factors, the company must stop producing this model. At this point, demand elasticity will begin to increase and the maturity stage will go into a decline stage (figure 13).The trend line drawn by the elasticity of demand showed that this brand of children's shoes from day 1 to day 49 was at the growth stage, from day 49 to day 73-at the maturity stage, and from day 73 to day 100-at the decline stage.

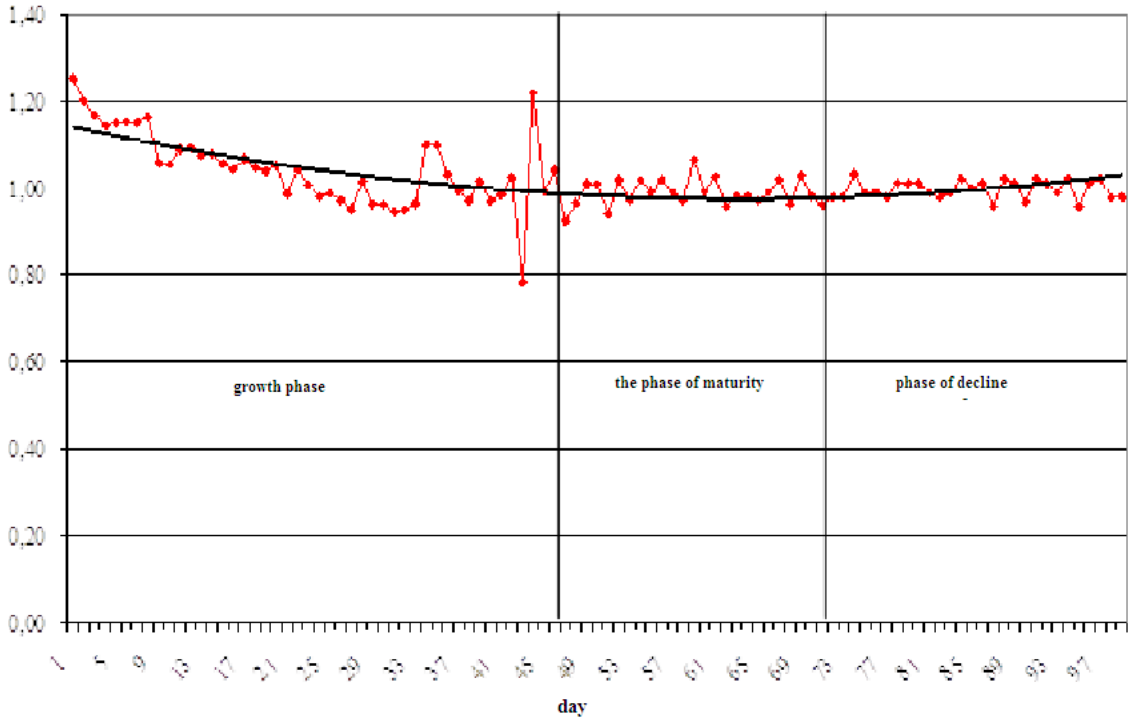

Fig. 13. The elasticity of demand

Let's analyze the change in profit during the life cycle of shoes (figure 14).

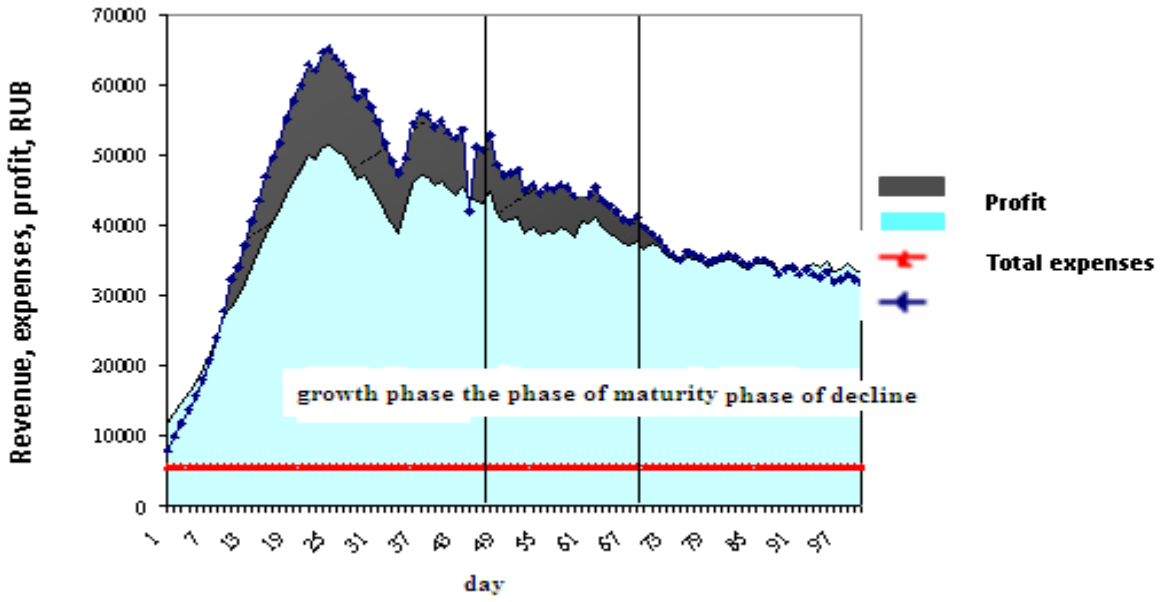

Fig. 14. sales of shoes during the life cycle of shoes

As can be seen from figure 14, the company received a maximum profit at the growth stage and a minimum at the decline stage.

Let's compare the results with the profitability of 1 pair of shoes over the life cycle of a child's Shoe model (Fig. 15).

Fig. 15. Elasticity of demand and profitability of 1 pair of shoes depending on the stage of the life cycle

At the growth stage, the profitability of 1 unit (pair) reaches the maximum value (about 20 %), at the maturity stage it decreases to 15% and by the decline stage it reaches the minimum values.

Let's compare the elasticity of demand and the daily sales volume divided by the average sales volume for the period (figure 16).

The average sales volume over the life cycle was 105 pairs. The maximum excess over the average level is observed at the growth stage. Slightly above the average value at the stage of maturity and below the average value at the stage of decline. At the stage of maturity, the company had to apply one of the above recommendations to increase sales, so as not to receive losses in the future.

Add to the graph shown in figure 17 the break-even sales volume for each day of the Shoe brand's life cycle.

The break-even sales schedule intersects with the average sales schedule during the transition from the maturity stage to the decline stage. Thus, when the company for individual category (mark) of products there are the following facts:

1. The elasticity of demand increases.
2. The profitability of 1 of a unit of production is reduced.
3. Reduced sales.
4. Sales volume approaching break-even sales volume, firm.

It is necessary to stop producing this brand of shoes or modernize it, that is, to give additional properties necessary for consumers.

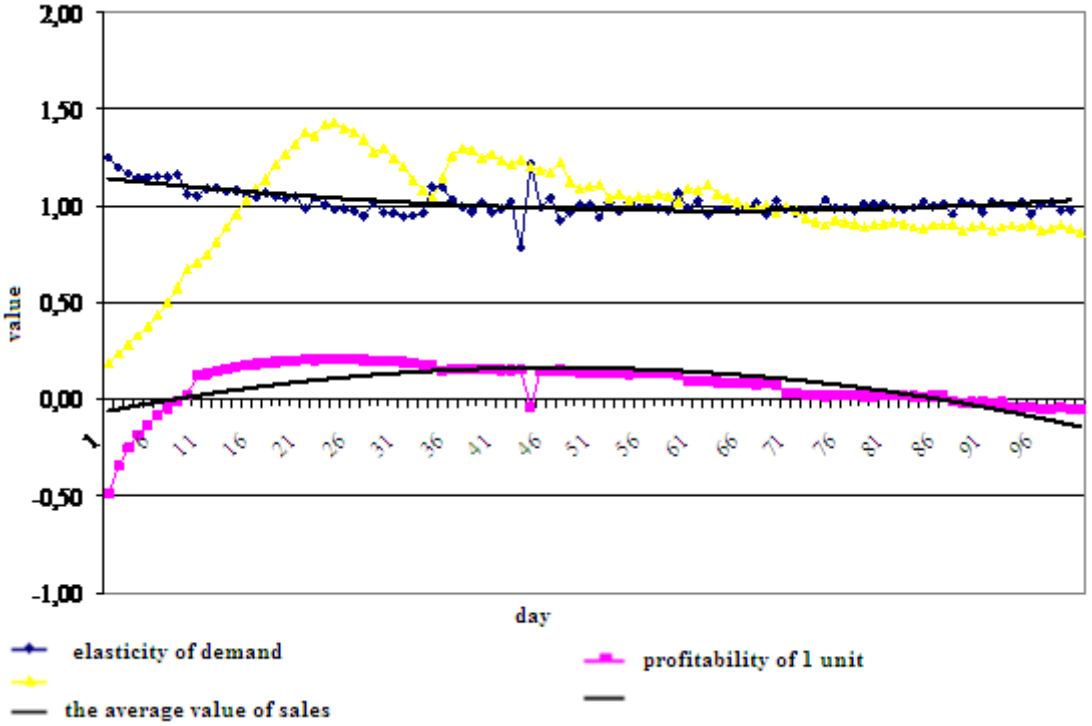

Figure 16. Daily sales

divided by average sales

The company must stop producing shoes of this model in the period between 60 and 70 days of sales. Further production will bring losses, as the demand for this model becomes inelastic.

PR= V (C-Zperem.) - Zpost.

The amount of profit depends on the number of pairs of shoes sold, the difference between the price of a pair of shoes and the amount of variable costs associated with it, i.e. the amount allocated to cover fixed costs, and the amount of fixed costs.

When using operational leverage, business leaders have the ability to influence three main elements: fixed costs, variable costs, and prices, each of which is related to sales volume in one way or another. Consider the effect of changes of each of these elements on the example of LLC "Bilrost" when we release the Cost of preparation and mastering of production of 0.71 RUB;

- the cost of maintenance and operation of equipment – 18,65 RUB;

overhead costs – of 10.26 RUB;

- raw materials
- General expenses – 114.95 rubles.;
- business expenses – 14.84 rubles.

Thus, fixed expenses amount to 159.41 rubles (21.06%).

The amount of fixed costs in total for the entire production volume is 2486796 rubles, respectively, the amount of revenue minus variable costs (i.e., the amount of fixed costs and profit) per pair of shoes is 292.61 rubles.

2238116.4 rubles other things being equal will cause a reduction in volume,

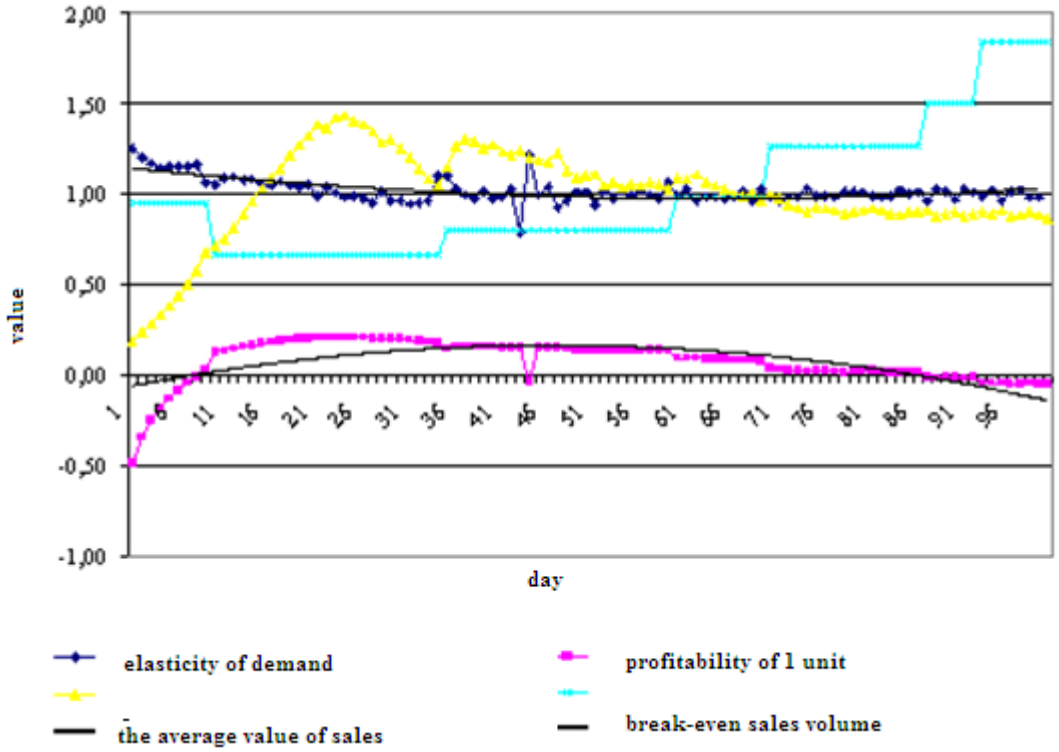

Fig. 17. Break-even volume of sales

CONCLUSION

The processes of globalization and increased international competition that characterize the world economy have become an objective prerequisite for changing the paradigm of managing competitiveness, which consists in abandoning traditional industrial policy and moving to a new industrial policy based on clusters (cluster policy). As a result of globalization, factors of production become mobile and competition between countries increases, so it is not only innovation and education that are important for the development and retention of superiority over competitors, but also the interconnections between enterprises, which has led to the creation of network structures – clusters.

The cluster is considered as a network organization of geographically interconnected and complementary enterprises (including specialized suppliers, including services, as well as producers and buyers), United around a research and education center, which is connected by vertical links with local institutions and authorities in order to increase the competitiveness of enterprises, regions and the national economy.

In the performed research, the issues of forming a regional Shoe cluster in the southern Federal district were considered. As a result of this work, the prerequisites for creating a cluster were identified, such as:

1. Large concentration of skilled labor.
2. Clear specialization of manufacturer.
3. Long-standing traditions of Shoe craft.
4. Availability of local suppliers of quality raw materials.
5. High demand in the region for high-quality shoes.

We believe that for the development of the footwear cluster in the southern Federal district, it is necessary to:

1. Legalization of preferential taxation of producers.
2. Creation of an effective system of production distribution.
3. Improving the quality and design of shoes.
4. Increasing the assortment.
5. Join forces of players to promote the region's footwear.

In the course of work, it was proved that the cluster is a socio-economic system and belongs to the class of organizational systems.

An organizational system (organization) is a system, i.e. a set of interrelated elements, but it is not

just a set of elements, but it exists or is created artificially to achieve certain goals, that is, the system is a means to achieve goals.

An economic and mathematical model for creating a cluster in the southern Federal district is also provided. The calculations were performed using multidimensional classification and cluster analysis. As a result of the model calculation, enterprises were merged into a cluster.

The result of the research can be calculated technical and economic indicators. Thus, the expected output of pairs of shoes at the end of the fifth year of operation of the cluster will be 190156000 pairs, which will ensure the cluster's economic stability by this time.

The estimated gross profit at the end of the fifth year of operation of the cluster will be 26928568.4 thousand rubles, the total cost of production, respectively, 162921748.2 thousand rubles. It is planned to create 76268 jobs. The average monthly salary of one worker for the production of men's shoes will be 11761.94 rubles, for the production of women's and children's shoes 10504.46 rubles and 10425.8 rubles. respectively. The most profitable is the production of women's shoes – 18.8%, the profitability of men's shoes will be 16.6%. Less profitable is the production of children's shoes 9.31% and this is not surprising, since the production of shoes for children requires the highest costs. The average return will be 16.64%.

We also considered various options for selling shoes during the month, for example, 100% sales of manufactured shoes , 80% and 50%. Calculations show that with 100 % of the sale of shoes in the specified period of time, not only the costs of production and sale of shoes are covered, but also a fairly significant profit is provided. This indicates the effective operation of the Shoe cluster, as well as the correct marketing and assortment policy, and it is also possible to make a profit when selling 80% of manufactured children's, men's and women's shoes.

If only 50% of all shoes are sold, the cluster activity will not bring in revenue, which makes it possible to assert that such cases are unacceptable when the sale of manufactured shoes will be less than 50% within a month. If such a situation occurs, it is necessary to attract borrowed funds to cover costs and subsequent production, which provokes the possibility of the cluster becoming bankrupt.

To ensure 100% implementation of footwear developed a competitive range of men's, women's and children's shoes including factors that affect consumer demand: in accordance with the main fashion trends, economic, social and climatic characteristics of the regions of the southern Federal district, and national peculiarities of the inhabitants of the regions of the SFD. The cluster provides for the production of shoes using both mechanized innovative technological processes and manual labor, which should ensure the demand of both elite consumers and mass consumers, creating prerequisites for the sale of all shoes. Developed innovative technological processes for the production of men's, women's and children's shoes using modern technological equipment produced by leading companies in the world, will allow you to produce shoes in a wide range not only by type, but also by fastening methods, which also guarantees a stable demand for the offered range of shoes. The proposed technological equipment, on the basis of which it is possible to form a technological process for the production of men's and women's and children's shoes, allows you to choose the optimal volume of production of shoes with high TEP, taking into account the available production areas. The decision to create a center for standardization, certification and quality management is justified. Such a center will ensure the preparation of certificates of compliance and declarations of compliance for the entire range of shoes that will be manufactured within the Shoe cluster. The presence of such documents will create trust in the buyer, create an image, and therefore high demand, which from our point of view is a determining factor for the competitiveness of the proposed range of shoes.

Based on the current situation in the economy, in our view, the most important issue in the development of regional consumer market is the lack of a full regulatory framework for the operation of the mechanism of state regulation of consumer market of regions. Thus, state intervention should correct the situation in the footwear market in the SFD and NCFD, and give the opportunity for the development of domestic Shoe industry.

From the analysis, we note the following trends in the development of the footwear industry in the southern Federal district and the Northern Federal district are characterized by a high level of migration of the working-age population to developing industries. The leather and footwear industry for the two districts can be confidently called developing. The southern Federal district and the Northern Federal district occupy the first place among the regions of the Russian Federation in terms of Shoe production.

1. On the territory of the region, there are unused industrial fixed assets that are suitable for restoration.

2. In the SFD and NCFD many specialized educational institutions for training in the field of leather and footwear industry.

It is also necessary to increase the investment attractiveness of the industry and create conditions for increasing its competitiveness. An important measure is to protect the domestic market from illegal import and turnover of light industry goods, create conditions for increasing its transparency and ensure non-discriminatory access of manufacturers of industry goods to trade organizations. To do this, it is necessary to introduce high duties on the import of finished shoes and low duties on the import of basic and auxiliary materials and equipment. Once again, we have to repeat the need to regulate the level of prices and tariffs, which would guarantee both the producer and the trade not only the reimbursement of reasonable costs, but also the accumulation of funds for the development of production.

It is necessary to allocate funds to Finance the development of technical regulations for light industry products and provide advice on their implementation.

I would like to note that there is a historically developed adaptation of the peoples living in the territory to manual production, the presence of their own national technologies and design of manufactured shoes adapted to the climatic conditions and landscape of the region. The prerequisites for the development of footwear production in the region are very significant.

We offer the following set of measures:

1. Creating a regional development and maintenance program domestic Shoe production in the region.

2. The adoption of measures to reduce imported imported shoes in region. These measures should include, first of all, the suppression of the trade in shoes smuggled in and without permission to sell them on local markets.

3. Assistance in employment of young professionals and graduates universities, on existing and newly created Shoe companies.

4. Assistance to enterprises in the process of promoting domestic

Shoe brands in local markets. First of all, it is necessary to develop a competent marketing strategy for regional Shoe companies.

5. Creation of a special credit program for enterprises light industry in the region, taking into account the specifics of production: the seasonal nature of products sold and the peculiarity of the turnover of working capital of enterprises in the industry.

In our opinion, the successful implementation of all these measures requires the interest of regional authorities in the formation and development of a Shoe cluster, reducing their prices for components and energy costs, and providing a convenient transport interchange. All this together will allow this formation to have a long life and a stable position not only in domestic but also in foreign markets. We only need the goodwill and support of all participants in the municipal, regional and Federal branches of government.

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