IMPROVING THE METHODOLOGY FOR ASSESSING LOGISTIC RISKS IN COMMODITY MOVEMENT: CASE-STUDY OF SELF-SERVICE STORAGE OF SAMARKAND REGION

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DOI: 10.5958/2249-7137.2022.00820.5

ABSTRACT

In the article, logistics risks are managed in the logistics service system inrelation to the effective coordination of the movement of goods, particularly the transportation and storage of wet fruits and vegetables in warehouses, and the reduction of the negative impact of logistics risks in maintaining the stability of the system to the negative changes brought on by changes in the external environment and the storage of goods based on these considerations, as well as logistical concerns, risk management, and the development of marketing strategies in the activities of commercial entities offering warehousing services, are addressed in the ideal coordination and effectiveness of goods movement..

KEYWORDS: *Commodity Resources, Transportation And Storage Services, Warehousing, Logistic Risk, Seasonality, Coefficient Of Seasonality, Fourier Series.*

INTRODUCTION

One of the significant shifts in the supplier-distributor-trade chain that happened under market conditions is that incoming orders now tend to be random rather than discrete,incontrast to the planned economy. The erratic nature of material flows, the requirement to account for logistical risks going forward, the need to guarantee the stability of the supplier-distributor-trade chain in adverse circumstances brought on by changes in the external environment in the logistics service system, and the need to lessen the adverse effects of logistical risks as well as to make decisions taking the min to account when fulfilling orders are urgent issues. Becoming one.

Authors such as [1]-[4], have discussed the issues of effective use of scientific-theoretical, methodological, and logistical services trategies for researching the movement of commodity flows. Scientists of our country, such as In the scientific researches of our country's scientists [5]-[8], the development of whole sale and retail trade, the management of goods movement and logistics processes, the improvement of the efficiency of the management of the transport and logistics system of cargo transportation, and the effective use of logistics services trategies for the organization of the movement of goods and material flows have been studied. The need for systematic theoretical and methodological research in this are a is brought on by the experts' and scientists' in a dequate attention to the problems of enhancing the flow of goods. The need for systematic theoretical and methodological research in this are a is brought on by the experts' and scientists' in a dequate attention to the problems of enhancing the flow of goods and material

resources, evaluating logistical risks, and making the best choices under the circumstances of contemporary market relations.

MATERIALS AND METHODS

This paper is given using statistical analysis, inventory management, and econometric modeling techniques, with the goal of reducing costs associated with offering warehouse services. On the basis of warehouses in the Samarkand region as an example, the gathered analytical data and information materials are compiled and organized from the author's perspective in accordance with the theoretical and methodological under pinnings of there search issue. Within the context of self-service storage “SHOKOMILBOBO” LTD.Co’s activities, analytical data were gathered and examined.

RESULT SAND DISCUSSION

The primary goal of organizing reserves in the efficient movement of goods and material resources is first and fore most to prevent demand unsatisfaction during a period of increased sales volume. On the other hand, long-term standing of reserves results in an increase in storage costs, a decrease in the quality of goods, and a decrease in the turnover of financial funds. The elimination of products shortages, stability in sales volume, and improvement inlogistics services are all made possible by maintaining the correct level of goods reserves.

The product storage warehouses contain products that are ripened through out the storage process in addition to those that are ready for sale at the same time. They are made to maintain the level of demand until the following season. [9].

Establishing the ideal quantity for the stock of goods that are prepared for sale helps to maintain the logistics processes. In this regard, the econometric modeling of the movement of goods and the implementation of the strategy on this basis form the basis of the model of logistical risks that may arise in the movement of goods and material resources and their management.

Let's assume that the following formula is used to indicate the likelihood of obtaining a given order by the organization providing logistical services in the transportation-storage and storage of products:

$$P = \{(r_0, d_0), (r_1, d_1), \dots (r_T, d_T), \} \quad (1)$$

Here, r_0 is the volume of goods that must be realized by transportation-storage and storage in accordance with a particular order.;

d_0-profit from realization;

Ifd_0=r_0=0,the order has not been fulfilled;

d<0, execution of the order with a loss;

r_i-i>0 the size of the order for a specific product type;

d–i-the amount of annual income from the order.

In that case, the economic effect of the order will be as follows:

$$d_0 - r_0 + \sum_{i=1}^{T} (d_i - r_i)$$

(2) The benefit of transportation-storage and ware housing in a certain period T is based on the maximization of the predicted value of the objective function:

$$f = \sum_{n=1}^{N} \left\{ d_0^n - r_0^n + \sum_{j=1}^{J_n} x^{n,j} \left[\sum_{i=1}^{T} \left(d_j^{n,j} - r_i^{n,j} \right) \right] \right\}$$

(3) In order to maximize the value of this objective function based on variables, the proposed model of goods movement management in transportation-storage and warehouses is based onlinear programming $x^{j,n}$, here *(n=1,...,N,j=1,...,J)*:

$$\sum_{j=1}^{J_n} x^{n,j} \leq 1, n = 1, \dots, N \ \textit{ва} \sum_{n=1}^{N} \sum_{j=1}^{J_n} x^{n,j} \ x^{n,j} \leq 0$$

(4) Taking in to account the probability of occurrence of risks, we express the expected volume of orders as follows:

$$V_0^k = \sum_{t=0}^{n} \frac{CF_t^k}{\left(1 + r_t^k\right)^t} \ ; \ V_0 = \sum_{k=1}^{k} s_k p_k V_0^k$$

(5)

Here s_k impact of risks.

S_k makes decisions regarding the impact of risks or attempts to avoid situations related to it when it comes to transportation, storage, and placement in warehouses. Here, at the level of significance$u$, r the volume of the anticipated orders and the profit from fulfilling the order during the period are equal to the following:

$$CF_t = \sum_{k=1}^{N} p_k F_t^k; \ u_t^k = \frac{p_k CF_t^k}{CF_t}$$

(6)

$$r_t = 1 - t \ln \sum_{k=1}^{k} u_t^k \frac{1}{(1 + r_t^k)}$$

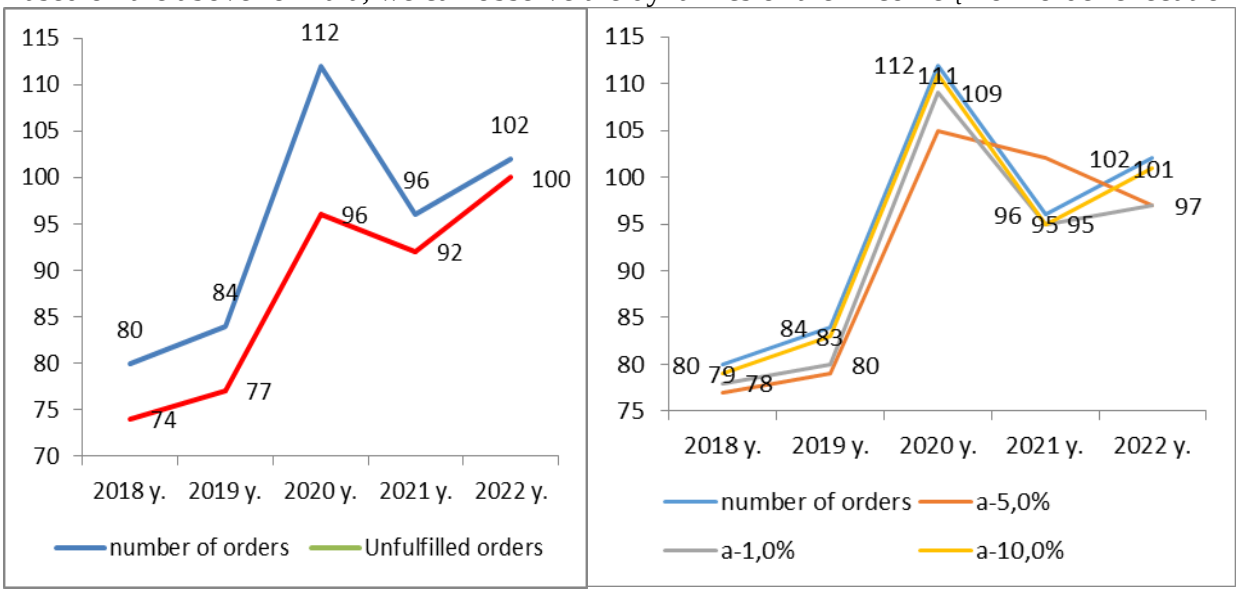
(7) This model was used in the transportation-storage and storage activities of “SHOKOMILBOBO” LTD.co located in Samarkand region, and the following results were obtained:

INFORMATION ON NON-FULFILLMENT OF ORDERS "SHOKOMILBOBO"LTD.CO IN 2018-2022

Years		**2018**	**2019**	**2020**	**2021**	**2022**
Number of orders		80	84	112	96	102
Unfulfilled orders		6	7	16	4	2
Probability of order failure,%		7,5%	8,3%	14,3%	4,2%	2,0%
Probability of failure rate of orders,%	10,0%	2%	4%	2%	1%	4%

	5,0%	1%	2%	1%	3%	2%
	1,0%	6%	3%	5%	5%	1%

Based on the above formula, we can observe the dynamics of the in $comer_t$ from order execution:



a) Without considering the risks b) Considering the risks

Figure1. Dynamics of income(rt)from order fulfillment at "SHOKOMILBOBO"LTD.Co in 2018-2022

The market for storage and warehousing services has been expanding quickly in recent years, but it is important to remember that this industry is seasonal. Seasonality is the propensity and level of process growth that is influenced by both internal and external factors based on market conditions [10]. Seasonality in warehouses refers to a brief or recurrent period during as pecific year, primarily associated with meteorological fluctuations.

However, seasonality in warehouses depends not just on environmental and climatic conditions, but also on how goods and services are consumed, how they are consumed, and howa marketable demand is created. The significance of elements associated to the in take of consumer goods, such as the type, amount, and delivery of moist fruits and vegetables, is also note worthy.

Th effectiveness of a ware house is significantly impacted by seasonality. In instance, because it isn't operating to its full potential, it directly damages something.

Seasonal changes can be recognized and represented using avariety of statistical techniques. The seasonality index is the most straight forward method for calculating seasonal changes In the literature, the following techniques for calculating this index are frequently used:

- Method of constant average;
- Method of variable averages;
- Weighted average seasonality index;

The ideal way for determining seasonality among the aforementioned approaches is the weighted average method, which is represented by the following formula:

$$I_s = \frac{\sum_{i=1}^{12} Z_i * M_i}{\sum_{i=1}^{12} M_i} * 100\%$$

Here I_s–seasonality index, in percent;

Z_i–the actual level of storage capacity during the month;

M_i–the highest filling level of warehouse capacity during the month.

During 2018-2021, the coefficient of seasonality in 12 warehouses selected in there gion was as follows (Table2).

Analysis of the data in Table 2 shows that these asonality index is high in practically all warehouses.

The lowest indicator is 62.2% in "SIROJIDDIN TRADE-SUPPLIES", which indicates that the warehouse capacity is being used effectively. Similarly, at self-service storage "SHOKOMILBOBO" LTD. Co, seasonality is 79.4%, and 2/3 of the capacity is being used. In general, the seasonality index for the 12 researched warehouse farms in the Samarkand region was 71.8%.

TABLE 2 SEASONALITY COEFFICIENT INENTITIES PROVIDING SELF-SERVICE STORAGE IN SAMARKAND REGION

Warehouses	Months												annualaverage
	August	September	October	November	December	January	February	March	April	May	June	July	
"KUZHOSILI"unitaryenterprise	45,5	55,5	73,3	82,2	99,0	101,0	100,0	99,0	99,1	86,2	57,4	23,8	76,8
"AZIZBEKSAVDO-TA'MINOTI"LTD.Co	45,1	55,0	72,6	81,3	98,0	100,0	99,0	98,0	98,3	85,5	56,8	23,5	76,1
"SIROJIDDINSAVDO-TA'MINOTI"LTD.Co	36,9	45,0	59,4	66,5	80,2	81,8	81,0	80,2	80,3	69,8	46,5	19,2	62,2
"SHOKOMILBOBO"LTD. Co	51,5	70,4	88,1	92,1	100,0	99,0	97,1	96,1	96,2	83,7	55,8	23,1	79,4
"NARPAYXOLOD"AgroLTD.Co	42,4	51,7	68,3	76,5	92,2	94,0	93,1	92,2	92,3	80,3	53,5	22,1	71,5
"SAXOVATAGROEXPORT"AgroLTD.Co	41,9	51,1	67,5	75,6	91,1	92,9	92,0	91,1	91,4	79,5	52,8	21,9	70,7
"ULMASYUSUFBEKRZS" AgroLTD.Co	42,3	51,7	68,2	76,4	92,1	93,9	93,0	92,1	92,2	80,2	53,4	22,1	71,5
"AGROSOVUTGICHSERVIS"FamillyCo	41,4	50,5	66,7	74,8	90,1	91,9	91,0	90,1	90,4	78,6	52,3	21,6	69,9
"LOLAUNIVERSALSAVDO"LTD.Co	41,0	50,0	66,0	73,9	89,1	90,9	90,0	89,1	89,2	77,6	51,7	21,4	69,2
"ZIOYLIMESTONE"LTD. Co	41,9	51,1	67,5	75,6	91,1	92,9	92,0	91,1	91,4	79,5	52,8	21,9	70,7

"MEBELSTANDART"LTD .Co	41 ,4	50 ,5	66 ,7	74 ,8	90, 1	91, 9	91, 0	90 ,1	90 ,2	78 ,5	52 ,3	21 ,6	69 ,9
"SAMROSXOLOD"LTD.C o	42 ,8	52 ,2	68 ,9	77 ,2	93, 0	94, 9	94, 0	93 ,1	93 ,3	81 ,2	54 ,0	22 ,3	72 ,3
Areaaverage	**42 ,9**	**52 ,8**	**69 ,4**	**77 ,3**	**92, 3**	**94, 0**	**93, 0**	**92 ,1**	**92 ,3**	**80 ,3**	**53 ,4**	**22 ,1**	**71 ,8**

Figure 2 compares the seasonality of warehouse operations in the case of self-service storage "SHOKOMILBOBO" and Samarkand region.

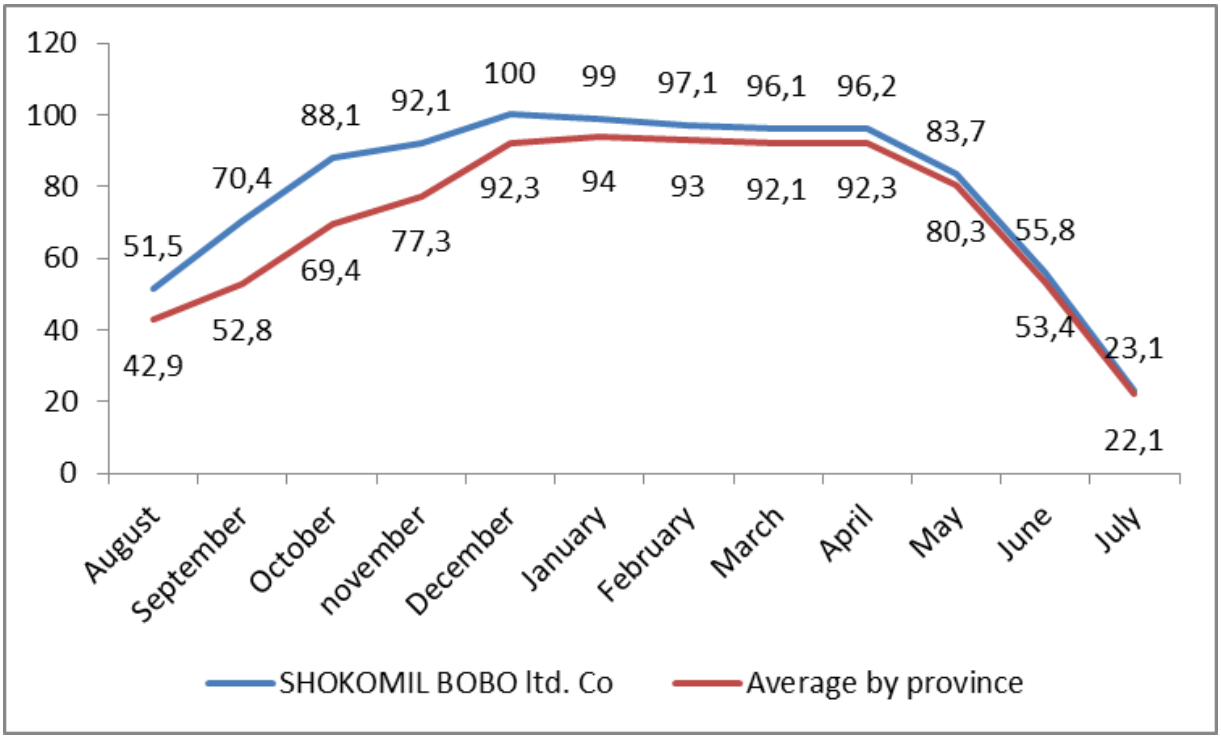


Figure2.Comparison of the level of seasonality of warehouse operations in "SHOKOMILBOBO" LTD. Co and Samarkand region

We use *Fourier's harmonic series* to analyze the annual dynamics of socio-economic events [11].

Fourier's harmonic seriesis analytically expressed as the transformation of the dynamics series, and the parameters are calculated by the method of least squares when solving the equation:

$$\bar{y} = \frac{a_0}{2} + \sum_{n=1}^{12} a_x \cos x + b_x \sin x$$

$$a_0 = \frac{\sum y_i}{n}; a_k = \frac{2}{n}\sum y_i \, coskt; b_k = \frac{2}{n}\sum y_i \, sinkt$$

Here *k* is the harmonic mean value of the months of the year, it is considered equal to 12 in the analysis by months. Through Table 3, we can see the dynamics of the harmonic series of the "SHOKOMILBOBO" LLC' s seasonality coefficient.

TABLE3 DYNAMICS OF SEASONALITY COEFFICIENT IN "SHOKOMILBOBO" LTD. CO

Months	t_i	***Seasonalitycoefficient,(y_i)***	$cost_i$	$sint_i$	$y_i cost_i$	$y_i sint_i$	y_{t_i}
August	0	51,5	1,0	0	51,5	0,0	19,3
September	π/6	70,4	0,87	0,5	61,0	35,2	18,4
October	π/3	88,1	0,5	0,87	44,1	76,3	20,4
November	π/2	92,1	0	1,0	0,0	92,1	24,7
December	2π/3	100,0	-0,50	0,87	-50,0	86,6	30,2
January	5π/6	99,0	-0,87	0,5	-85,7	49,5	35,4
February	π	97,1	-1,0	0	-97,1	0,0	38,9
March	7π/6	96,1	-0,87	-0,5	-83,3	-48,1	39,7
April	4π/3	96,2	-0,5	-0,87	-48,1	-83,3	37,7
May	3π/2	83,7	0	-1,0	0,0	-83,7	33,4
June	5π/3	55,8	0,5	-0,87	27,9	-48,3	27,9
July	11π/6	23,1	0,87	-0,5	20,0	-11,5	22,7
Total		**953,1**			**-159,8**	**64,8**	**348,8**

The parameters of the equation's values are determined:

$a_0 = \frac{\sum y_i}{n} = \frac{953}{12} = 79{,}4; a_1 = \frac{2}{n}\sum y_i\, coskt = -\frac{159{,}8}{6} = -26{,}6;$

$$b_1 = \frac{2}{n}\sum y_i\, sinkt = \frac{64{,}8}{6} = 10{,}8$$

Based on the obtained parameters, we can create an econometric model of seasonality dynamics:

$$\bar{y} = 79{,}4 - 26{,}6cosx + 10{,}8\sin x$$

Based on this econometric model, we determine the seasonality coefficient (y_{t_i}) values for each month:

TABLE4 HARMONIC INDICATOR OF DYNAMICS OF SEASONALITY COEFFICIENT IN "SHOKOMILBOBO"LTD.CO BY MONTH

Months	y_i	y_{t_i}	$\lvert y_t - y_{t_i} \rvert /100\%$
August	51,5	52,8	1,3%
September	70,4	61,8	-8,6%
October	88,1	75,5	-12,6%
November	92,1	90,2	-1,9%
December	100,0	102,1	2,1%
January	99,0	107,8	8,8%
February	97,1	106,0	8,9%
March	96,1	97,0	0,9%
April	96,2	83,3	-12,9%
May	83,7	68,6	-15,1%
June	55,8	56,7	1,0%
July	23,1	51,0	27,9%
Total	**953,1**	**952,8**	**-0,3**

According to the analysis, the seasonality coefficient's average dynamic deviation for the years 2019 to 2021 is 0.3% on average. As a result, we may deduce that the seasonality index in the region's storage warehouses differs significantly between December and April, which implies that this is the time when products are consumed that have been stored [12]. In order to make the calculations clearer, the price range of a few different product categories in the local farmers' markets was compared in April and May of 2021.

TABLE5 CHANGES IN THE AVERAGE PRICE LEVEL AS A RESULTOF A DECREASE IN THE SEASONALITY COEFFICIENTOFCERTAIN TYPES OF PRODUCTS IN THE FARMERS' MARKETS OF THE SAMARKAND REGION

Product types*	**Average price in April-May 2022,kg/soum**	**The amount of additional products offered by reducing the level of seasonality, kg**	**Expected price level**	**Savings**
Grapes	16000	0,021-0,112	15670,9-14390,2	1854,5(11,6%)
Apple	10000-12000	0,021-0,112	9794,3-8993,9	1390,9(13,9%)
Peach	18000	0,021-0,112	17629,8-16189,0	2086,3(11,5%)
Potatoes	5200	0,021-0,112	5093,0-4676,8	211,7(12,4%)
Onion	5500	0,021-0,112	5386,9-4946,6	637,4(5,1)
Carrot	7000	0,021-0,112	6856,0-6295,7	811,3(4,0%)
Product types were analyzed on a selective basis				

The average seasonality coefficient for the studied period is 2.1-8.9%, allowing for a price reduction in the range of 4.0% to 11.6% in the product types section in April and May.

When considering the activity of warehouses, it's crucial to keep in mind that there is a correlation between a decline in the seasonality coefficient and areduction in transaction costs. The following calculation can be used to determine how much money would be made if the seasonality coefficient in the warehousing sector was reduced by1%:

$$K_m = \frac{S_{r(max)} - S_{r(real)}}{100 - I_s}$$

Here K_m– additional funds due to a 1% decrease in the seasonality coefficient, in soums;

$S_{r(max)}$–the amount of profit that can be obtained as a result of using the full capacity of the warehouse, in soums;

$S_{r(real)}$–the amount of profit that can be obtained from the actual use of the available capacity of the warehouse, in soums;

I_m–seasonality index, inpercent

Based on the method above, the result achieved by accounting for "SHOKOMILBOBO" LTD. Co1% seasonality drop for 1kg of product from December to April is as follows:

TABLE1 THE FORECAST VALUE OF THE AMOUNT OF PROFIT OBTAINED IN THE SEGMENT OF CERTAIN TYPES OF PRODUCTS AT THE EXPENSE OF REDUCING THE SEASONALITY COEFFICIENT AT "SHOKOMILBOBO" LTD. CO

Producttypes	**Averagemarketpriceofproduct**	**Decembe**	**Januar**	**Februar**	**March**

*	s	r	y	y	
		Seasonalityfactor			
		97,90%	91,20%	91,10%	99,10 %
Theamountofprofitfrom1unitofproduct					
Grapes	16000	343,2	7,4	0,2	0,0
Apple	10000	214,5	4,6	0,1	0,0
Peach	18000	386,1	8,3	0,2	0,0
Potatoes	5200	111,5	2,4	0,1	0,0
Onion	5500	118,0	2,5	0,1	0,0
Carrot	7000	150,2	3,2	0,1	0,0

The statistics in Table 6 show that the categories of products evaluated in December–February are often seasonal, which suggests that the population's reserves for these types of things are depleting. Averaging 343.2 soums per unit of grapes, 214.5 soums from apples, 111.5 soums from potatoes,118.0 soums from onions, and 150.2 soums from carrots are gained during this time due to the stabilization of the supply of products by warehouse farms and the lowering of the seasonality coefficient. An opening presents itself [13].

CONCLUSIONS

Based on the effective execution of ware house operations, it is possible to lower the price level in the range of 4.0%-11.6% in the sector of products in April-May in the Samarkand region, where the seasonality coefficient is on average 2.1-8.9%. The analysis revealed that, when considering the logistic risks associated with the fulfillment of seasonal orders,it is possible to increase the amount of expected income by 1.0–6.7%. Making informed decisions while taking in to account the potential effects of risks during the formulation of a marketing plan is made feasible by modeling logistics risk management in businesses that offer products to rage and warehousing services.

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