

Optimization of International Trade for Sustainable Development Marketing Strategy: Economic and Legal EU Regulations



Farouq Ahmad Faleh Al Azzam^{1*}, Lesya Khomko², Nataliia Mykhailyk³, Oleksandr Maslak⁴,
Lesia Danchak⁵

¹ Faculty of Law, Jadara University, Irbid 21110, Jordan

² Department of Economic and Legal Disciplines, Lviv State University of Internal Affairs, Lviv 79000, Ukraine

³ Department of Marketing and Logistics, Lviv Polytechnic National University, Lviv 79059, Ukraine

⁴ Department of Foreign Economic and Customs, Lviv Polytechnic National University, Lviv 79059, Ukraine

⁵ Department of Business Economics and Investment, Lviv Polytechnic National University, Lviv 79059, Ukraine

Corresponding Author Email: f.alazzam@jadara.edu.jo

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ABSTRACT

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The main purpose of the article is to define a methodical approach to the evaluation of international trade within the framework of ensuring the sustainable development of EU countries in the context of the formation of a marketing strategy. The object of the study is the system of international trade regulation of the EU countries. The article aims to develop a methodical approach for evaluating international trade, with the goal of promoting sustainable development in EU countries in the context of the formation of a marketing strategy. The methodology includes the method of intellectual analysis using the technique of the association method. The use of the association method allows, at the first stage of analysis, to identify possible hidden dependencies and patterns in a large array of statistical data. The main result of the study is the presented graph, which is able to determine hidden dependencies and regularities in the framework of international trade optimization through a large array of data. The innovativeness of the research involves the application of a modern methodical approach to the economic and legal regulation of international trade optimization within the framework of sustainable development through the search for hidden dependencies and regularities in the data. The study is limited by taking into account the specifics of the economic and legal regulation of international trade only within the EU countries. Further research should be devoted to the system of regulation of international trade around the world.

1. INTRODUCTION

International trade, as an integral part of the national economy of any country in the world, is the leading form of international economic relations, since today its growth rates exceed the growth of world industrial production. An important prerequisite for the sustainable development of international trade is the successful decision-making in this area both at the level of government institutions of countries and international organizations. Its effective organization, the correct choice of the direction of strategic planning and the development of scenarios for the sustainable development of trade relations provide the country with economic growth and national welfare within the framework of economic and legal regulation. The modern practice of decision-making in all areas and types of economic activity is based on the use of the latest tools for making such decisions, in particular, using the mathematical apparatus in the process of analyzing economic phenomena. Since international trade is characterized by dynamic and structural changes, there is an urgent need to develop a methodological justification for mathematical modeling of estimates and technologies for measuring the volume of international trade of the countries of the world based on the use of modern methods and tools for quantitative

measurement of economic processes in the context of the formation of a marketing strategy. The problem of using mathematical tools for these purposes requires the development of specific models in the framework of improving the efficiency of economic and legal regulation in the context of the formation of a marketing strategy. Marketing strategy plays an important role for international trade activities. The optimization of economic and legal aspects should contribute to the marketing strategy of how to introduce international trade to the EU countries.

We adhere to the theory of ensuring sustainable development through the optimization of key aspects of international trade and agree with the statement that this cannot be achieved without an effective regulatory system.

In recent decades, along with the rapid progress in the field of computer information technology, the development of socio-economic processes is also accelerating. International trade is also possible. Today, all countries of the world are participants in international trade relations. With such a variety of goods and services, no country can provide its population with absolutely all the benefits, and participation in international trade allows you to more fully satisfy and diversify the needs of its citizens. In addition, international trade stimulates the growth of the country's total production,

an increase in the productivity of national resources, and the development of certain industries. During the entire period of existence of international trade relations, consumer preferences of the population changed, technological means of production were improved, countries had differences in the provision of resources, etc. These and other factors characterized the level of economic growth and determined how competitive the country was in the international market. The increased interest in the emergence of international trade, attempts by scientists to explain the main purpose of trade, principles, advantages and disadvantages prompted the emergence of a large number of theories of international trade and periodization of sustainable development.

The purpose of the authors of the article is to present a new methodological approach to the optimization of international trade in such a way that it is possible to effectively implement a strategic approach and ensure sustainable development, taking into account aspects of regulation in the EU. The object of the study is the system of international trade regulation of the EU countries.

The structure of the article includes a review of the literature, description of research methods, presentation of the main results of the study and their discussion, highlighting the conclusions.

2. LITERATURE REVIEW

2.1 Literature review on the problem of international trade optimization

As noted in modern world literature [1, 2], foreign trade is one of the priority areas of foreign economic policy and a tool, thanks to the sustainable development of which, improves the country's competitiveness in the international arena. Not always, the changes taking place in the country's foreign trade relations with other countries can be positive and contribute to sustainable development. Often the problems in foreign trade are the raw material nature of export operations, the lack of an effective foreign trade policy, the inadequate institutional framework for the economic and legal regulation of foreign trade operations, and the dependence of the national economy on imported products. The identification of such problems and the causes of their occurrence is a determinant of the directions of changes in the economic and legal foreign trade policy.

Burinskienė [3] and Sylkin et al. [4] note that international trade, as one of the main areas of international economic relations, is a combination of foreign trade of the countries of the world in goods, services and other products of the intellectual labor of mankind. Today, it affects not only the economic development and national welfare of the population of a particular country, but also the state of the world economy as a whole. International trade in the context of the formation of a marketing strategy characterizes the degree of trade and economic cooperation between the countries participating in the process of exchanging goods, services and other attributes of the intellectual labor of the population, and this, in turn, ensures the existence of a world market, which reflects commodity-money relations between peoples and depends on various factors of labor, capital and production. That is, the processes of exchange of goods in the world market reflect information about the average value of aggregate supply and demand. This has the opposite effect on national markets - exporting countries analyze and reassess the main trends in the

world market and adapt the production of their products to the needs of consumers.

Thus, in the world literature [4, 5] there is information that in order to obtain reliable data in the formation of international statistics on trade in goods, their assessment is of great importance. Thus, there should be close interaction between organizations involved in the collection of statistical data on the circulation of goods, to ensure the reliability of obtaining an assessment of the products of all product groups, even those belonging to problem categories in the context of the formation of a marketing strategy. Opening the issue of expressing the cost of trade operations within the framework of economic and legal regulation, it should be noted that initially it can be expressed in many currencies or, observing certain cost standards, in euros, for example. However, in order for a country to form high-quality national statistics that make it possible to determine trade flows and on which the compilation of national accounts and the balance of payments directly depends, the developers of international statistics insist on converting the value of export-import operations into a basic unit of account, which is much more stable in cases where the national currency not stable in relation to others. This reduces the impact of changes in the exchange rates in which trade transactions are taken into account on their value in the international market [6, 7].

2.2 Literature review on the problem of economic and legal regulation within the framework of sustainable development

Also, in various scientific sources like Mishra and Shaikh [8] and Huang [9], you can find facts that there are countries for which there is a regime of economic and legal regulation of the use of multiple exchange rates. For example, depending on the category of goods, different exchange rates are preferred, supporting some transactions and depreciating others. In this case, it is recommended that trades be recorded using the actual exchange rate applicable to each specific transaction and detailing the description of the official rate at which each currency was exchanged. Also, the use of parallel exchange rates or black-market rates should not be overlooked. Such transactions should be accounted for separately from transactions using official rates, and statisticians should qualitatively assess the exchange rate used in transactions in such markets and take it into account when converting currencies. Thus, the assessment of the cost of export-import operations depends on fluctuations in domestic prices and market conditions. Goods are valued at contract prices, taking into account actual prices. If brokers were involved in making trade transactions, a brokerage commission is deducted from the cost of goods.

The relevance of this problem at the present stage of sustainable development of international relations, its theoretical and practical significance, the need for the formation of practical methods and recommendations that can lead to an increase in the efficiency of managerial decision-making in the field of economic and legal regulation of the optimization of international trade, determined the choice of the topic of work, its purpose and tasks.

The literature has a number of gaps that should be taken into account and pointed out. Yes, the gaps concern the very approach to solving the problems of sustainable development through the optimization of international trade. There are few new approaches and there is a gap. Also, the lack of

consideration of aspects of regulation is also a problem that is little covered in the literature. A research question arises: How can international trade be optimized in a new way to improve the sustainable development of the marketing strategies of developed countries such as the EU countries?

Today the analysis and implementation of changes in the economic and legal foreign trade policy should become a priority task for public authorities, which will ensure the gradual sustainable development of foreign trade and, as a result, will positively influence the formation of socio-economic indicators of the country's sustainable development.

The scientific task is the analysis of a large array of data in such a way as to optimize this process within the framework of sustainable development of the EU countries.

3. METHODOLOGY

In order to identify and determine a quantitative measure of the influence of a large number of factors on the effective indicators of optimizing international trade in the context of the formation of a marketing strategy, we will further apply statistical and economic-mathematical analysis. The purpose of this approach is not only the classification of factors, but also the study of their relationships and the formation of basic theoretical generalizations. An important task in the formation of tools for measuring and evaluating the optimization of international trade is the use of properly selected methods for analyzing this process in the framework of improving economic and legal regulation. Often, the conceptual apparatus of statistics and economic and mathematical modeling are identified, and sometimes taken for one. The reason for this association is not only the dependence of statistics on mathematics, but also the fact that many scientists who contributed to the education and development of statistics as a separate science were mathematicians. However, statistics is not mathematics, although the mathematical apparatus is a tool for solving statistical problems and solving problems.

Thus, the main method of the article will be the method of intellectual analysis in the framework of sustainable development. Since the international trade of the EU countries as a whole has a significant impact on the national economy of each of them, in order to ensure economic growth and the national welfare of the country, firstly, it is necessary to conduct a regulated effective policy in the field of international trade. At present, when computer information technologies are developing rapidly, data mining is becoming increasingly popular as one of the research and modeling tools for optimizing international trade. To conduct effective data analysis, search for correlations and trends, Data Mining technologies are used, the main task of which is to search for patterns between database objects. Data mining is mainly designed to search for hidden objective patterns that can be useful for practical application in large information data arrays as part of optimization processes to ensure sustainable development.

One of the methods of intellectual analysis is the association technique. This method is designed to find patterns between data arrays that relate in accordance with the condition and the consequence. When finding association rules, patterns are searched for between related multiple events in the data array that occur simultaneously.

Association methods work in such a way that they are used for a number of implicit rules and use cases for the study

sample. It allows you to pre-determine the goals of a particular process. To ensure the validity and reliability of the results, a method of repeated measurement for verification was applied.

There were limitations in that the data taken from the official sources of the EU countries dated back to the end of 2022 and it was impossible to provide fresh data for 2023 at the time of the study. The software implies the use of computing systems and graphic visualization methods. STATISTICA 10 became the main part of the software for the article.

Also, one of the limitations and disadvantages of the proposed methods is their complexity for persons who are not at all familiar with the basic aspects of the presented methods and tools. There is a threshold of entry with certain knowledge. But at the same time, the optimization of international trade should be done by professionals in order to better build a marketing strategy for sustainable development.

When modeling the optimization of international trade, as well as when modeling any socio-economic process within the framework of sustainable development, it is important to choose a mathematical method for solving the problem in the context of the formation of a marketing strategy. It is a properly conducted trade study with the identification of possible patterns between indicators that will affect this choice. Therefore, the first step in assessing international trade should be to search for possible hidden rules and relationships between international trade indicators. This can be done using association analysis. Thus, our task is to find hidden patterns in a large array of data characterizing the international trade of EU countries within the framework of economic and legal regulation. To demonstrate the possibility of using association analysis to study international trade, consider such an indicator as the volume of exports of goods in a million euros.

4. RESULTS OF RESEARCH

STATISTICA is an integrated data analysis and management system. The system has the ability to carry out classical and latest methods of data analysis: cluster, factorial, correlation, variance analysis, linear and non-linear regression, neural networks, etc. Visualization of initial, intermediate, initial data can be carried out by choosing from many different graphs and charts. All this is important in optimizing international trade.

	1	2	3	4	5	6	7	8
	M01	M02	M03	M04	M05	M06	M07	M08
2008	140 499,	147 189,	157 247,	157 122,	150 451,	154 162,	152 381,	127 056,
2009	146 161,	150 890,	164 398,	153 210,	148 756,	152 225,	153 172,	122 160,
2010	144 472,	155 334,	178 869,	166 907,	163 396,	177 061,	165 906,	143 149,
2011	158 025,	167 798,	186 749,	181 409,	177 137,	187 620,	170 156,	158 208,
2012	183 121,	192 226,	225 356,	192 645,	212 119,	212 356,	192 583,	176 934,
2013	201 715,	207 350,	232 888,	208 505,	219 878,	227 163,	217 467,	194 223,
2014	221 190,	230 003,	229 515,	241 127,	223 633,	235 335,	232 806,	188 833,
2015	166 241,	173 109,	188 693,	172 973,	165 243,	182 879,	179 518,	152 733,
2016	172 017,	186 053,	219 307,	201 001,	203 025,	223 182,	205 462,	183 335,
2017	210 147,	222 470,	256 383,	223 070,	241 067,	234 278,	221 215,	206 512,
2018	216 587,	232 074,	253 356,	224 014,	236 838,	235 811,	230 700,	210 464,
2019	223 434,	222 237,	239 867,	233 291,	231 388,	230 235,	236 221,	201 374,
2020	228 251,	231 127,	248 243,	236 865,	234 752,	241 068,	243 700,	200 783,
2021	224 321,	238 827,	268 607,	248 128,	241 581,	264 627,	256 543,	211 698,
2022	225 607,	251 693,	265 313,	253 756,	250 297,	267 758,	239 568,	226 819,

Figure 1. A fragment of a table of statistical data on the volume of exports of goods in million euros of the EU countries from 2008-2022

For the analysis, we selected Eurostat statistics on the volume of exports of goods in million euros of the countries of the European Union for each month from January 2008 to December 2022. So, we have formed a sample of 180175 observational data (Figure 1), and the unknown M01-M12 (number of months) characterize the volume of exports of goods of the EU countries by months in accordance with January to December.

The volume of exports of goods from EU countries has a certain structure, which means that it can present in the form of changes and dynamics. It is a graphical structure based on a database.

Before conducting a direct analysis of associations, we first consider the dynamics of the volume of exports of goods of the EU countries (which is important in the framework of the regulation of international trade in the system for ensuring sustainable development) and build a graph of the average annual volumes of exports of goods of countries (Figure 2). The graph (Figure 2) clearly shows the trend of increasing the average annual volume of exports of goods of the EU countries, with the exception of 2014, which is due to signs of a crisis. This is due to the fact that the export of goods suffered a decline in 2014. That is, the upward trend begins already in 2015-2016.

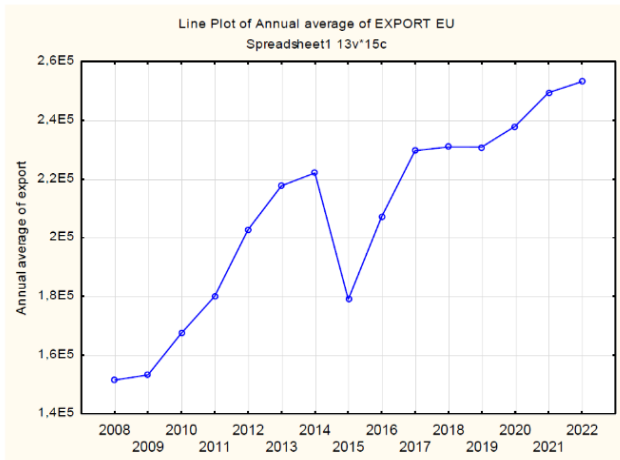


Figure 2. Dynamics of the average annual volume of goods of the EU countries

In addition to the dynamics of the average volume of exports of goods, a graph of changes in the average monthly volumes of exports of EU goods over the entire period of the period 2008-2022 is possible (Figure 3).

As can be seen from the graph (Figure 3), the variability of monthly averages in the first half of the year is greater, except at the end of the year and, in addition, for January, February, April, August and December, the average monthly exports of EU goods are slightly lower than in other months. Association methods are used for a number of hidden rules and application cases for the study sample. It is important to be identified in advance for the purpose of international trade within the framework of international development. Therefore, the recommended indicator of the analysis will be measured by the statistical data of a table of certain variables, the values of which will take 0 or 1 depending on the volume of EU exports in the average month in the average year will be more or less than the average for this year (if the value is greater, the variable when mastering the value 1, if less - 0). Therefore, for the original statistics, it is necessary to find the average values.

For this, the Statistics/Basic Statistics module of the STATISTICA 10 product is used (Figure 4).

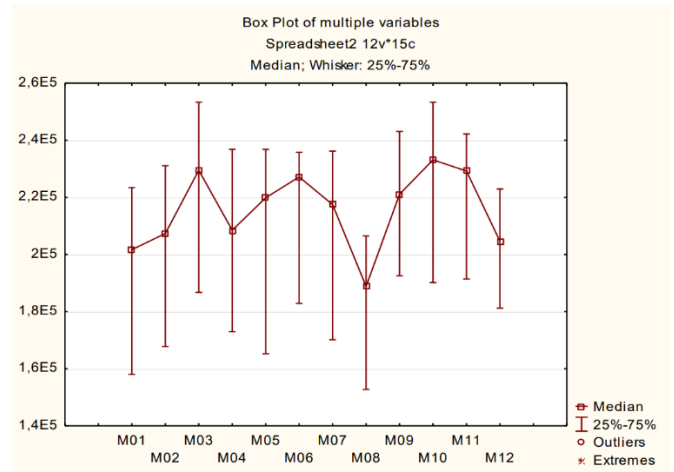


Figure 3. Graph of changes in the average monthly volumes of exports of goods from EU countries in million euros

Variable	Descriptive Statistics (Spreadsheet4)				
	Valid N	Mean	Minimum	Maximum	Std.Dev.
2008	12	151484,	127056,!	166156,!	10025,8:
2009	12	153223,	122160,!	168311,!	11779,7:
2010	12	167464,!	143149,!	184652,!	13750,1:
2011	12	180100,!	158025,!	202025,!	13983,4:
2012	12	202766,!	176934,!	225356,!	15546,1:
2013	12	217711,!	194223,!	242286,!	15052,4:
2014	12	222069,	181237,	241127,!	19826,9:
2015	12	178993,!	152733,!	197854,!	13433,2:
2016	12	207149,!	172017,	229234,!	18556,0:
2017	12	229681,!	206512,!	256383,!	14566,2:
2018	12	230943,!	209052,!	253356,!	14233,2:
2019	12	230927,!	201374,!	253337,!	12968,4:
2020	12	238008,!	200783,!	261364,!	15310,0:
2021	12	249453,!	211698,!	268607,!	18217,1:
2022	12	253206,!	225607,!	274460,!	15739,0:

Figure 4. Descriptive statistics of a sample of statistical data characterizing the volume of exports of goods of EU countries during 2008-2022

	1 M01	2 M02	3 M03	4 M04	5 M05	6 M06	7 M07	8 M08
2008	0	0	1	1	0	1	1	0
2009	0	0	1	0	0	0	0	0
2010	0	0	1	0	0	1	0	0
2011	0	0	1	1	0	1	0	0
2012	0	0	1	0	1	1	0	0
2013	0	0	1	0	1	1	0	0
2014	0	1	1	1	1	1	1	0
2015	0	0	1	0	0	1	1	0
2016	0	0	1	0	0	1	0	0

Figure 5. Fragment of the table of transformed data

Based on the corresponding addition of the initial statistical data, we obtained a new table of transformed data (Figure 5), which we use for further analysis using association rules, which is carried out using the Data Mining / Association rules module of the STATISTICA 10 software product.

As a result of the analysis, 50 association rules were obtained that satisfy the restrictions on the minimum value of

economists were more interested in the supply of goods and factors of production and much less in demand. The modern theory of international trade equally studies both supply and demand for products.

Scientists [13-16] in their research carried out the substantiation of the mechanisms for the formation and implementation of the state foreign trade policy as a component of foreign economic policy. However, in the context of ongoing changes in the world economic system and Ukraine, in particular, organizational, economic, legal and informational mechanisms for the formation and implementation of state foreign trade policy require analysis and improvement. This will ensure the creation of grounds for the development of scientifically based theoretical and methodological provisions for the formation and implementation of state foreign trade policy and the provision of practical recommendations for solving identified social problems in the field of organization and implementation of foreign trade activities.

Using mathematical tools to obtain numerical characteristics, other scientists have evaluated the foreign trade of any country, as well as compare the corresponding indicators of different countries. An assessment of the level of sustainable development of foreign trade of each country makes it possible to conduct a comparative analysis and assess its competitiveness in the world market. Having a number of statistical data on two main indicators of export-import operations and using the analytical apparatus of mathematical statistics, we will determine the main numerical characteristics for the statistical distribution of exports and imports of each country [17, 18].

Another group of scientists [19-21], using absolute indicators of descriptive statistics when conducting a comparative analysis of international trade, found that this leads to false conclusions, since the volumes of export and import operations (million dollars) for different countries differ significantly. However, with the help of relative indicators, one can compare the variation in the data characterizing the trade of different countries. Given the importance of determining the type of distribution of statistical data, it is also advisable to calculate the coefficients of asymmetry and kurtosis.

Discussing the results of the study, it should be noted that, based on the results of the analysis, we have identified certain patterns between the volumes of exports of goods from the EU countries, which were recorded in January, March, August and October during the study period. Namely, certain associative rules have been identified between the fact that in January and August the volume of exports of goods is less than the average annual value and in March and October - more than the corresponding value of this indicator. Moreover, these rules are present in all 100% of cases, and the level of reliability and correlation is also equal to 100%, which indicates the proportion of observational values for which the cause and the correct consequence are correct. It is worth noting that the association method can be used in a similar way to conduct a primary analysis of other indicators of international trade, for example, a similar study can be carried out to find patterns between data that reflect the volume of import flows of countries. And it is also possible to build association rules between two indicators and the volume of exports and the volume of imports in order to identify relationships between the main quantities characterizing international trade, which will make it possible to put forward assumptions for further

construction of mathematical models. This essentially ensures sustainable development for the EU countries.

Our study has similarities and differences from others. The similarities are that we agree with the claims and findings that regulation in countries has a direct impact on sustainable development and international trade. The difference lies in the very methodical approach to optimization. Our research, by searching for hidden dependencies and patterns in data, contributes to the optimization of international trade within the framework of sustainable marketing strategies for the EU countries.

In practice, these practices, policy makers involved in economic and legal regulation in the EU countries will be able to better see problems in trends and dynamics through our results and effectively optimize the international trade system and contribute to sustainable development strategies.

6. CONCLUSIONS

The main result of the study is the presented graph, which is able to determine hidden dependencies and regularities in the framework of international trade optimization through a large array of data. The innovativeness of the research involves the application of a modern methodical approach to the economic and legal regulation of international trade optimization within the framework of sustainable development through the search for hidden dependencies and regularities in the data.

Association analysis was used to identify patterns and search for hidden rules in the general data array characterizing the volume of exports of goods from EU countries. Since the analysis of the main indicators of sustainable development includes the consideration of a large array of statistical data, it is necessary to start the initial analysis of the data by finding certain patterns and relationships between the indicators. It is the conduct of such an analysis at the initial stage of the study that will suggest the further construction of regression, predictive models or neural networks. To carry out this analysis, Eurostat statistical data on the volume of exports of goods in million euros of EU countries for 15 years on a monthly basis (from January 2008 to December 2022) were selected and the Data Mining/Association rules module of the STATISTICA 10 software product was used. As a result of the analysis, 50 associative rules that satisfy the constraints on the minimum value of the level of support, validity and correlation in the framework of sustainable development. On the basis of the study, it was revealed that it is advisable to use the method of associations as one of the optimization tools for measuring international trade. Based on the results of the analysis, certain patterns were revealed between the volumes of exports of goods from the EU countries, which were recorded in January, March, August and October during the study period. Moreover, these rules are present in all 100% of cases, and the level of reliability and correlation is also equal to 100%, which indicates the proportion of observational values for which the cause and the correct consequence are correct.

Politicians of the EU countries involved in ensuring sustainable development and heads of enterprises engaged in international trade operations can be based on the proposed methodological approach to build their own marketing strategy for sustainable development and regulate the optimization of activities in general.

We set out to present a new methodological approach and

this is what was described in the results. In our opinion, we are as close as possible to the solution of the research question. The study is limited by taking into account the specifics of the economic and legal regulation of international trade only within the EU countries. Further research should be devoted to the system of regulation of international trade around the world. If in further research we expand and study the countries of Asia and America, this will better allow us to understand the difference in the features of the regulation of international trade in comparison with the EU countries.

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