

Features of the Diamond Cluster Project Implementation in the Vladivostok Free Port Zone

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Abstract

Background/Objectives: The study is aimed at justifying and applying modern economic tools capable of providing favorable conditions for diamond and jewelry manufacturers to be competitive in the world market. **Methods/Statistical Analysis:** Different methods of analysis have been used in the study: Horizontal (time) and vertical (structural) analysis to determine the structure of the research subject and the effect of each element of the system; trend analysis to determine the main tendency of factors dynamics; comparative analysis of aggregated and averaged indicators on separate elements of the considered sector; factor analysis to assess the impact of individual causes on the performance indicator. **Findings:** The article presents the results of studying the implementation of the working potential of the diamond cutting and jewelry production in the territory of the free port of Vladivostok on Russky Island. Ground has been given to competitive advantages of creating a diamond cluster project as a resident of the Free Port of Vladivostok, the main risks that could affect the development of the proposed project have been assessed taking into account regional characteristics and the current state of development of the world diamond market and the Russian diamond industry. The model of cooperation with foreign investors has been described and the advantages for manufacturers within the cluster interaction have been shown. The predictive assessment of key financial indicators of the investment project has been made and the synergetic effect of production in the revenue from sales has been calculated. The conceptual suggestions regarding the formation of the cluster infrastructure have been given. **Applications/Improvements:** Use of cluster coordination strategy mechanisms and other key planning documents will ensure an effective interaction of participants of strategy events implementation.

Keywords: Cluster, Infrastructure, Diamond Industry, Investment Attractiveness, Manufacture, Tax and Customs Preferences

1. Introduction

1.1 Introduce the Problem

A feature of the Russian diamond industry is the presence of the world's largest diamond mining sector (25% of global production) with underdeveloped diamond cutting (7% of global production), jewelry (1% of global production) and tool-making production. The percentage of profits from the production and sales of diamond industry products in the Russian total GDP is insignificant and is less than 1%. The strategic goal of the Russian economy is to overcome its raw material orientation. The Russian diamond industry aims to develop processing facilities:

Diamond cutting and jewelry manufacturing in order to reduce export-oriented supplies of uncut rough diamonds for the purpose of increasing the volume of advanced diamond processing by domestic processing enterprises in order to elevate the value added.

Diamond mining, diamond cutting and jewelry industry cannot be considered without a comprehensive approach, as these sectors are highly interdependent in the context of the movement of finished industry products, financial flows and information that form a so-called diamond pipeline. This fact obliges us to consider these industries as a single intersectoral cluster producing the final product based on the principles of vertical

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integration, from which the financial results of each industry depend.

1.2 Importance of the Problem

Profitability of diamond cutting enterprises sales is the lowest one in the entire diamond pipeline chain and varies from 2% to 5%¹. The proportion of material inputs in the cost of diamond production for the purchase of diamond feedstock is up to 90-92%. Thus, diamond cutting enterprises are faced with the problems of effective working capital replenishment and lowering raw material costs. This involves the maximum reduction of the supply chain on the one hand, and the active integration of product manufacturing in the jewelry industry and the industry of retail sales on the other hand. In the world practice, there is a widespread government support of diamond cutting and jewelry industry aimed at reducing the tax and customs burden through the creation of free economic zones. Justification for the use and application of modern economic tools capable of providing favorable conditions for manufacturers of diamonds and jewelry by allowing them to be competitive in the world market has been made, which determines the relevance and timeliness of the research.

1.3 Relevant Scholarship

The study is based on the scientific works in the field of the theory and practice of the global diamond market of the following scientists:^{2,3} and others.

Direct questions of formation of industrial clusters in certain regions have been studied based on scientific works of⁴⁻⁶ and others. Also, some early studies of the authors regarding the development of the diamond industry of Russia and the Republic of Sakha (Yakutia) have been considered.

As an information base for determination of the diamond market conditions, the annual reports of ALROSA^{7,8} industrial enterprises, analytical and expert reports of the following consulting and analytical agencies: AWDC^{9,10}, Busines Stat¹¹ and Diamond Pipeline¹.

The changes in the diamond market in a volatile economy require the development of adaptive mechanisms to improve the investment attractiveness and creation of favorable conditions for the development of the processing sector of the complex in order to obtain greater added value for export-oriented goods. Development of practice-oriented proposals for investment should be formed with account of assessment of the investment and innovation

capacity of industries, regional features, factors, criteria and performance indicator systems. Determination of these aspects is within the scope of scientific research.

1.4 State Hypotheses and their Correspondence to Research Design

Taking into account the real events happening in the Russian diamond market and adaptation to the political challenges of the EU and the US and to the devaluation of the ruble, the creation of a world diamond center in Vladivostok is a strategic decision of the Russian Government. The aim of the study is the development of theoretical and conceptual guidelines and the technical and economic feasibility study regarding the creation of a diamond cluster for the production of diamonds and jewelry in the territory of the Free Port on the Russky Island.

Research is intended for solving a number of important issues in the field of the development of the Russian diamond industry, such as:

- Attracting investments into the domestic industry.
- Modernization of equipment and production technology.
- Employment creation.
- Creation of stable sources of revenue for budgets at all levels.
- Creation of industries providing a full cycle of deep processing of precious stones (diamonds) and precious metals mined in the territory of the Russian Federation, from the diamond cutting to diamond jewelry manufacturing.
- Increase in the production of export goods in the territory of the Russian Federation, which will strengthen the Russia's position in international markets.

2. Method

To achieve this goal and conceptual problems, different methods of analysis have been used in the study. Horizontal (time) and vertical (structural) methods of analysis have been employed to determine the structure of the subject of study and the effect of each element of the system. Trend analysis has been used in order to compare the data of the current period with the number of previous periods and to determine the trend as the main tendency of factors dynamics, free from random influences and specific characteristics of certain periods. Comparative analysis has been made between aggregated and averaged indicators on separate elements of the considered sector. In order to assess the impact of individual causes on the performance indicator, factor analysis has been used with deterministic or stochastic research techniques applied.

3. Results

More than 20 countries have deposits of natural diamonds (primary, placer, marginal-marine). Today, the production on an industrial scale is mainly concentrated in eight countries: Botswana, Russia, Canada, Angola, South Africa, the Democratic Republic of Congo, Namibia, and Australia. Russia has the world's biggest stocks, but in terms of forecast resources, it is inferior to South Africa, Namibia and Australia.

There are several major tendencies that could significantly affect the future development of the global diamond market. In this context, positive aspects include the development of new deposits on an industrial scale, improvement of the welfare of consumers and respectively the demand for diamonds, resolution of conflicts in the countries of South Africa, development of high technologies; negative aspects are the depletion of natural resource stocks, crisis of the global financial system and political sanctions.

The dynamics of reduction of the rate of global diamond output in volume terms in 2006-2014 which led to higher prices for natural diamonds has been determined. This trend occurred due to the depletion of operating industrial diamond mines and the absence of new results from the diamond field geologic exploration, so in the near future there will be shortage of natural rough diamonds in the world market.

The leading position in terms of production volume is occupied by Australia, Zaire (Congo), Botswana, Russia, Angola and South Africa, and in monetary terms by Botswana, Russia, Angola, South Africa and Canada, the share of which has increased over the last decade and exceeded 15%. The global diamond output in 2013 amounted to 130.482 million carats, among them Botswana: 23.2 million carats, Russia: 37.5 million carats, Congo: 15.7 million carats, Canada: 10.6 million carats, Angola: 9.36 million carats and the others 33.722 million carats⁹.

There are more than 1200 companies on the world market are involved in the diamond sales. And only a few of the companies (not more than a fifth part of them) are processing rough diamonds by themselves. All the rest are carried out the secondary trading. The annual diamond production volume in the world in 2013 was estimated at USD 19.4 billion. The USA production growth was of 5%. The average growth rate of the world's diamond production is about 5-10% per year. India is still occupying the leading position in diamond cutting

market among manufacturer countries by producing about 58% of diamonds in the world (in terms of value). China and Thailand are in the second place (14%) and Israel occupies the third place (12%)⁸.

In terms of diamond production volume, Russia occupies about 7% of the world diamond market. In 2013, the diamond production in Russia amounted to USD 1.1 billion. The Russian import and export of rough diamonds in 2013 totaled 0.0482 million carats and 35.363 million carats respectively. Almost 90% of the diamonds produced in Russia is exported. This is due to the fact that at this time the manufacturers of jewelry in the country cannot fully consume the diamonds produced by cutting factories.

In 2013, the volume of offer in the world jewelry market exceeded USD 125 billion with growth of 10% compared to 2012. According to experts, there are more than 1600 companies, mostly transnational, in the world that are engaged in the production and sale of diamond jewelry. Like that, Bulgari (Italy) sells its products in 35 countries, Tiffany (USA) in 25 countries⁹. Big changes are expected to be in the market of the final product: diamond jewelry. Sales in India and China are rapidly growing. According to some reports, by 2020 the consumption of diamond jewelry in these countries will cumulatively exceed the volume of consumption in the United States (now about 37%). The consumption of diamond jewelry in Russia is estimated to be about 1% of the world volume.

In 2013, the Russian jewelers produced goods for RUB 80 billion; the growth was of 33% compared to 2012. At the same time, the share of Russia in the world's market of jewelry production was less than 2%. In 2013, the consumption of jewelry in Russia reached RUB 150 billion. Diamond jewelry occupies half of the market in monetary terms. According to market research, in Russia for about 75% of demand is for jewelry in the price segment up to RUB 10 thousand. It should be noted that Russian jewelers meet the demand of domestic consumers only by 57%. The remaining 43% of sales fall on imported products, mostly from Turkey and China¹¹.

Against this background, according to estimates of Bain and Co., for the next 10 years a deficit of rough diamonds is expected in the diamond market and only its extent will vary. By 2020, the deficit of natural rough diamonds in the market can be already 72 million carats and this volume is comparable not with 15-20% but with a half of the world's production of natural diamonds. It will entail a rise in prices for raw materials. This trend has become evident and continues to progress. At the same

time, the global demand for diamonds will grow from USD 22.4 billion in 2013 up to USD 31 billion in 2018 as expected. It means that if the share of dealers and cutters in 2013 accounted for about USD 4.3 billion, this amount could soon grow up to USD 5.5-7 billion. This growth will be possible as a result of a sharp rise in demand from the side of the growing middle class in China and India⁹.

According to a study conducted by the Fortune Character Chinese Media Group Institute, in 2013, Chinese consumers purchased almost half (47%) of all luxury products in the world. Despite the government measures taken last year against excessive spending on luxury and high-end brands, the consumption of products from this group, however, increased by 11% and set a new record: USD 217 billion in 2013, according to China Daily.

The global diamond jewelry retail market is also showing rapid growth. In 2011, it amounted to about USD 70 billion; in 2013 it reached USD 75 billion. According to the forecast, by 2020, the market volume could increase, mainly because of rising demand in China for USD 15-20 billion. Revenues of participants in the Chinese market during this period are expected to be increased from USD 47 billion in 2011 to about USD 55-58 billion in 2020⁸. In

the future, the demand for diamond jewelry will continue to grow, especially in the BRICS countries as well as in South America (Brazil, Argentina, Uruguay, and Colombia). It is also indicated by the fact that a new center of diamond trade, which in future will take a leading position in the global diamond market, is formed in Panama.

Profitability of sales of mining companies is around 16-20%, while the number of players is less than a hundred due to the presence of high competitive barriers to entry to this market.

Secondary industries are highly fragmented and represented by more than 5000 companies in the entire world, when about half of the world trade belongs to the largest fifty of them, the revenue of which varies from USD 100 million to 900 million per year. A fundamental role in the structure of secondary industries is played by the diamond-cutting enterprises, which form a significant part of the diamond added value by processing diamond feedstock and selling finished diamonds through the short-term and long-term contracts and auctions.

Return on sales of cutting enterprises is the lowest one in the entire chain of the world diamond industry and varies from 2% to 5% (Figure 1). Thus, the diamond cutting

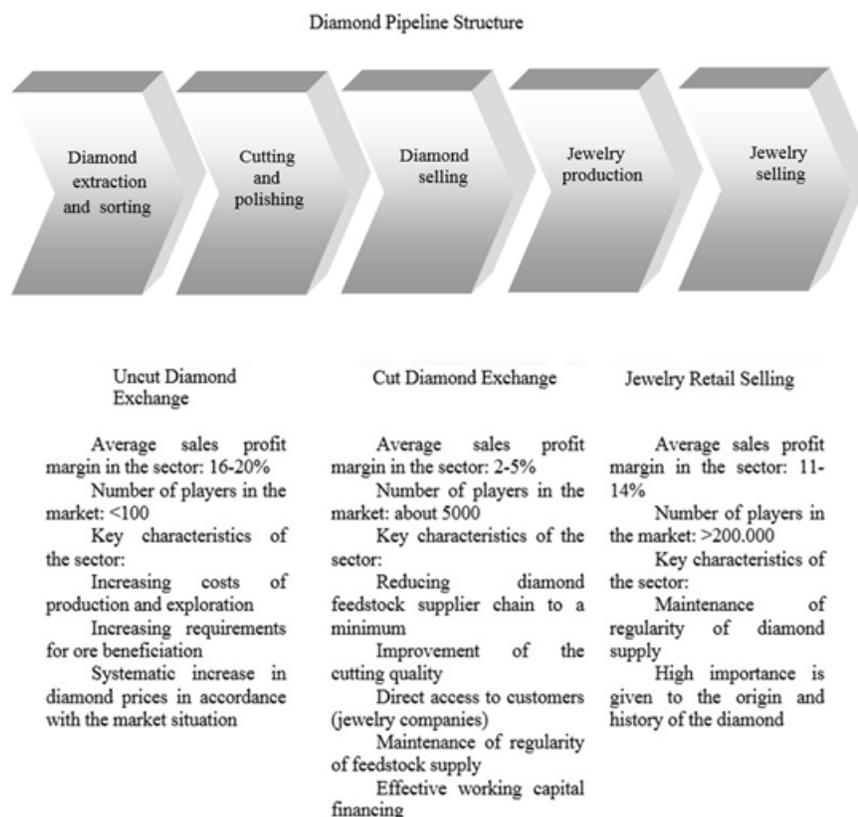


Figure 1. Average sales profit margin in the sector.

*Prepared by the authors on the basis of Bain experts' reports⁹.

enterprises are facing the tasks of effective replenishment of working capital and reducing raw material costs by reducing the supply chain to a minimum, on the one hand, and by an active integration into the jewelry industry and the retail sales industry, on the other hand. In the world diamond industry, there is also a widespread government support for the jewelry diamond cutting industry, aimed at reducing the tax, customs and administrative pressure on manufacturers through the creation of free economic zones.

The tertiary industries in the structure of diamond industry are represented mainly by companies that sell diamonds and jewelry. There are more than 200,000 representatives of the retail sales industry. Profitability of sales of the majority of representatives of the industry is at the level of 11%-14%.

In the past few decades, there is an active vertical integration of enterprises of the world diamond industry in the direction of unification of cutting, jewelry and retail businesses. In addition to the cutting enterprises, which are trying to optimize by this means costs and to increase their own profitability, world producers of rough diamonds are also using their own potential for further vertical integration and better control over the entire value chain of the international diamond industry¹⁰.

Competitive advantages of the diamond industry of Russia in the world market consist in the presence of significant reserves and resources of natural diamonds.

The strong points of the industry are the following:

- Global leadership in rough diamonds production and sale.
- Vertically integrated business system.
- High quality of diamond cutting with precise geometric parameters (Russian Cut).
- Young economically active human resources.
- Leading positions with strong prospects for the forecast period regarding the extraction of rough diamonds and diamond production.
- Favorable geographical and economic situation towards the countries of South-East Asia and Europe.
- Presence of big scientific and educational centers. The high educational level among the population.
- Effectively working regional executive authorities, constructively dealing with the major economic actors, and with federal agencies.

At the same time, there are some weak points in the industry:

- Diamond mining in the extreme climatic conditions.

- Sector-specific economy with the predominant diamond industry, entering into a difficult period of technological switch to the underground mining method.
- Weak proper marketing network in the world diamond centers, absence of a secondary market in the country.
- Narrow assortment of products.
- Underinvestment in marketing and advertising.
- Imperfection of the regulatory framework, hamper the development of industry sectors.
- Low level of innovative activity, inadequate technological support of production.

Opportunities:

- Favorable situation in the world and domestic markets. The objective interest of the economies of the Asia-Pacific region and China in the production of fuel and energy industry and mineral resources base of the country.
- Tax policy implemented by the Russian Federation aimed at reducing the tax burden on manufacturers of goods.
- Elimination of unnecessary barriers to the regulatory framework.
- Raise in the level of production and development of a proper sales network.

Threats:

- High susceptibility to influence of changes of legislation and regulatory measures.
- Changes in customs procedures and duties and the imposition of political sanctions.
- Competition in the global labor market.
- High sensitivity to the global financial crisis.
- Discovery of new diamond deposits outside Russia.

During determination of the export potential of the Russian diamond market, the dynamics of sales of rough diamonds by Russian diamond mining enterprises as per results of 2012-2014 have been analyzed. As a result, it has been established that the rough diamonds sales in the domestic market by the ALROSA Group is rapidly slumping. For 2014 sales slumped by 3%, or for USD 155.7 million. At the same time, the total diamond sales volume increased by 2.2% compared to 2013 and by 10.1% compared to 2012 (Table 1). Sales growth is related, of course, with the planned increase in diamond production, but at the same time, the rise in prices on the world market and the decline in rate of the ruble against the U.S. dollar led to a decrease in purchasing power of the Russian diamond cutters. Thus, the company is forced to export its products.

Table 1. Dynamics of sales of diamonds by ALROSA Group for 2012-2014, million USD

| Manufac-turer | 2012 | | 2013 | | 2014 | |
|--------------------------|-------------|-----|-------------|-----|-------------|-----|
| | USD million | % | USD million | % | USD million | % |
| ALROSA Group, including: | | | | | | |
| Export | 3414.5 | 77% | 4114.4 | 86% | 4376 | 89% |
| Domestic sales | 1035.7 | 23% | 680.4 | 14% | 524.64 | 11% |

* Prepared by the authors on the basis of ALROSA annual reports for 2012-20147.

While considering Alrosa Group by enterprises, we have noted that the dynamics of export sales growth is maintained in all enterprises (Figure 2). At the same time, the companies Nizhne-Lenskoe, Almaz Anabara and Sever-Almaz are switching to almost 100% export. And the sales of products in the domestic market are carried out by ALROSA and yet by ALROSA-Niurba. The data shows that the group is carrying out organizational work aimed at the enlargement of the internal unified sales network.

The structure of sales of diamonds (Figure 2.) shows that regional diamond cutting enterprises sell their products for export and import in the ratio of about 60:40, the largest Russian manufacturers sell their products in the ratio of 97:3.

Upon consideration of the geographical structure of diamond sales by the largest producers of diamonds of

Russia (Figure 3.) it has been determined that almost half of the diamonds produced in Russia is sold in Belgium. With the possible ban on diamond exports to the EU and the USA, about 60% of the consumer market will be closed for manufacturers, which will undoubtedly cause an increase in stocks of finished products and correspondent economic impacts. So, the question of establishment of a diamond exchange in Russia for diamond manufacturers will be crucial for the maintenance of diamond cutting industry after the sanctions introduction.

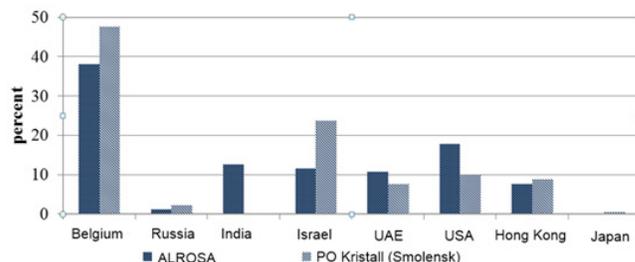


Figure 3. Geographical structure of diamond sales by PO Kristall, JSC and ALROSA, PJSC in 2014 according to value in percent.

*Prepared by the authors based on the annual reports of PO Kristall13 and ALROSA, PJSC7.

It is no secret that the mineral resources base of Russia is the most attractive for investment for foreign investors.

The Russian Federation has proven reserves sufficient to maintain the current production level of at least 30 years⁷. Foreign producers of diamonds, particularly the

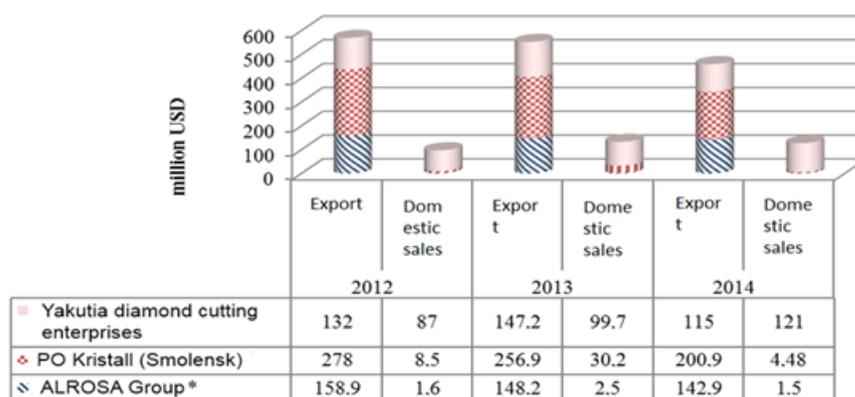


Figure 2. Sales of diamond by Russian companies.

*ALROSA Diamonds: 40%; Barnaul Crystal Plant: 37%; Orel ALROSA: 23% as per 2014.

** Prepared by the authors based on the annual reports of PO Kristall¹³, ALROSA PJSC,⁷ and the materials of the website of the Ministry of Industry of the Republic of Sakha (Yakutia)¹².

representatives of India and China, are interested in buying out rough diamonds in Russia.

It is economically efficient for investors to process purchased uncut diamond raw materials on-site with a lower average cost of production of diamonds. Based on the analysis of the cost of production of diamonds, depending on regions participating in the world diamond market, we can see that in Russia the cost of diamond processing is high (Tables 2 and 3). The U.S. dollar-denominated average cost of diamond production, with regard to the real expenses in local currencies, was reduced to the greatest extent in Russian diamond cutters.

Table 3. Changes in quotations of the national currency against the US dollar

| | Ruble | Euro | Israeli Shekel | UAE Dirham | Indian Rupee | Chinese Yuan |
|------------|-------|-------|----------------|------------|--------------|--------------|
| 02.2014 | 35.5 | 0.72 | 3.4 | 3.67 | 62.0 | 6.11 |
| 07.2015 | 59.7 | 0.90 | 3.78 | 3.67 | 63.9 | 6.20 |
| Changes, % | -68.0 | -25.0 | -11.1 | 0 | -3.0 | -1.4 |

*Prepared by the authors on the basis of the exchange rate of the Central Bank of the Russian Federation

Therefore, in Russia it is economically feasible to process the average and large rough diamonds. But taking into consideration the financial situation in the country with the fall of the ruble against the U.S. dollar at the end of 2014, the situation led to a decrease in the processing cost in the range of USD 35-85 per carat. In comparison with competitors from Belgium, Israel, UAE and the United States, Russian cutters gained a significant advantage by the middle of 2015. Thus, the Russian labor market has become attractive to sightholders.

Also we shall not forget about the production costs of diamond export duties amounting to 6.5% in the framework of the Customs Union.

The duties imposed on the diamond cutting enterprises when the raw materials are exported or given for processing on subcontracting basis outside of Russia, make more than 15% of the working raw material cost. This measure was introduced in the period of establishment of the Russian diamond market, and was designed to protect it from speculative transactions.

The main factors constraining the development of the diamond industry in Russia are the following:

- Legislation that complicates the customs procedures and extends the terms of deliveries for imported and exported diamond products.

- Access to finance and credit resources: The simplification of procedures and interest rates when obtaining a loan for the purchase of expensive raw materials would increase the production turnover.
- Absence of a proper foreign distribution network when exporting products.
- Backward technologies and equipment used by domestic producers comparing to the real potential of the world technologies. Innovation would give the possibility to significantly reduce the cost of mining and processing, therefore, to increase the profits of enterprises.

These competitive advantages may be used when dealing with the development constraining factors through cooperation within the industrial cluster.

The “cluster” means a territorial association of interconnected companies and institutions within the respective industrial region, focusing their activities on the production of goods of international standard¹⁴.

The implementation of cluster policy promotes the competitiveness of business by realizing the potential of effective interaction of participants of the cluster related to their geographical proximity, including the enlarged access to innovation and technology, “know-how”, specialized services and highly qualified personnel, as well as by lowering of transaction costs, creating the conditions for the implementation of joint cooperation projects and productive competition.

The formation and development of clusters is an effective mechanism to attract foreign direct investment and encourage foreign economic integration. The inclusion of local clusters into the global chain of added value forming can significantly raise the level of national technological base; improve the rate and quality of economic growth by increasing the international competitiveness of enterprises belonging to the cluster by:

- Acquisition and implementation of critical technologies and modern equipment.
- Obtaining by cluster companies of access to modern management techniques and special knowledge.
- Obtaining by cluster companies of possibility to access the highly competitive international markets.

The development of clusters also allows optimization of the status of domestic enterprises in the industrial value forming chain, helping to raise the level of processing of extracted raw materials, to substitute the import and increase localization of assembly plants, as well as to improve the non-price competitiveness of domestic goods and services.

The successful operation of the cluster includes the following factors:

- Interest of the business elite and the municipal executive power and public support in the development of the cluster.
- Clear cluster formation technology.
- Existence of public scientific laboratories or university which could work with local companies.
- Availability of information exchange networks between small and medium-sized enterprises and public scientific laboratories.
- Availability of qualified staff and strong connections between them ensured by horizontal mobility between sectors and types of organizations.
- Variety of financial resources, including the availability of venture capital financing.
- Existence of regional leading companies in the industry sector.
- Cooperation between companies, the possibility of shared use of the equipment.
- Presence of an entrepreneurial spirit.
- Adequate structural and industrial policy of the local authorities.
- Traditions and historical conditions.
- The typical barriers to the development of process clusters include:
 - Restriction of access to raw materials for small and medium enterprises specialized in the processing of production of large process enterprises.
 - Financial barriers to the purchase of expensive production equipment.
 - Problems with the availability and quality of training of engineering personnel and skilled workers serving modern processing equipment. Some of the typical barriers to the development of process clusters are the following:
- Restricted access to raw materials for small and medium enterprises specialized in the processing of production of the large process enterprises.
- Financial barriers to the purchase of expensive production equipment.
- Problems with the availability and quality of training of engineering personnel and skilled workers serving modern processing equipment.

The purpose of the proposed project is to create conditions for intensive development of sectors of diamond processing industry within the framework of cluster interaction between manufacturers.

The advantage of the cluster interaction of industry members is determined by the access to different raw materials, technological and human resources during formation of horizontal and information connections, the available opportunities to form R&D and various forms of outsourcing.

Based on the aim of the project, the following tasks can be determined:

- Development of cooperation and cluster initiatives in

- the industrial and infrastructure sectors of the diamond industry, taking into account specific macro-regional model of the innovation system development.
- Preparation of engineering personnel and executives, qualified in the fields of advanced processing technologies and renewable resources, applicable in operations and maintenance of the industry.
- Modernization of material and technical base of high-tech production and transfer of innovations demanded by the diamond industry market.
- Development of interregional and international cooperation in the field of diamond production and sales, and technical, scientific and economic development.
- Creation of investment-attractive conditions for the development of production and export of diamond jewelry.

As practice shows, this kind of industrial clusters should include the whole range of infrastructure items: staff hostel, training center for training and retraining of personnel, medical center, hotel for visitors and clients of the cluster, trade and exhibition complex, etc.

Table 4. Initial parameters of the project

| Parameters | Initial concept |
|--|--|
| Aggregate investment in the industrial complex establishment | USD 42.7 million* |
| Residents participating in the complex operation | 42 companies with 30 employees |
| Calculated profitability of diamond manufacturing | 3-5% |
| Calculated profitability of jewelry manufacturing | 5-18% |
| Lease payment for residents | RUB 120,000 per month |
| Recoupment of production building expenses | 10 years |
| Monthly amount of purchased diamonds | USD 41.7 million* |
| Diamond raw material processing by residents by 2020 | up to 32,555 carats of diamond raw material per month |
| Human resources by 2020 | up to 1300 jobs without regard to employment in related industries |
| Period of turnover based on VAT recovery | 4 months |
| Organization expenses | USD 1 million * |
| Circulating assets | USD 525 million * |
| Volume of credit** | USD 7.5 million * |
| Credit volume payout period | 3 years |
| Project payout period | 10 years |

* The calculations are given in rubles according to the prices in 2015.

** The volume of credit to the cutting enterprises, excluding investments in jewelry production.

Table 5. Estimated volume of sales, including export

| | | Plan for production and sales | | | | | | | | |
|--|---------|-------------------------------------|----------|----------|----------|--------|--------|----------|----------|--------|
| Parameter | UM | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| | | Products (diamond reselling) | | | | | | | | |
| Amount of diamonds purchased by cluster residents | USD mln | 500.00 | 500.00 | 500.00 | 500.00 | 500.00 | 500.00 | 500.00 | 500.00 | 500.00 |
| Volume of sales of rough diamonds to the secondary market by residents | USD mln | 357.00 | 295.80 | 224.40 | 193.80 | 178.50 | 153.00 | 142.80 | 132.60 | 127.50 |
| Share of reselling of purchased diamonds to the secondary market (by weight) | % | 70% | 58% | 44% | 38% | 35% | 30% | 28% | 26% | 25% |
| | | Products (diamond selling) | | | | | | | | |
| Volume of diamond production | USD mln | 150.15 | 214.41 | 292.14 | 324.57 | 344.01 | 371.29 | 382.20 | 393.12 | 398.58 |
| Volume of sales of diamonds, including for export | USD mln | 107.36 | 235.85 | 321.35 | 357.03 | 378.41 | 408.42 | 420.42 | 432.43 | 438.43 |
| | USD mln | 62.27 | 141.51 | 224.94 | 285.62 | 302.72 | 367.58 | 378.38 | 389.19 | 394.59 |
| | | Products (diamond jewelry) | | | | | | | | |
| Volume of jewelry production | RUB mln | 12,460.0 | 19,487.1 | 25,809.3 | 28,949.7 | 33,013 | 35,631 | 36,679 | 37,726.6 | 38,250 |
| Volume of sales of jewelry | RUB mln | 14,079.8 | 22,020.4 | 29,164.4 | 32,713.1 | 37,305 | 40,264 | 41,447.5 | 42,631.1 | 43,222 |
| Share of export sales | % | 58 | 60 | 70 | 80 | 80 | 90 | 90 | 90 | 90 |

Creation of a brand new complex will require significant investments (about USD 140 million for the whole project implementation). However, the establishment of the Diamond Center in an area with an existing infrastructure will help to minimize the costs of construction (Table 4). On the Russky Island, where the campus of the Far Eastern Federal University (FEFU) is located, there are already a medical center, hostel and training center. So, in order to establish the proposed diamond cluster in a given territory, it is only needed to build a production building to house the jewelry and cutting manufacture. The size of investments in this case will be reduced up to USD 3-4 million. It is expected that the Diamond Center workers will be residents of Vladivostok Free Port, to whom a part of the equipment and other infrastructure items will be leased. In the case of favorable development of the project, the Diamond cluster can provide jobs to 1,300 cutters and jewelers.

Project implementation period comprises 2 provisional stages:

Stage 1: Preparation works, construction of the industrial building and formation together with FEFU of a necessary infrastructure, increase in production capacities (in 2016-2018).

Stage 2: Operation and increase in diamonds and

jewelry production capacities up to the maximum target level by 2030.

The beginning of the Diamond Center construction is scheduled to be in 2016, and the end of the main stage of this project is scheduled to.

The following option of financing is provided within the project for the putting of the industrial complex into operation:

- Capital construction and purchase of objects of the industrial complex, assignment or purchase of land plots will be carried out at the expense of the Russian Federation budget and private investments.
- Purchase and installation of equipment of diamond cutting and jewelry industries will be carried out at the expense of foreign investments.
- Industrial complex supply (utilities, electricity, water) will be at the expense of the lease payments of residents of the center.
- Provision of rough diamonds, precious metals and other necessary component materials of residents will be carried out at the expense of own and borrowed funds of residents of the center.

At full capacity, the cutting manufacture of the Diamond Center will be able to process up to 32,555 carats per month by the year 2020. The average raw material processing cost is USD 70 per 1 carat of raw

Table 6. Planned financial results of the project

| FINANCIAL RESULTS OF THE PROJECT | | | | | | | | | |
|---|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|
| Parameter | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| Revenues from sales including VAT, RUB mln | 41,384.0 | 56,258.7 | 63,328.4 | 67,525.6 | 75,174.6 | 78,440.5 | 79,746.8 | 81,053.1 | 81,706.3 |
| Current expenditures, RUB mln | 36,973.8 | 42,409.7 | 43,523.5 | 45,045.7 | 49,231.3 | 50,301.9 | 50,922.9 | 51,571.1 | 52,071.0 |
| Balance profit, RUB mln | 4410.1 | 13,848.9 | 19,804.8 | 22,479.8 | 25,943.3 | 28,138.5 | 28,823.8 | 29,481.9 | 29,635.2 |
| Taxes, RUB mln | 220.5 | 692.4 | 990.2 | 1123.9 | 1297.1 | 2813.8 | 2882.5 | 2948.1 | 2963.5 |
| Net profit, RUB mln | 4189.6 | 13,156.5 | 18,814.6 | 21,355.8 | 24,646.1 | 25,324.6 | 25,941.4 | 26,533.7 | 26,671.7 |
| Payroll charges (as per contributions to non-budgetary funds) | 2143.2 | 12,314.7 | 25,860.9 | 40,731.0 | 57,023.4 | 74,843.2 | 94,302.4 | 115,520.5 | 137,290.6 |
| Payment of a part of the FEFU net profit, RUB mln | 2.3 | 7.1 | 11.8 | 15.1 | 17.5 | 18.7 | 19.6 | 20.8 | 22.6 |
| Net profit of the Project Partners, RUB mln | 4187.3 | 13,149.3 | 18,802.7 | 21,340.7 | 24,628.6 | 25,305.9 | 25,921.8 | 26,512.9 | 26,649.0 |
| Product profitability, % | 11 | 31 | 43 | 47 | 50 | 50 | 51 | 51 | 51 |
| Sales profitability, % | 10 | 23 | 30 | 32 | 33 | 32 | 33 | 33 | 33 |

material depending on its characteristics. In the diamond cutting manufacture, the yield ratio will be 42.0%. Thus, the initial volume of production is planned to be USD 150 million in 2016 and is expected to be raised up to the level of USD 398 million by 2024, upon condition of consistent sales of finished products (Table 5). Planned financial results of the project, including the net present value, internal rate of return, the annual amounts of tax revenue to the Russian Federation budget, the budget of the subject of the Russian Federation and local budgets, as well as the revenues to extra-budgetary funds in the next ten years are shown in Table 6.

In order to determine the innovative part of the project, we have calculated a synergistic effect, where the share of total revenues from sales of finished products is obtained by attracting highly qualified specialists and using high-tech equipment. The effect has been calculated taking into account the growth of the productive forces, innovation susceptibility and innovative capacity of the productive forces.

For the calculation of synergistic effect in production volume we have used a technique developed by¹⁵ which determines the production synergistic effect by the Formula (1):

$$EdQ_i = (Q_i - Q^0) * L(PSR) - F(PSR) * (L=1) \quad (1);$$

Where, EdQ_i - actual synergistic effect in the production volume, million rubles.

Q_i - production sales revenue in the i-year, Q^0 - production sales revenue in the basic year.

$L(PSR)$ - coefficient of the innovation lever of the development productive forces.

$F(PSR)$ - power of the development of production, million rubles* turnover/year².

During the project implementation according to the initial data in the Table 4, the synergetic effect can reach 27 billion rubles under the influence of innovation lever of production equal to 1.3. The action of the innovation lever equal to the maximum value of 1.41 may increase the synergetic effect up to 13 billion rubles (Figure 4).

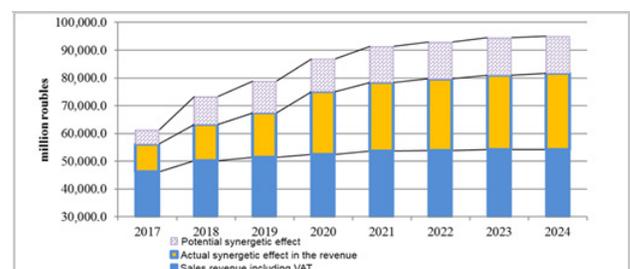


Figure 4. The synergetic effect in the revenue of Diamond cluster.

*Prepared by the authors based on calculations according to the method¹⁵.

In these circumstances, the power of production is steadily increasing, and by 2024 will amount to 28.8 million rubles* turnover/year² (Figure 5.), but at the same time, the innovation lever will slightly reduce its efforts in 2018-2019, but will later return to its positions, reaching the level of 1.39, which indicates a high degree of dependence on innovative susceptibility and innovative capacity of the productive forces in this project.

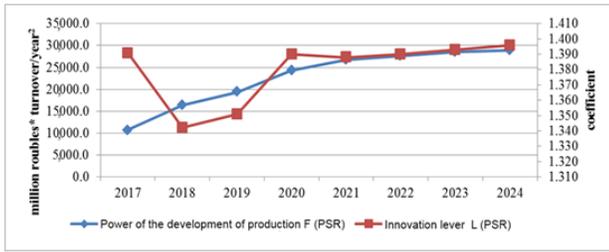


Figure 5. The values of power of development of production and innovation lever during the cluster project implementation.

*Prepared by the authors based on calculations according to the method¹⁵.

A comparative analysis of the structure of costs of production of 1 carat of diamond and 1 jewel shows that as a separate line of business, the cutting production has a low level of profitability, but in relation to the jewelry manufacturing, the business becomes more profitable. But the effectiveness of this area largely depends on the structure of sales and marketing policy.

Taking into consideration the assortment and weight composition of rough diamonds to be purchased for cutting, as well as assessing the need in diamonds for jewelry production, it can be assumed that the jewelry production will use 35-40% of diamonds produced, and 60-65% of locally produced diamonds should be prepared for selling.

At the same time, local diamonds will cover approximately 70% of the jewelry production needs, and 30% of needed diamond inserts have to be purchased from external suppliers in the market. Basically, these are small diamonds which are produced from so-called "Indian" raw materials.

Diamond and jewelry markets are the most sensitive to changes in purchasing power and financial fluctuations of the market economy.

Among the major project risks the following groups can be distinguished and evaluated:

- The risk related to the preparation of the regulatory and legal framework for Project implementation and risk of imposition of tax and activity tariffication in the Free Port, which are related to a high level of uncertainty regarding the specific measures of stimulation of activity of port residents as of today. The probability of the negative scenario as a result of the events connected with these risk groups, is considered as "average" in both cases, while the potential damage to a successful project implementation can be rated as "high".
- Risks of project financing.

Risks of project financing are divided on the one hand into a group of risks related to the involvement of the budget, borrowed or internal funds, and on the

other hand into a group of risks related to unforeseen estimated project cost overrun and missed deadlines in the infrastructure construction. In order to minimize the impact of these risks on the success of the project, it is recommended from the federal budget to get approval of the project and support from all relevant ministries and departments in the preparatory phase.

The risk of insufficient private funding is primarily depending from the ineffectiveness of measures of attracting of private investors in the project under the given conditions. So, borrowed or proper funds of private investors, necessary for construction (reconstruction) and/or operation of the project, may be granted not in full, not in time or not on the expected terms.

The risk of availability and terms of attracting of debt financing in the project can be expressed in an insufficient attractiveness for credit institutions due to their specificity. Given the current unfavorable situation in the financial markets of the Russian Federation, there is a risk of worsening of conditions of funding attracting in terms of the cost and maturity.

The risk of increase in the estimated cost of construction of the project infrastructure is manifested in the form of overrun of actual costs of implementation against the estimated cost. This situation can occur because of errors in the assessment of capital investments, the need for changes in the project documentation for various reasons, appreciation of the construction process: The conclusion of fixed price contracts for materials and equipment supply; contractual security of unforeseen costs etc.

The risk of extension of terms of putting of the center infrastructure into operation is possible in the circumstances similar with those of increase in the estimated project cost: Design errors; the need for changes in project documentation; unforeseen circumstances during construction.

This group of risks represents the potential events or conditions that may somehow have a negative effect on the success of the project during the construction and installation works, acceptance of work or introduction of the center infrastructure into operation.

1. Risks of the operational phase of the project. This risk group is formed mainly of the factors affecting the cutting and jewelry industry as a whole: single supplier risk; risks related to finished products sales; risk of unexpected overrun in production expenses; risk of mistakes of administrators and managers of the center.

Measures to reduce the impact of this risk on the

residents may be the following:

- Reduction of the cost of bank loan funds issued for replenishment of the project working capital by attracting state guarantees.
- Subsidies given to the cutting enterprises for rough diamonds purchase.
- Creation of a diamond exchange that operates within the Free Port and redistributes the flow of rough diamonds between residents.
- Involvement of professional consultants into development of the marketing policy and detailed analysis of the sales market for diamonds and jewelry.
- Improvement of the quality of products in order to create a greater added value and increase the rate of gross profit margins.

2. The risk of professional mistakes of the main industrial personnel is related a deficit of skilled diamond cutters and jewelers in the Russian labor market. In the current environment, employers are not able to keep a constant staff that causes low wages and high staff turnover in the industry sector. This entails an increase in the cost of training and the risk of increased amount of defective products for several years of the residents' work.

The following measures may reduce the impact of the risk:

- Private sector attracting (including residents) for participation in the programs of practical training of cutters and jewelers.
- Development of programs of tangible and intangible rewards for staff (bonus system for fulfillment and over-fulfillment of the plan for the cutting quantity and quality, advanced training programs, social security, etc.).
- Raising public awareness about the possibility of passing the specialized training.
- Creation of favorable conditions for moving for professionals from neighboring regions.

Therefore, in order to stabilize sales and to monitor the situation on the world market, it is suggested to create a coordinating and analytical center the functions of which will include the analytical, marketing and strategic studies diamond market.

Products of this manufacture are export-oriented, so the objectives of the project are to increase the export of finished products by 2024 up to a level of 90% (see Table 5).

It is expected that on the basis of the Diamond Center the Free Port of Vladivostok residents will be working and all equipment and other infrastructure will be leased to them. With favorable project development, the Diamond Center will be able to employ up to 1300 persons of main personnel.

Required qualifications: Knowledge of technology diamond cutting and jewelry manufacturing, diamond

cutters, pre-polishers, diamond splitters, markers, jewelry designers, jewelry setters, fitters, foundry men, gemmologists, engineers, appraisers and others.

4. Discussion

In order to liberalize the procedure of formation of a long-term partnership with ALROSA, PJSC and to overcome the limitations of the normalization restrictions, it is proposed to use a paradigm (model) of cooperation with foreign investors, which is presented in Figure 6.

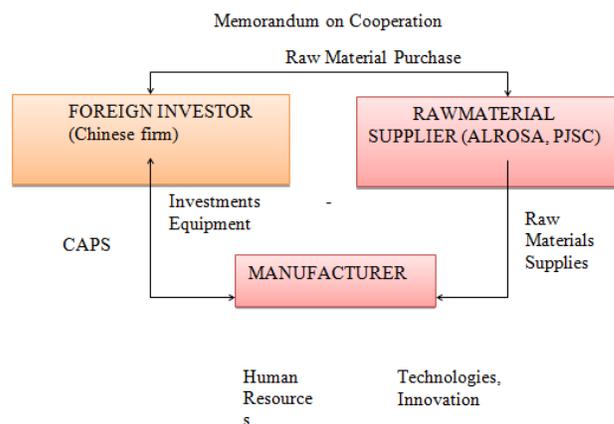


Figure 6. The model of interaction with the investor.

*Prepared by the authors.

In accordance with this scheme, investors are proposed to buy rough diamonds through the Russian manufacturer who has a long-term contract with ALROSA. During further processing of rough diamonds at a joint production, it is suggested to form the CAPS. On the basis of CAPS, it is possible to make different types of semi-finished products according to the desire of investors and to carry out technological stages of processing. For selling purpose, split, turned and pre-polished semi-finished products are offered. Depending on the stage of processing, the mass of semi-finished diamond products will be reduced due to irreversible losses (splitting: 2-3%, rough cutting: 10-15%, pre-polishing: 10-20%). At the same time, the terms of processing of rough diamonds in CAPS will be reduced and the turnover of working capital will be reduced with a high probability up to 180 days of VAT payment delay. So, with further export of semi-finished diamonds it is possible to obtain effect. A detailed calculation of the effect requires further evaluation.

The functions of the firm-manufacturer include:

- Production of CAPS and their export through foreign investors.

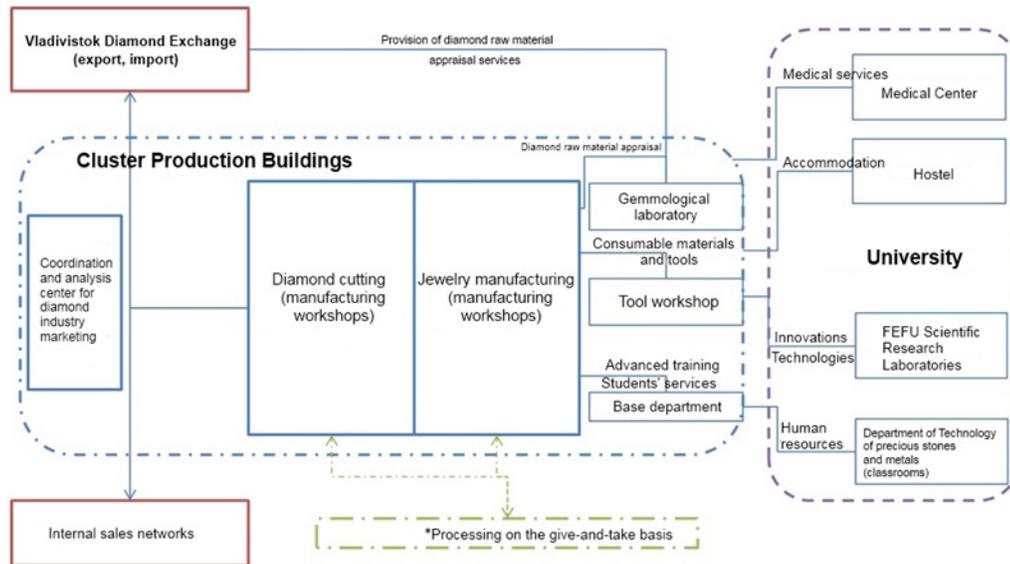


Figure 7. Business model of the diamond cluster units interaction.

*Prepared by the authors.

- Production of diamonds on the give-and-take basis.
- Provision of rough diamonds marking, assessment and grading services.

Participation in the scientific and educational activities (attraction of students, carrying out of advanced training for professionals, conduction of on-the-job trainings and training with use of modern equipment, etc).

To ensure the supply of local skilled workers, it is necessary to open the Department of Technology of precious stones and metals on the basis of FEFU (Figure 7). At the same time, in order to involve students in the production and improve their practical skills, it is planned to create the department on the basis of the cluster production unit. Location of educational laboratories in the production buildings provides a number of advantages for both the educational process and the production.

The University can also expect to receive preferences from establishment on its territory of the modern diamond cluster. First of all, it will make it possible to obtain additional revenue from the provision of medical services for the center staff and from the premises lease. Secondly, the university will be able to open new training courses. Cooperation between FEFU and the cluster will create a modern scientific and educational base for the cutting industry. Thirdly, the location of the cluster in the FEFU campus will increase the awareness and prestige of this university in the entire world.

In order to successfully implement the project of

establishment and functioning of the diamond cluster, it is necessary to create a strategic management system.

The basic mechanisms of the strategic management of the cluster are the following:

- Implementation of the cluster strategy is controlled by the management company.
- Industry sectors executives are involved into coordination of the implementation of the cluster strategy.
- Monitoring and control of the implementation of the strategy are carried out by the planning and economic department of the management company. The external control requires the conduction of monitoring with the participation of companies and investors representatives.

Tools of the strategy management are the following:

- Situation monitoring system.
- Balanced scorecard system.
- Long-term municipal and departmental special-purpose programs.
- Annual budgets of the branch enterprises.

For effective implementation of the development strategy of the diamond cluster, it is proposed to form a commission for monitoring and control of the strategy implementation.

The objectives of the Commission for monitoring and control of the strategy implementation will be the following:

- Development and discussion of the development strategy project and plan of actions for its implementation.
- Review and evaluation of the initiative proposals from

participants of the development strategy who are not members of the Commission.

- Discussion of proposals of the participants of the strategy implementation regarding introduction of amendments and additions to it and preparation of proposals on amendments and additions.
- Organization of the development and implementation of corporate purpose-oriented programs and investment projects.

Use of cluster coordination strategy mechanisms, and other key planning documents will ensure an effective interaction of participants of strategy events realization.

5. Conclusion

In the course of this study, the following results have been obtained:

- Analysis of actual problems of development of the diamond industry of the Russian Federation, legislative and regulatory restrictions in the activities of diamond cutting and jewelry enterprises has been carried out.
- Description of the global experience in the establishment and operation of similar clusters in diamond cutting and jewelry manufacturing has been given.
- Calculation has been made regarding the direct and indirect expenses taking into consideration during the formation of the cost of diamond and jewelry production by Russian and foreign manufacturers.
- Financial feasibility of the creation of diamond cluster has been made taking into account the financial, fiscal, economic and social efficiency of the project and analysis of project sensitivity to the basic manufacturing factors.

6. Acknowledgement

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