PROBLEMS AND OPPORTUNITIES OF MINING COMPANY’S STRATEGIC DEVELOPMENT

Tatyana Ponomarenko¹, Igor Sergeev²

¹ Prof. St. Petersburg Mining university. 21 lines, 2. St. Petersburg, 199106, Russia. Phone +370 812 3288253. E-mail stv_mail@mail.ru.
² Prof. St. Petersburg Mining university. 21 lines, 2. St. Petersburg, 199106, Russia. Phone +370 812 3288228. E-mail miner-spb@yandex.ru

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Company’s strategic development has to be aimed at value growth. External growth is connected with effective using of new assets at the created value chains. The goal of the paper is to distinguish organizational and economic conditions of economic efficiency of the value chain transformation. Research Methods: the comparative analysis of financial results of the mining companies for 2003–2015, technology, economic and institutional factors, the case method and strategic and investment analysis are applied. Results: geological, technical, economic and other specific conditions of the value chain transformation as strategic development are formulated; estimate new effects of added assets at the value chains is offered.

Key words: value, technology, process, value chain, project, assets, efficiency, strategy.
JEL Codes: D23, D46, Q32.

1. Introduction

Vertical integration is one of the most ambiguous forms of economic organization. The key reason for the creation and such wide distribution of vertically integrated companies is the desire to limit market competition by replacing the market mechanism with internal corporate mechanism, as well as to gain a synergistic effect due to the integration of single price, financial, investment, and technology policy. Modern large corporations incorporate hundreds of subsidiaries and affiliated companies. It causes not only consolidation of capital and assets along with the growth of number of workers that is quite typical for industrial economy but also it induces the emergence of new types of interaction. In the age of innovative economy, the consolidation of business activities is appearing through strategic management as well as through the design of value chains that take a form of meso-economic network structures with a single logistics center, digital assets and a special system of long-term contracts. In the industrial companies the integration is generally based upon technological linkages that are determining commodity and financial flows.

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Flow management is performed within the value chain that must be designed and modified in order to response to the changes in the external environment.

The Corporate Control Center of the vertically integrated companies can take decisions on any type of assets’ configuration in order to ensure the supply of the resources for the value chain. The configuration of assets is based upon the engineering, upgrading and optimization of the value chain. The following challenges might be related to the value chain itself: the absence of separate links in the value chain; the imbalance of the production capacities of the links in terms of main and auxiliary processes; inefficiency of both individual links and entire value chain from the point of view of value creation. In order to overcome these challenges managers are taking decisions to integrate new assets in the value chain changing its configuration. However, such changings do not always lead to the optimization of value chain or to the enhancement of its KPIs. When the value chain incorporates several entreprises (as in the vertically integrated companies) changes in its configuration cause wide variety of effects including additional synergistic effects (Pil, 2006; Das, 2001; Holm, 2005).

While designing a structure of vertically integrated company based on the design of the value chain, every integrated company has to make a tradeoff between market flexibility, which is maximized under the context of the absence of any integration, and control, which is maximized under the context of full integration. It should be noted that stability of integrated company or group of companies generally implies its economic and financial stability in terms of the resistance to the impact of external environment. Implementation of new project that can be considered as a creation of new business asset will change the structure of vertically integrated company due to the changes in the number of elements within the system as well as the changes of the nature of the linkages among them.

Integration of new business assets within the vertically integrated company may lead to the following consequences:
- increase in the economic efficiency of value chain, the implementation of projects is rational, assets continue to be exploited;
- decrease in the economic efficiency of value chain, the implementation of projects is irrational, “toxic” assets should be sold;
- increase in the technological efficiency of value chain along with no increase in its economic efficiency, the asset has to be upgraded or sold; wider range of effects should be considered.

Based on all above stated the current research is following two objectives:
- to analyze the specific nature of value chain engineering under the context of mineral and raw material industry as well as to distinguish particular success factors ensuring the efficiency of value chain relevant for this industry;
- to analyze the effects caused by re-engineering of value chain, particularly by the integration of new elements.

In order to meet stated objectives three RQs were formulated:
- is there any industry-related specificity that should be taken into consideration while engineering value chains within the mining companies?
what are the consequences of the integration of new business assets into the value chains of mining companies?

what are the factors determining the economic efficiency of value chain under the context of vertically integrated company?

The paper is structured as follows: first, there is the Literature Review section that presents key concepts and theoretical approaches to the analyzed phenomena existing in the academic literature and relevant for this research. The key results of the study are presented in the Results section. The Discussion section aligns gained results with existing academic knowledge as well as provides some implications of the results in order to answer stated research questions. The Conclusion section highlights the key conclusions of the research as well as provides answers for the stated research questions.

2. Literature Review

The concept of added value developed by the M. Porter (1980; 1985), R. Kaplinsky (2000), J. M. Maloni (1997) is the fundamental theoretical approach to the evaluation of product, project, and company. According to M. Porter, value chain is a coherent set of activities creating value for the company ranging from the supply of raw materials to the delivery of final products to the end users including also additional activities such as services. Value chain being a model in its nature requires structuring the process of product movement from supplier to consumer through stages that add value to the product (Baker, 2013; Buckeridge, 2010).

The concept of value chain has been developed significantly by R. Kaplinsky and M. Morris (Kaplinsky, 2001) along with many other researches (Chen, 2004; Kopczak, 2003; McCuish, 2011). According to R. Kaplinsky and M. Morris, the concept of value chain incorporates a full range of activities required to ensure that a product or service passes the full cycle from the point it was created, through intermediate production stages (including a combination of physical transformations and the contribution of various producer’s services), to delivery to the end user and disposal after the use.

Engineering of the value chain is aimed at enhancing company’s competitive position in the market, increasing the efficiency of company’s operations (extension of the value added as well as improvement of its structure). In academic literature one may find a lot of researches dedicated to the issue of value chain design, including the papers of R. Grant and Baden-Fuller (2003), J. L. G. Dietz (2006), L. Horvath (2001), P. Hruby (2006). At the same time, the criteria for distinguishing strategically important activities within the value chain and the criteria for selecting the most effective design of the value chain are not well substantiated in academic literature. The problems of interaction between the assets previously created within the vertically integrated companies and assets newly created by the implementation of investment projects, especially of a strategic nature, also have not yet been solved.
Despite the absence of accurate definition of a term “strategic project” in academic literature, one may find its main characteristics identified by the scholars: focus on achieving strategic competitive advantages (Ling, 2004; Walters, 2000), systematic approach to its development and implementation, long-term nature. At the same time, the role of strategic projects in the design of a value chain of mining companies has not been adequately studied.

3. Results

In the world economy one may find a lot of examples showing that vertical integration is widespread phenomena, especially in such industries as oil and gas and mineral and raw materials.

Three types of factors have been distinguished that shape out the specificity of value chains in mineral and mining industry.

**Economic factors**: technical industrial goods and its types; the current state and development prospects of the commodity and intermediate products markets; the market environment, its boundaries and structure, terms of the financing. Another important factor is the level of commodity and resource dependence of companies in the group.

**Technological factors** include: modern technologies for extraction and processing of mineral raw materials, the possibility of using waste-free technologies, rational use of mineral resources, the capacity of extracting a useful component from the ore, the ability of integrated use of mineral raw materials.

**Institutional factors** include the system of state regulation of mineral use and industrial production, the tax system, sector development strategy, innovative development strategies, existing and planned measures of state regulation and stimulation of the industrial production.

In case of mineral and raw material companies the value chains are based on the projects aimed at development of mineral and raw materials assets, therefore, the specificity of mining projects determines the specificity of design and evaluation of the value chain (Buckeridge, 2010). These include: mining and geological conditions of the deposits; the choice of technical and economic solutions based on the particular mining and geological conditions; specific risks. Mining and geological conditions of mineral deposits include: qualitative characteristics (content of useful components, mineral composition, and its ability to be processed), quantitative indicators (size of reserves), and conditions of occurrence. The risk assessment of the mining development project is ensured by the usage of modern methods of resource base assessment in accordance with The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (‘the JORC Code’).

The range of products, the logistics of production and marketing, the location of production, the value and cost of the products depend on economic factors, technological factors, as well as on the institutional ones. Therefore, various designs of val-
Value chains lead to different economic results and non-economic effects that affect the company, the region, the national economy as well as cross-border cooperation.

This research has revealed and analyzed different examples of positive and negative impact of projects’ implementation on the efficiency of value chains of vertically integrated companies.

**Case of EuroChem**

EuroChem Group is a vertically integrated company producing mineral fertilizers. The company consists of five divisions: Mining, Oil and Gas, Fertilizers, Logistics and Sales. The main activities are: extraction of phosphate ores, production of oil, gas and gas condensate, production of nitrogen fertilizers, production of phosphate fertilizers, production of iron ore concentrate. EuroChem Group is multinational enterprise incorporating trade and service companies located in Europe, Asia, Africa, North and South America.

According to the Group's strategy there are four key development directions: price leadership, growth due to the potash segment, expansion of product range, customer focus (Table 1).

<table>
<thead>
<tr>
<th>Strategic goals</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price leadership (Due to the vertical model)</td>
<td>- Maximize intra-group shipments of ground phosphate from Kazakhstan and apatite concentrate from Kovdorsky Mining and Concentration Complex</td>
</tr>
<tr>
<td></td>
<td>- Increase the efficiency of natural gas production</td>
</tr>
<tr>
<td></td>
<td>- Achieve progress in the construction of a new ammonia plant</td>
</tr>
<tr>
<td></td>
<td>- Proceed to the exploration work at new gas fields</td>
</tr>
<tr>
<td>Growth due to the potash segment</td>
<td>- Proceed to the ore processing at the Usolsky Potash Plant</td>
</tr>
<tr>
<td></td>
<td>- Resume the passage of the cage shaft on VolgaKaliy</td>
</tr>
<tr>
<td></td>
<td>- Optimize “market entry” strategy and self-positioning in the potassium chloride market</td>
</tr>
<tr>
<td></td>
<td>- Finalize the development of storage scheme for potash products</td>
</tr>
<tr>
<td>Expansion of the product range</td>
<td>- Introduce to a number of markets a range of products with high added value</td>
</tr>
<tr>
<td></td>
<td>- Expand the range of biofertilizers / biostimulators</td>
</tr>
<tr>
<td>Customer focus</td>
<td>- Expansion of distribution in Russia, Ukraine, Moldova and Eastern Europe</td>
</tr>
<tr>
<td></td>
<td>- Integration of recently acquired downstream assets</td>
</tr>
<tr>
<td></td>
<td>- Retention of the share of shipments to the traders within 15% of the total volume</td>
</tr>
</tbody>
</table>

In order to evaluate company’s ability to achieve the above stated goals, an analysis of the company's security with the necessary resources was performed. The key success factor in the mineral fertilizer market is an access to cheap and high-quality resource base. At present, self-sufficiency in phosphate raw materials of EuroChem is 75%, and the company plans to increase it to 100% due to the upturning
production at the field in Kazakhstan. EuroChem has access to more than 10 billion tons of potash ore reserves and resources in Russia. The company has developed projects aimed at construction new mining enterprises for the extraction of potassium ore and production of potash fertilizers. The performed analysis of company’s processing capacities has shown that the existing capacities are not sufficient for significant growth of production volumes for both nitrogen group and complex fertilizers.

The value of strategic projects for the construction of potash mines has been determined (Table 2).

The performed revaluation of potash projects leads to the increase of the project value of "VolgaKaliy" of $ 104.57 million, the project value of "Usolsky Potash Combine" of $ 23 million. Assessment of additional effects relevant for the project "VolgaKaliy" provides an increase in the project’s value of $ 61.39 million caused by the effect of technological changes, and for the project "Usolsky Potash Combine" of $ 425.18 million due to the synergistic effect and a change in the method of ore processing.

Table 2. Characteristics of potash projects of EuroChem MCC

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Project “VolgaKaliy”</th>
<th>Project “Usolsky Potash Plant”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Gremyachinskoe field, Volgograd region</td>
<td>Verkhnekamskoye field, Usolye (Perm region)</td>
</tr>
<tr>
<td>Budget (CAPEX), bln. $</td>
<td>4.5</td>
<td>2.85</td>
</tr>
<tr>
<td>NPV, bln. $</td>
<td>2.56</td>
<td>1.48</td>
</tr>
<tr>
<td>IRR, %</td>
<td>25</td>
<td>19</td>
</tr>
<tr>
<td>WACC, %</td>
<td>13.2</td>
<td>12.7</td>
</tr>
<tr>
<td>Start of project, Year</td>
<td>2006</td>
<td>2008</td>
</tr>
<tr>
<td>Year of reaching the designed production capacity, Year</td>
<td>2022</td>
<td>2026</td>
</tr>
<tr>
<td>Additional Capacities</td>
<td>• the opportunity of switching to a new method of ore processing</td>
<td>• the opportunity of developing additional mining sites • the opportunity of switching to a new method of ore processing</td>
</tr>
</tbody>
</table>

Thus, these projects lead to the growth of the company's value as well as to the increase of the economic efficiency of its value chain.

Case of Acron

A case of Acron can be considered as an example of irrational design of production assets.

Acron is the most dynamically developing company in the industry with a growth rate of 12% per year while an average industry growth rate in terms of product output is about 5–6%. In the age of decreasing price this enabled the company not to lose revenue, EBITDA and net profit as compared to its main competitors.

In 2008, the company acquired a license to develop a mine site at the potash field for 16.800 million RUR, while the specific costs per 1 ton of ore reserves exceed those of the same field from 2 to 7 times, therefore, the price of this asset was overestimated. The total costs of the project are estimated at $ 1.5–1.7 billion. The
launch of production was planned for 2019, however, postponed for 2021, and reaching the designed production capacity was planned by 2023. Such difficulties are due to high production costs along with low market prices for potassium. Currently the project requires project financing, or a change in the ownership structure of the company’s shareholders.

In fact, the project is not being implemented due to the availability of other highly profitable projects where economic effect might be achieved faster. According to the corporate strategy of Acron, the company is planning to launch the production of phosphate fertilizers DAP / MAP and high-phosphate complex fertilizers in operating plants within the next ten years. The capacity of the new production will be from 600 thousand to 900 thousand tons per year depending on the structure of the output, while the costs are $ 220–280 million. This is a new direction for the company that will ensure its competitiveness in comparison with Fosagro, EuroChem and Uralkali.

The performed analysis has shown that the majority of the considered companies’ projects are related to other assets of the group. For example, in EuroChem, the ammonia production project is considered to be not efficient according to the traditional investment valuation methodology. At the same time, different options of project’s integration may provide an increase of the total effect of the Group, while an opportunity not to purchase third-party ammonia provides an increase in efficiency without any investment costs. The greatest effect is gained by the integration of considered project within the project of creating logistics capacities.

An important effect of the implementation of large projects is their possible impact on the effectiveness of other projects of the Group. For example:
- construction of terminals in Ust-Luga and Tuapse will ensure the supply of products to India, China and Brazil. Lower transportation costs will increase economic efficiency of the acquisition project of the Tocantinis sales network in Brazil (cost reduction);
- construction of port terminal will improve the efficiency of the Usolsky potash plant projects and EuroChem-VolgaKaliy (cost reduction);
- the EuroChem-VolgaKaliy project will enable the production process of complex fertilizers in China that will increase the efficiency of the project of the Migao plant (increase of the revenue side).

4. Discussion

Engineering of company’s value chain is a process consisting of several stages. At the first stage, the effectiveness of the current value chain is assessed.

At the second stage, value chain is designed considering a possible change in the commodity output. This stage is aimed at establishing the main activities (links of the value chain) involved in the process of end product’s value creation. Material flows of value chain (raw materials - product), including the main types of raw materials, materials, intermediate products, and ready-to-use product, are taken into ac-
count as well as the main processes of the value chain, represented by a set of interrelated actions, which, with the help of certain technologies, transforms raw material into an intermediate and final product.

Within the third stage the profitability of each type of value chain activity should be determined. This stage is aimed at establishing the focal element of value chain – activity with the maximum share of value added. Analysis of the structure of the product price in a particular market makes it possible to distinguish a specific type of analyzed value chain: a chain managed by producers and suppliers of raw materials; a chain managed by the producers of final products; a chain managed by the consumers of final products.

The fourth stage of value chain engineering is aimed at identifying potential opportunities for expanding value chain based on the analysis of external and internal factors. The purpose of this stage is to establish the types of activities that a company can carry out independently. As a next step different options for their implementation are considered and selected: the creation of new business units (departments, enterprises) in the company; acquisition (merger) with other companies that have the necessary assets and competencies.

The fifth stage implies the analysis of transfer prices of performing the considered activities within the value chain as well as profitability analysis of each link of the value chain. If the average market price exceeds the transfer price it is cost-effective for a company to carry out this type of activity independently and, therefore, it is economically feasible to integrate this activity into the value chain. When the transfer price exceeds the average market price, the independent production is not economically feasible for this link of the value chain; therefore, buying this product is more cost-effective rather than producing.

The main goal of the sixth stage is to map out alternative options for value chain design and to assess their effectiveness. At this stage, there is a consistent grouping of all types of activities identified during the preliminary analysis, which are feasible for a company to carry out independently with a special focus on the most profitable activities.

Engineering and analysis of the value chain under the context of integrated companies, which incorporate many production stages, include: identifying the linkages between technological processes, analysis of value chain in terms of business processes, analysis of the impact of a set of factors (economic, technological and institutional), analysis and evaluation of business processes in terms of their potential for value creation considering the expected influence of external environment, determining the possible directions for increasing the value of production stages by enhancing the efficiency of operational and project activities, maximization of the effect throughout the entire value chain by the development of organizational and economic mechanism of the value chain.

The level of integration is determined by the degree of commodity and resource dependence within the integrated company that is determined by the structure of sales in the group. Commodity dependence refers to the amount of sales of inter-
mediate products traded in the group by the seller company to buyers who are members of the same group. Resource dependence refers to the amount of intermediate products acquired by the buyer companies in the group supplied by the seller company belonging to the same group.

The degree of dependence is often determined by the company’s technological linkages as well as by the focus of the integration processes designed by the corporate center:

- one unit of integrated company (the supplier company) supplies 100% of its products (raw materials) for processing to another unit of the integrated company (the buyer company) in the form of intra-corporate deliveries. In this case, there is a total commodity dependence of the supplier, which does not have any alternatives to the sale the commodity products;

- the unit that produces high-value commodity products (the buyer company) acquires 100% of the raw material from the other unit (the seller company) while the missing part can be bought in the external market. In this case, for the buyer company, the degree of resource dependence is determined by the structure of the supply market;

- the company's subdivision is obliged to market raw materials for processing only within the group and cannot sell outside the company, while the processing company can purchase raw materials only within the company. In this case, there is a total commodity dependence of the supplier and as well as a total resource dependence of the buyer.

Table 3 shows the concept of commodity and resource dependence by the example of two companies A and B having mutual business relations within the vertically integrated company. Company A – is a supplier who produces semi-finished product (intermediate product) that can sell it both inside and outside the group. Company B is a buyer who sells its products in the external markets. The stability of companies is determined by the ratio between the level of sales and production and the break-even level of production and sales.

Table 3. Terms for determining the commodity and resource dependence of companies in the group

<table>
<thead>
<tr>
<th>Conditions for Company A</th>
<th>Result for Company A</th>
<th>Conditions for Company B</th>
<th>Result for Company B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ( Q_{\text{group A}} \geq Q_{\text{break-even A}} )</td>
<td>stability</td>
<td>( Q_{\text{B}} \geq Q_{\text{break-even B}} )</td>
<td>stability</td>
</tr>
<tr>
<td>2. ( Q_{\text{group A}} \leq Q_{\text{break-even A}} )</td>
<td>instability</td>
<td>( Q_{\text{B}} \geq Q_{\text{break-even B}} )</td>
<td>stability</td>
</tr>
<tr>
<td>3. ( Q_{\text{group A}} \geq Q_{\text{break-even A}} )</td>
<td>stability</td>
<td>( Q_{\text{B}} \leq Q_{\text{break-even B}} )</td>
<td>instability</td>
</tr>
<tr>
<td>4. ( Q_{\text{group A}} \leq Q_{\text{break-even A}} )</td>
<td>instability</td>
<td>( Q_{\text{B}} \leq Q_{\text{break-even B}} )</td>
<td>instability</td>
</tr>
</tbody>
</table>

Legend: \( Q_{\text{group A}} \) – sales of Company A within the group; \( Q_{\text{break-even A}} \), \( Q_{\text{break-even B}} \) – break-even level of production and sales of Companies A and B, \( Q_{\text{B}} \) – sales of Company B.
In the first case, when the level of sales and production of each company exceeds the break-even level of production, the conditions of stability are met.

In the second case, when Company A has the level of sales within the group lower than the breakeven level of production, the position of the supplier is unstable due to the dependence on external market with its high risks and other market factors.

In the third case Company B is facing the same situation but as its products can be supplied to multiple competitive markets the market risks are lower.

In the fourth case a Company B has not ensured sales, exceeding the breakeven volume production of B, due to the volatility, lower demand and changes in market environment. Considering the flow of intermediate products produced by Company A in order to supply the production of Company B, the position of the supplier is becoming also unstable.

The performed research shows that starting from the fourth stage of value chain engineering the implementation of new project or creation a new asset within the group is changing the value chain and therefore may change the degree of resource and commodity dependence. The economic efficiency of a project being implemented in the group of companies depends both on the nature of technological linkages within the group, the structure of its production and sales, and on the type of market (growing, falling), its structure and the degree of its concentration. The project and the group are also affected by the uncertainty of external environment, including technological breakthroughs, level of demand, prices of the resource, legislation as well as by the government regulation, level of competition in the industry and the behavior of major competitors.

Based on the performed research it is possible to develop the algorithm of evaluation the impact of investment project on the value chain of mining company:

1. Identification and analysis of economic, technological and institutional factors affecting the project and company currently and in the future;
2. Design of different options of value chain;
3. Choosing the project to be implemented based on its economic efficiency with the value chain.

5. Conclusions

1. Under the context of mining companies, the value chains are based on projects aimed at the development of mineral and raw materials assets, therefore, the specific nature of mining projects determines the specificity of valuation and engineering of the value chains of mining companies. The specific nature of mining projects implies particular mining and geological conditions of the deposits that are the fundamental reasoning for choosing key technical and economic solutions to be implemented; specific risks, technological interrelation of the projects.

2. Integration of new assets (elements) into the value chain of mining companies may lead to the various consequences:
- increase in the economic efficiency of value chain, the implementation of projects is rational, assets continue to be exploited;
- decrease in the economic efficiency of value chain, the implementation of projects is irrational, “toxic” assets should be sold;
- increase in technological efficiency of value chain along with no increase in its economic efficiency, the asset has to be upgraded or sold, wider range of effects should be considered.

3. Performed analysis of companies working in the sector of minerals and raw materials has shown that the investment strategies of mineral and chemical companies are medium- and long-term. The core goal is to increase company’s mineral resource base by investing in mineral and raw materials and production assets well integrated into the value chain.

4. The algorithm of evaluation the impact of investment project on the value chain of mining company proposed within current research includes following stages: identification and analysis of economic, technological and institutional factors affecting the project and company currently and in the future; design of different options of value chain; choosing the project to be implemented based on its economic efficiency with the value chain.

References

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KALNAKASYBOS ĮMONIŲ STRATEGINĖS PLĖTROS PROBLEMAS IR GALIMYBĖS

Tatyana Ponomarenko3, Igor Sergeev3

1 Prof. St. Petersburg Mining University. Phone +370 812 3288253. El. paštas stv_mail@mail.ru
2 Prof. St. Petersburg Mining University. Phone +370 812 3288228.
El. paštas miner-sp@yandex.ru

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Santrauka


Raktiniai žodžiai: vertė, technologija, procesas, vertės grandinė, projektas, turtas, efektyvumas, strategija.

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