



INTEGRATED SUPPLY CHAIN PLANNING: OPPORTUNITIES FOR THE TRANSPORTATION SYSTEM OF AN OIL AND GAS COMPANY

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Abstract: *The transportation system of an oil and gas company is a collection of large structures integrated into a complete technological production process. But within the framework of the organizational, economic and technological characteristics of the industry, the need to integrate all counterparties of the supply chain increases by introducing integrated planning technologies. The lack of integrated planning of the supply chain leads to a decrease in the efficiency of its management, namely, to an increase in the volume of inventories, an increase in logistics and production costs, the inability to take into account external factors and risks that affect the competitiveness of an oil and gas company. The article analyzes the supply chain of a typical oil and gas company based on the SCOR-model (Supply Operations Reference model), recognized as an international benchmark. The analysis revealed gaps in the supply chain that negatively affect the optimization of the transport and logistics system and production activities. The author proposes the implementation of an integrated information system that meets the requirements of integrated planning and takes into account the specifics of the supply chain of an oil and gas company. This model of information and analytical support for integrated planning reduce operating, commercial, general and administrative costs, as well as inventory volumes.*

Key words: *transport system, Supply Chain Management, Integrated Planning, information system, oil and gas industry.*

Introduction

One of the most important conditions for effective management of the production process of an oil and gas company is the uninterrupted provision of its material and technical resources, including raw materials, materials, fuels and lubricants, equipment, and units and spare parts for them, energy carriers, semi-finished products, etc. In this regard, improving the efficiency of the financial and economic activities of an oil and gas company is directly related to the

optimization of processes in the transport and logistics system of an oil and gas company [1].

Supply chain management refers to the network of production and distribution facilities that purchase raw materials and supplies, then manufacture them into finished or work-in-progress products, and then distribute them to end users of the supply chain [2]. Russian scientists call supply chain management a logistics concept (approach), that is, some idea that arose within the

framework of logistics. Based on this, we can conclude that supply chain management is part of logistics [3]. The Council of Supply Chain Management Professionals (USA) on Supply Chain Management understands the planning and management of all activities in the supply chain, including sourcing and procurement management, product processing and management of all logistics activities [4]. Specialists in the field of logistics Medvedev V.A. Prisyazhnyuk A.S., consider that supply chain management is designed to automate and manage all stages of the supply of an enterprise and to control the entire movement of goods in the enterprise [5]. According to D. Waters, logistics is responsible for the flow of material through the supply chain. This feature is also called supply chain management [6]. Thus, specialists in the field of logistics agree that the analysis of the movement of material flow within the transport system of an enterprise cannot be considered without taking into account the financial and information flow adequate to them [7,8,9].

Methods

In this regard, the transport system of a typical oil and gas company of the Republic of Uzbekistan was analyzed on the basis of the SCOR-model (Supply Operations Reference model), which is used to analyze operations in supply chains, which is widely popular abroad. This model can be used to describe both the simplest supply chains and complex networks. As a result, we can get the structure integrated into the description of almost any network structure of supply chains. The SCOR model is today recognized as an international cross-industry standard in supply chain planning and management. It was developed and is constantly being improved by the well-known international organization Supply Chain Council. The methodology of this model is based on management benchmarking technologies, best practice method and business process reengineering [10].

The main principle of the model is the continuity of commodity and information

flows, that is, the functioning of the objects under study is considered as a set of cross-functional processes [11].

Results and Discussion

Both internal (domestic) and external (foreign) suppliers of material and technical resources (MTR) participate in the transport and logistics system of an oil and gas enterprise (Figure1). Due to the need to equip production processes with high-tech equipment, the main suppliers of oil and gas enterprises are external suppliers. They supply the necessary equipment and components, high-quality fuels and lubricants, etc. for drilling fields and oil and gas processing plants.

Internal suppliers mainly supply fuels and lubricants, special clothing for company personnel, food and others. Along with external and internal suppliers, transport and forwarding companies that transport inventory, as well as customs authorities and customs brokers, if the products are subject to customs declaration, are involved in the process of material and technical support of an oil and gas enterprise.

When carrying out the procurement process, oil and gas companies use various methods: holding a tender, purchasing in small volumes, purchasing from one supplier.

Supplies of materials and equipment from foreign (external) suppliers are carried out by freight forwarding companies (mainly by sea or by rail), as a rule, at the expense of the supplier, unless otherwise specified in the contract. Domestic supplies of materials and equipment from domestic suppliers are also carried out by forwarding companies at the expense of the supplier or the supplier's own transport. In view of the high technological effectiveness of the production process, only specialized companies are used as freight forwarding companies capable of transporting highly hazardous and bulky cargo. Transportation of materials and equipment between warehouses and production facilities is carried out only on our own vehicles.

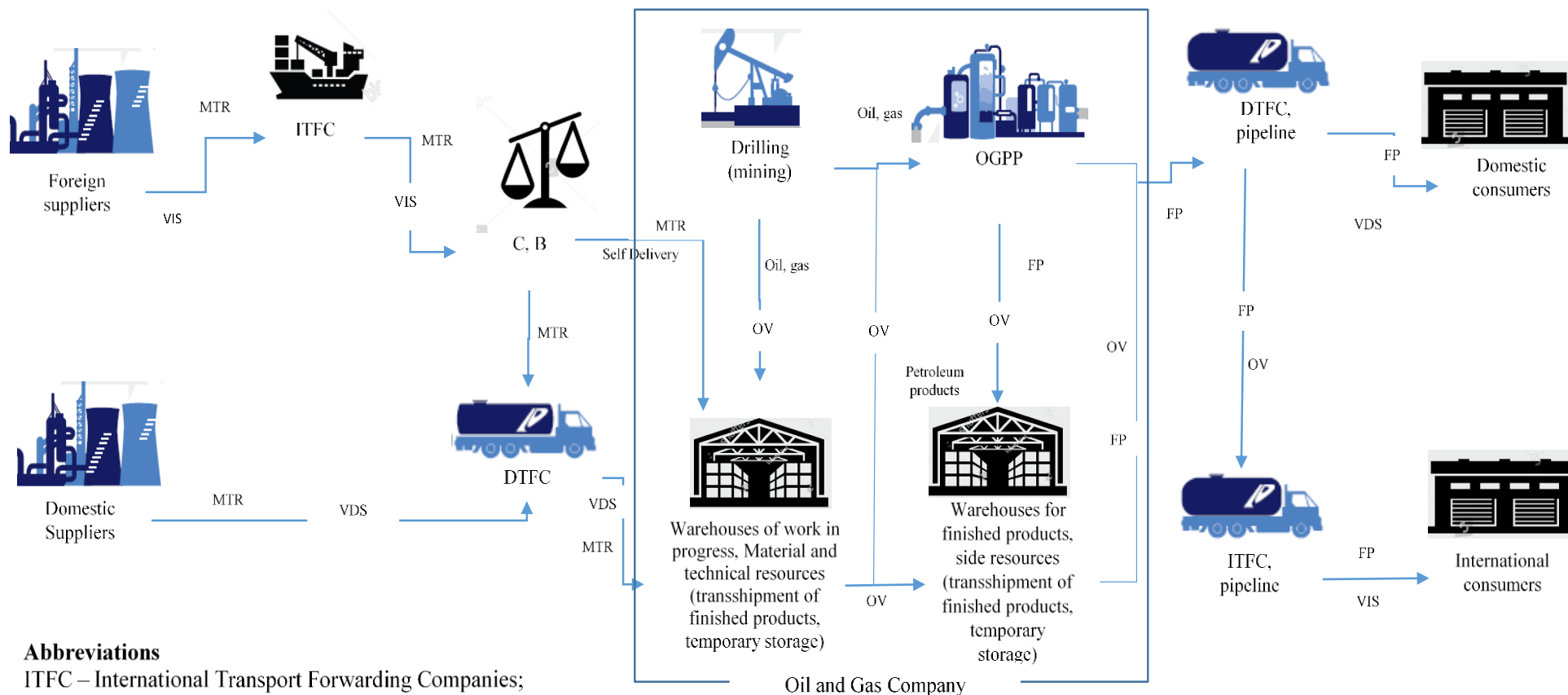


Figure1. Supply Chain in Oil and Gas Industry (developed by the author)

Temporary storage warehouses of oil and gas companies, as a rule, are not outsourced and are included in the company's fixed assets. Cargo handling processes are also carried out in-house. Finished products are transported to temporary storage warehouses, from where, subsequently, they are delivered to customers (public sector, energy sector both within the country and abroad).

The main problem associated with the flow of documents between suppliers and an oil and gas company, as well as intermediaries represented by freight forwarding companies, brokers and customs authorities. It is the delay in processing documents and, as a result, their delivery to customs authorities, which leads to a delay in the delivery of goods, especially at the peak of the seasons.

Logistics of petroleum products accounts for the bulk of the costs of the oil and gas industry [12]. Since the quality and quantity of finished products supplied to consumers is clearly stipulated by the terms of the signed contract, as well as in accordance with international standards for the quality of finished products, supplies of substandard finished products are excluded. In this regard, in oil and gas companies, return processes are the processes of transferring low-quality materials and equipment from oil and gas companies back to suppliers for replacement or correction of defects. Long distances between counterparties along the supply chain represent a high variability in the increase in transportation time, which can be detrimental to the oil and gas company in terms of reduced service levels and end users in terms of the cost of safety stock [13].

The planning process of an oil and gas company is associated with the specifics of the extractive industry that affect the transport and logistics system, including:

- Specificity of production technology;
- Lack of comprehensive data on the quality and volume of the investigated deposits;
- Stable demand for products;
- Changes in working conditions;

- High need to ensure the safety of the production process;
- Increased attention from government bodies to the company's activities.

Figure 2 illustrates the supply chain discontinuities that result from planning problems:

1. Delivery plan. This gap arises as a result of the lack of supply chain planning and coordination of the plans of the structural divisions of the oil and gas company, plans between the oil and gas company and its suppliers of materials and equipment. All of the above leads to incorrect planning of the logistics process and problems in inventory management.

2. Logistic plan. In the field of the company's logistics system, there is a lack of a stage of coordinating plans between the focus company and suppliers of materials and equipment, as well as between the structural divisions of the oil and gas company. All this is reflected in the irrational distribution of materials and equipment between drilling rigs, downtime in the distribution of supplies of materials and equipment after the conclusion of a supply agreement with suppliers, irrational distribution of materials and equipment in temporary storage warehouses.

3. Production plan. Within the focus company, there are also gaps in production planning, which lead to problems arising as a result of incorrect capacity utilization, underproduction / overproduction, disruption or interruption of production processes.

In view of the strict agreement within the framework of signed contracts between oil and gas companies and customers, problems in the distribution of finished products (distribution) are not identified, since for non-fulfillment of the conditions of the agreement, the oil and gas company will incur costs that are tangible for its activities in the payment of fines. Therefore, in the field of distribution of finished products, an oil and gas company may encounter problems only in the case of incorrect planning of the volume of products produced, which does not

correspond to the volume of demand of the current market conditions.

The main bottleneck in the economic activity of oil and gas companies is the management of inventories of materials and equipment. The cost of inventories, including work in progress, affects the return on assets. Stocks of materials and equipment of an oil and gas company are formed by purchasing the necessary materials and distributing the purchased materials to the necessary facilities within the oil and gas company. Excessive formation of stocks entails an increase in costs for the purchase of materials and equipment, transportation, storage, cargo

handling, remuneration of labor by employees of logistics (warehouse), subsequent disposal (in cases of illiquid assets), etc. The reason for the emergence of excess reserves is the inconsistency of actions between the subjects of the micro-logistics system of the oil and gas company.

The inventory management approach should be based on the strategic goals of the entire company, namely, to ensure that the level of inventories is reduced to optimal, with the aim of freeing up financial resources, increasing the company's net profit by reducing insurance payments, taxes and increasing asset turnover.

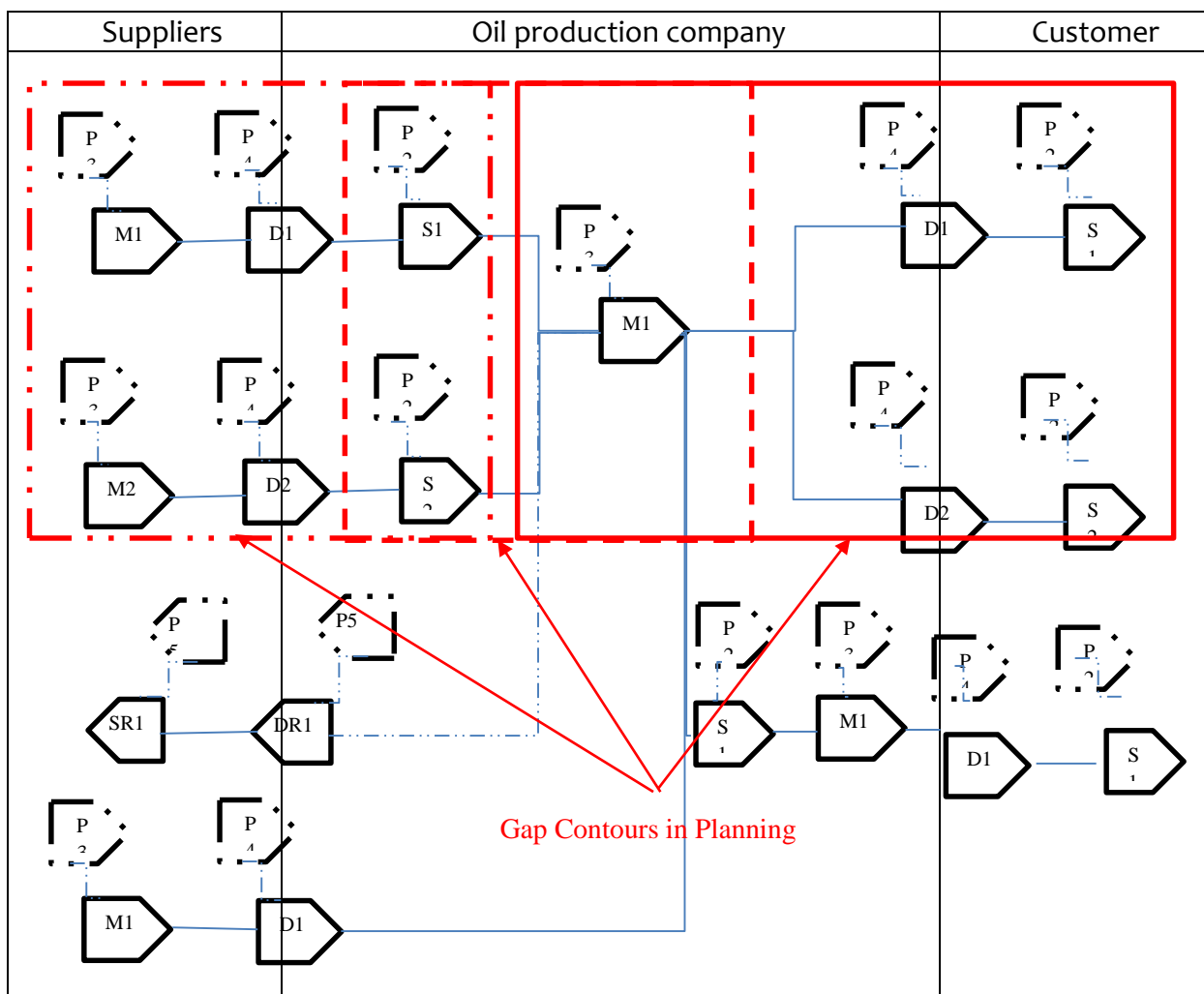


Figure2. AS-IS diagram of the movement of material flow in the supply chain of an oil and gas company with the indicated inconsistencies in planning

Every year, oil and gas companies incur colossal losses estimated at hundreds of thousands or even millions of US dollars as a

result of ineffective management of business processes within the company's transportation and logistics system. The weak deve-

lopment of the transport and logistics system of oil and gas companies is influenced by the following constraining factors:

1. the lack of a well-thought-out logistics strategy at enterprises, including a strategy for the development of product distribution systems;

2. an unreasonable number of resellers in supply chains;

3. backwardness of transport infrastructure: low level of multimodal transportation, logistics, customs, forwarding services. The share of container traffic is lower than in developed countries;

4. low level of development of production and technical base and storage facilities;

5. weak development of the industry for the production of modern types of containers and packaging;

6. high transport tariffs are not aimed at supporting small and medium-sized shipping companies;

7. within the framework of bilateral intergovernmental agreements, various legal regimes have been defined that regulate transit only through certain checkpoints, restrictions on the delivery route and freedom of transit;

8. the different degree of participation of the CIS countries in the system of international agreements and conventions in the field of transport leads to the fact that most of the international norms are not observed;

9. Lack of integrated information systems for cargo tracking, uniform standards and requirements for cross-border customs control [14].

Conclusions

The growing demand for high-quality and fast customer service, the globalization of the oil and gas business, fierce competition, and the availability of information technology facilitating the exchange of information are the main prerequisites for the introduction of integrated supply chain planning technologies [15].

The elimination of the “manual” reporting mode, rationalization of the management decision-making process, the presence of a stage of coordinating final plans with the strategic goals of an oil and gas company can lead the activities of oil and gas enterprises to achieve the following results:

- streamline traffic and increase the level of monitoring of the main flows of the company's logistics system;

- reduce the amount of logistics costs;

- improve the accuracy of the production plan;

- reduce the costs aimed at eliminating downtime as a result of equipment breakdown;

- to form optimal channels for the movement of materials and equipment to the required objects.

To form a modern information infrastructure of an oil and gas company, it is necessary to introduce information systems that meet the requirements for the formation of a single information space within the entire holding and integrated planning of the supply chain.

Based on the presented analysis of the supply chain, the author has developed a model of information and technical support for integrated planning technology, which takes into account the basic requirements for supply chain planning and the specifics of companies in the oil and gas industry (Figure 3).

All supply chain management (SCM) processes can be divided into two patient groups: Supply Chain Planning (SCP) and Supply Chain Execution (SCE). Planning in the supply chain includes strategic planning of the supply chain or business processes in its individual links, and Execution in the supply chain - the implementation of plans and operational management of links in the supply chain, such as transport or warehousing [16].

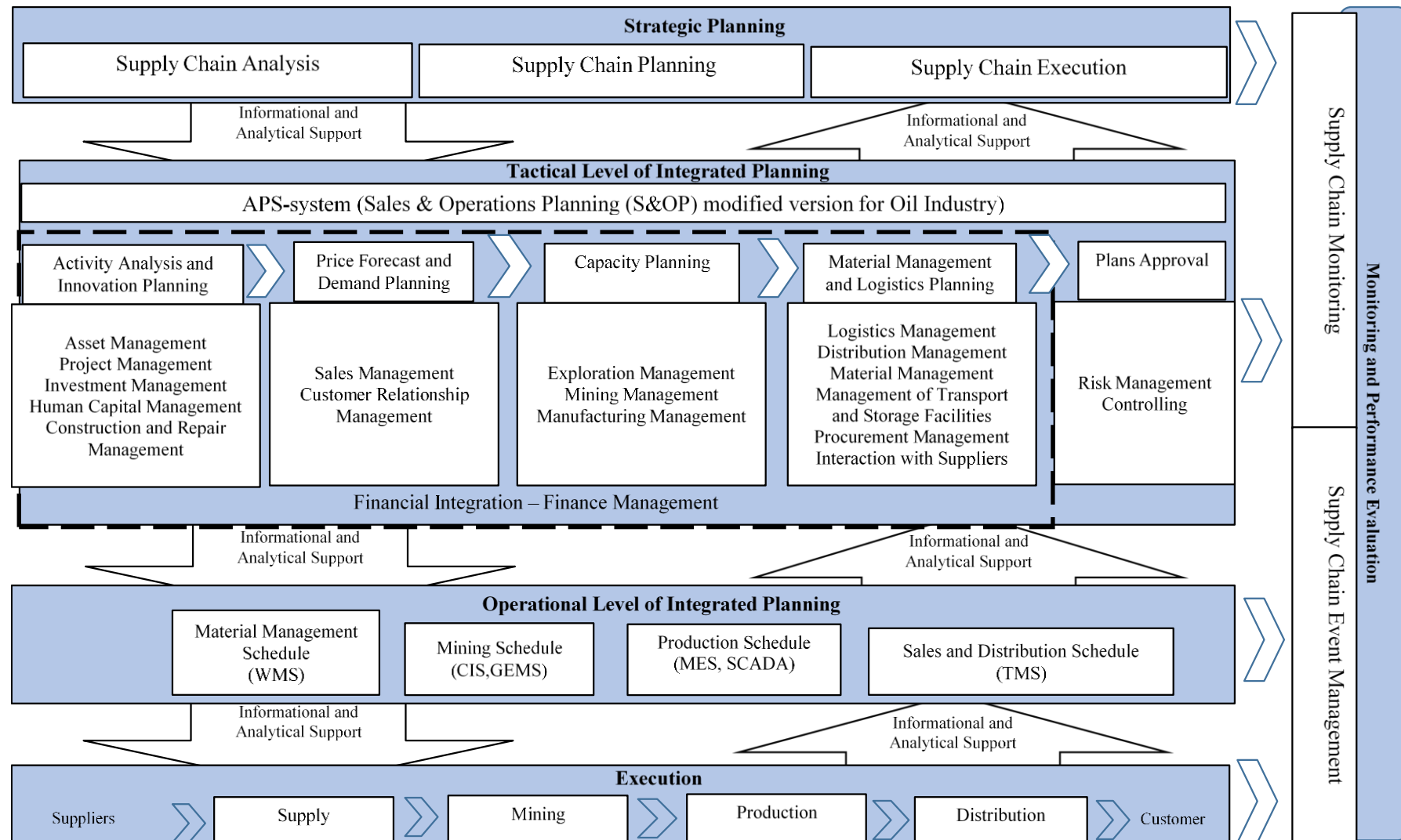


Figure 3. The proposed model of information and analytical support for the Integrated Planning of the Supply Chain of an oil and gas company (developed by the author)

Thanks to the implementation of Supply Chain Planning, the management of the oil and gas company will be able to work together on forecasting demand and prices with supply chain counterparties, carry out strategic planning of the supply structure, improve distribution plans, and assess the degree of implementation of plans. Thanks to the implementation of Supply Chain Execution, the company will be able to implement the planned processes in the supply chain and control their execution.

Implementation of Supply Chain Monitoring and Supply Chain Event Management technologies will help the company to identify discrepancies between planned and actual indicators. For example, an increase in the delivery time due to a delay in the movement of vehicles, an increase in the level of insurance stocks of materials and equipment over the planned, inconsistencies in production indicators, etc. In cases of detection of relevant inconsistencies, the company will be promptly notified of their causes and possible consequences. Thanks to this system, the oil and gas company will be able to obtain a comprehensive information assessment of the company's current position in the field of supply chain management and make the necessary adjustments in planning.

APS systems support integrated planning technology, which enables extractive companies to reduce inventory costs, lower operating costs, increase inventory turnover, improve portfolio management, improve forecast accuracy and production efficiency, reduce equipment downtime, and reduce transportation costs.

One of the most common APS based integrated planning technologies, Sales & Operations Planning (S&OP), according to Thomé et al [17], has two goals: first, it aims to balance supply and demand. Second, it helps integrate cross-functional plans by supporting the coordination of different decision makers to achieve business goals. The functionality of information systems will give this class an opportunity for a company to carry out effective planning of logistics, planning storage and distribution volumes, as well as balancing plans with each other and with other plans of the company, be it a production plan, demand plan, logistics, etc [18,19,20].

As a result of improving planning accuracy, as well as improving the quality of transport logistics management, the economic effect from the implementation of the proposed model will be achieved by reducing operating, commercial, general and administrative costs, as well as the volume of inventories.

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