

Business Process Optimisation for an International FMCG

Supply Chain

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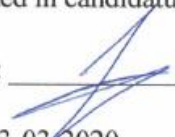
Submitted in partial fulfilment for the award of the degree of Doctor of Business
Administration

University of Wales Trinity Saint David

2020

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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ABSTRACT

Studying the patterns of supply chain integration can significantly increase the performance of inter-organisational operations. The lack of research in practically-applicable tools supporting the integration of supply chains has defined the aim of the present study: to establish a model capable of optimising efficiency of a cross-border FMCG supply chain by using a case study of an international manufacturer of bottled water.

To achieve the objectives of the study, the main advantages of integrating partners in the supply chain were identified, and factors contributing to effective integration studied. The theoretical basis for these were the stakeholder theory, resource-based view and relational view. To enrich the theoretical base of business process management, best practices were analysed and supply chain priorities, as well as common problems affecting the stable operation of the supply chain, were discussed. These included the lack of resources, visibility, conflict of interest, the bullwhip effect, data quality and late deliveries. The research design was based on a mixed method to take advantage of inductive reasoning based on qualitative research complemented with the deductive reasoning study based on quantitative research.

A methodology for business process modelling, taking into account the requirements in terms of priorities, problems and improvements extracted from real practice, has been developed. Based on this methodology, a supply chain business process model was formulated using the SCOR framework. The proposed business process model is shown to have a potential for eliminating bottlenecks and information gaps, as well as improving manageability through the continuous exchange of data pertaining to operations plans and their actual progress.

This study is aimed at contributing to the academic body of knowledge related to the enhancement of competitive advantage and value creation in supply chain management through optimisation of the process of integration design and implementation in real-world international operations. The outcomes are beneficial for organisations seeking to increase the supply chain sustainability and scalability by continuously exchanging information and sharing each other's resources and capabilities. At the same time, companies are offered guidelines on incorporating shared factors and interests into their strategies towards attaining interdependent competitive advantage.

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LIST OF ABBREVIATIONS AND DEFINITIONS

3PL operators – third-party logistics operators.

APQC – American productivity & quality center.

BPM CBOK – business process management common body of knowledge.

CDW – corporate data warehouse.

CPFR – collaborative planning, forecasting and replenishment.

EDI – electronic data interchange.

ERP - enterprise resource planning.

FC – focus company, the owner of finished products.

HOD – home and office delivery.

GSCF - global supply chain forum.

IBP – integrated business planning.

IT - information technology.

IV – inventory visibility.

KPI – key performance indicators.

MIMO – multiple-input, multiple-output.

Partner – supply chain participant.

POS – point of sale.

RBV – resource-based view.

RCA – root cause analysis.

R&D – research & development.

RTM – route to market.

RV – relational view.

S&OP – sales and operations planning.

SC – supply chain.

SCM – supply chain management.

SCOR – supply chain operations reference model.

SKU – stock keeping unit.

SL – service level.

SLA – service level agreement.

TMS – transport management system.

VMI – vendor managed inventory.

WMS – warehouse management system.

CHAPTER 1. INTRODUCTION

1.1 Background to the research

The growth of the global economy and the trend towards globalization are contributing to the entry of many companies into new markets in different regions of the world, and accelerating the process of bringing new products to the market, which are produced in one part of the world and consumed in another (Mann, 2012). This tendency is most often due to the need for improving the efficiency of operations because of “economies of scale” and, accordingly, increasing the share of presence in global markets. The growth in supply volumes contributes to an increase in import and export operations in different parts of the world, which in turn enables companies to find the supply chain solution that best fits the demands of the market place (Christopher, Peck & Towill, 2006).

In addition to globalization factors, companies need to consider the specific features of the regions where they are located in order for their products to be in demand. The requirements of consumers in different regions vary widely and, thus, the diversity of goods and services offered contributes to increased competition between companies for consumers (Priem & Swink, 2012). Competing in international markets encourages companies to employ sufficiently high standards and, with technological progress, creates the basis for improving the quality of products and services provided, as well as increasing the speed of delivery (Sulek & Hensley, 2010). The development and growth of foreign economic activities determine the need for the development of logistics, improvement of the efficiency of the supply chains, and the formation of new and more effective methods and operational management tools.

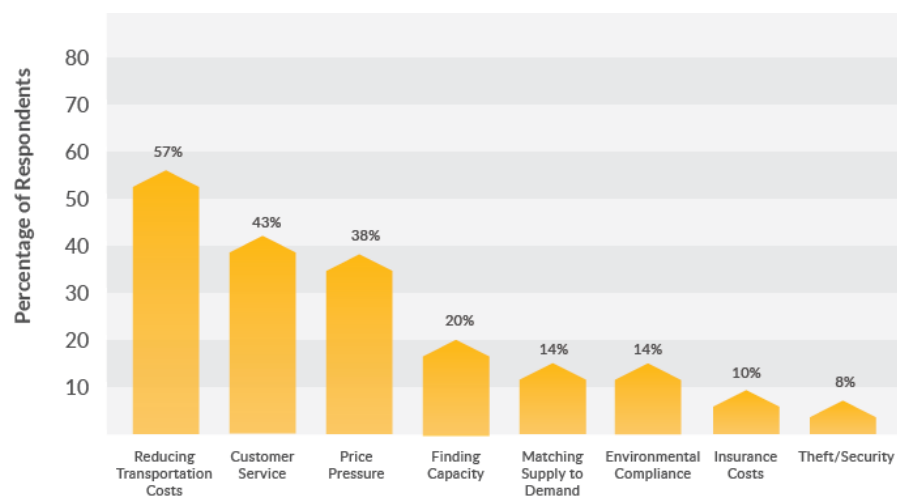


Figure 1.1: Supply chain challenges 2019. Source: (O'Shaughnessy, 2019).

Among the main challenges to the supply chain, the following should be noted: the reduction of transport costs, increasing customer service, competition, management of logistics production capacities, balancing demand and supply, and so on (O'Shaughnessy, 2019). Figure 1 shows the distribution of the main challenges facing supply chains in 2019.

In response to these requirements, companies most often review the performance indicators of their supply chains, use the most effective tools for designing supply chains, and increase the efficiency of interaction between all partners from the supply of raw materials and equipment to the time of production and delivery of finished products. This is because companies currently operate in a competitive landscape that changes so quickly, requiring that the activities of every function in an organization must be proactive (Robert, Robert & Steven, 2005). By managing these changes, companies are trying to increase their competitive advantage.

Supply chain strategies determine the number of links and partners in a supply chain. Firms often exploit their power or resources to influence other network members; in fact, this can help increase performance and can even result in a competitive advantage (Chang, Chiang & Pai, 2012). At the same time, the advancement of the product flow from the manufacturer to the final consumer requires streamlined and continuous activities that are performed by professional managers of supply chain partners. Many groups interact with firms on the basis of their members' shared social identities, and it is these identities that drive the groups' cohesion, mobilization and action with respect to firms (Crane & Ruebottom, 2011). The need for close interaction between partners in supply chains is due to the prevention of information gaps, increasing the speed of response to external and internal changes, as well as maintaining the manageability of supply chains.

The optimal use of resources and advantages of partners in supply chains can be achieved by the optimization of business processes. At the same time, considering the interests of all who may be affected in some way, owing to such improvements, it could be an equally significant factor for affecting the achievement of a company's goals. By integrating business processes, stimulating information and knowledge sharing, supply chain partners intend to curtail the interruptions related with the bullwhip effect (Kamal & Irani, 2014). Supply chain business process integration and re-engineering should be designed to improve the process efficiency and effectiveness of the entire supply chain (Lambert & Cooper, 2000) and increase capacity to perform operational activities together with supply chain partners so as to adjust or react to market fluctuations rapidly (Irani *et al*, 2017). When achieving the effectiveness of any company, it is very important to consider the interests of

the various stakeholders in order to assess how optimization might affect them, as well as how it might be possible to overcome difficulties in order to achieve maximum goals consistency and not reduce the quality of the value creation process.

This study is based on real practice, using the example of an existing bottled water company, which is present in the international markets of more than 40 countries. An International FMCG supply chain”, hereinafter referred to as supply chain or the company, is actively developing and increasing its market share and, at the same time, is experiencing certain difficulties associated with rapid growth. The company brings together many brands in the different countries where it operates and is a market leader, which implies a highly competitive environment. The company has its own distribution structure, which is represented in the form of branches in large cities and has a large number of partners. The company’s own logistic capacities allow the quick and uninterrupted supply of products to consumers. The company’s strategy is aimed at strengthening leadership in the markets of presence and expanding the product matrix, introducing innovations and the continuous improvement of business processes.

The problems, priorities and improvements, extracted from real practice, were reviewed and analysed in order to gain a better understanding of the current level of development of the company and choose the most suitable tools for improving the efficiency of the supply chain. Given the international status of the company, as well as sales growth and the increase in market share, increasing the efficiency of the supply chain is one of the priority tasks and is aimed at ensuring the company’s stable growth.

This study is important for several reasons: firstly, it facilitates the ability of the supply chain to increase its volume without loss of quality and ensure the rapid growth of the company; secondly, it elaborates on the definition of the principles of effective integration by partners in the supply chain to obtain a synergistic effect. This allows the company to manage not only changes, but also to significantly increase the resilience of the supply chain to various deviations. Thirdly, it facilitates the formation of an effective and optimal model of business processes, from which elements creating bottlenecks, information gaps and inefficient interaction are excluded. Finally, the result of the study is a conceptual model of business processes, which reflects best practices, taking into account the features of an existing company, in order to achieve complete compliance with the strategic priority and the competitive environment of that company. Most studies on the integration of business processes between supply chain partners are conducted in developed countries, and there is a relatively small number of studies available for emerging markets in Eastern Europe. This fact necessitates conducting this study, which takes into account regional characteristics, as

well as the ability of companies to benefit from collaboration. All of this determines the direction of research regarding the discovery of ways to solve the effective integration of partners and obtaining sustainable competitive advantages.

According to the background provided above, the aim of this study is to establish the optimal functioning mechanism of an International FMCG supply chain with the example of an international company – a manufacturer of bottled water, which contributes to the achievement of the strategic goals of all of its participants and stakeholders. The practical importance of the research is to develop a methodology for integrating the business processes of all participants into a complex International FMCG supply chain.

To achieve the aim of the study, the research questions were formulated as follows:

RQ1. Which mechanisms will facilitate the effective interaction of supply chain partners?

RQ2. Which targets, problems, challenges and improvement measures are currently in the supply chain?

RQ3. Which approaches can be considered as suitable for developing a methodology for business processes modelling for an International FMCG supply chain?

RQ4. What kind of optimal business process model of an International FMCG supply chain can be recommended for all of its participants and stakeholders?

1.2 Research objectives

In order to achieve the aim of the study, the research objectives are to:

- Define the mechanisms that will promote the efficient interaction of supply chain partners;
- Extract from real practice targets, problems, challenges and improvement measures to formulate requirements for supply chain business process modelling;
- Develop a comprehensive methodology for business process modelling for an International FMCG supply chain;
- Develop an optimal business process model of an International FMCG supply chain for all of its participants and stakeholders.

1.3 Methodology

The methodology of the present study is to implement the following steps:

- Conducting a literature review and identifying knowledge gaps;

- Forming a conceptual model, taking into account the establishment of the relationship between the studied phenomena; hypotheses formation and testing to understand what hinders the effectiveness of the supply chain and interaction between partners;
- Conducting and analysing semi-structured interviews in order to identify current priorities, problems and understanding of how problems can be eliminated;
- Searching for solutions to research questions, formed on the basis of the literature review, in order to select the most suitable business process reference model for an International FMCG supply chain;
- Developing a business process conceptual model that considers all of the previously identified attributes of efficiency and methods for eliminating supply chain inefficiencies.

1.3.1 Research paradigm

In order to achieve the aim of the study, the use of a combination of quantitative and qualitative research is proposed; by using two or more research methods, results are then triangulated to form a complete whole (Esteves & Pastor, 2003). The research approach is based firstly on inductive reasoning, which facilitates the creation of broad generalizations from specific observations (Bradford, 2015). Exploratory research is chosen as a research design, as it allows the discovery of what is occurring and the identification of new insights, as well as questioning and assessing phenomena in a new light (Saunders, Lewis & Thornhill, 2016).

1.3.2 Data collection strategy

Initially secondary research was conducted by the researcher in an in-depth literature review. This facilitated the formation of the theoretical basis of the research by the study of a large number of academic sources on supply chain business processes, in order to create the basis for the development of hypotheses and questions for the semi-structured interviews. The recommended business process conceptual model was developed using the results of the analysis of qualitative and quantitative data.

The primary research was based on semi-structured interviews with supply chain managers. The quantitative research was conducted by the use of a survey. The survey was intended to identify bottlenecks in the business processes and how increased efficiency might be achieved, as well as to understand the opinion of the target audience, and to examine and

explain the relationships between variables, in particular cause-and-effect relationships (Saunders, Lewis & Thornhill, 2016).

The number of representatives of the partners and the focus company was 37, including senior managers. They were chosen based on purposive sampling within the segment of the population with the most information on the characteristic of interest (Guarte & Barrios, 2006). For these purposes, the most 20 % of voluminous companies will be selected according to the Pareto principle (Simon, 2012), i.e. which operates with 80% of the total volume of materials, finished goods and deliveries.

1.3.3 Validity and reliability

The present research is based on a combination of quantitative and qualitative research using two or more research methods. The results are then triangulated to form a complete whole (Esteves & Pastor, 2003). The research approach is based on inductive reasoning using exploratory research which creates broad generalizations from specific observations (Bradford, 2015). Synergising these approaches will allow the analyses of the research subject in a new way and offer the most appropriate recommendations for improvement of supply chains. (Exploratory research was chosen as a research design, as it facilitates discovery of what is occurring and the identification of new insights, as well as questioning and assessing phenomena in a new light (Saunders, Lewis & Thornhill, 2016).

The variables were collected, evaluated and prepared along with the structures and processes accessed to identify expedient action recommendations (Kotzab *et al.*, 2005). In order to verify the obtained results and correctly design an adequate model of the business processes, separate sessions were held with the experts, representing all of the major stakeholders, for the discussion of the proposed model and gathering their opinions (Linstone & Turoff, 2002).

1.4 Significance of the study

The theoretical significance of the study is that it creates a better understanding of the supply chain integration process by researching the mechanism for creation of interdependent competitive advantages from the focus company's point of view, as a major component of value creation for the customer. The practical significance of the research is that it develops a methodology for integrating the business processes of all participants into a complex international FMCG supply chain using the "best practices" i.e. reference models of SCOR (Supply chain Council, 2012). The SCOR model provides a common supply chain framework, a standard terminology, as well as common metrics with associated benchmarks and best practices (Huan, Sheoran & Wang, 2004). This technique will significantly improve

International FMCG supply chain competitiveness and the quality of decisions made; it will reduce costs and ultimately increase value for both customers and stakeholders.

1.5 Limitations of the study

Supply chains are considered as interconnected systems between partners and are built on the basis of economic benefits. Considering the fact that this study was conducted on an existing company, which is part of an International supply chain, and which includes the focus company and its partners, the results obtained reflect the specifics of this supply chain. The analysis of the collected data takes into account the unique characteristics of the supply chain and the current status of relationships. The results of the study cannot take into account the diversity of the specifics of all international supply chains and their individual characteristics. Of course, in other circumstances, the supply chains may interact with each other on the basis of various principles depending on the level of maturity and used mechanisms of interaction. The opinions and judgements of the supply chain participants that have been collected in this study may vary considerably if similar research is carried out on other supply chains with different conditions and realities.

It should be noted that the formed requirements for the development of a business process model are applicable only for this case and may not reflect the specific features of other supply chains, especially when taking into account their market position, industry, product features and priorities.

The business process model formed on the basis of the SCOR model does not take into account the business processes of the entire company, but only those that create value for the consumer in terms of providing services. When applying this model to other supply chains, the accuracy and completeness of requirements should be clarified, as they may differ when the supply chains are in different competitive environments, and this may affect the formulation of other goals for achieving long-term sustainability.

Additionally, it should be noted that the objectives of this study are to develop models of business processes in the supply chain; the development of key performance indicators evaluating the actual implementation of these business processes are, therefore, not covered in this study. The formation of key performance indicators is a rather time-consuming process based on the prioritization of the company at a given moment and, if necessary, can be singled out in a separate study.

1.6 Thesis structure

The present study begins with an introduction, which provides the background of the research. The introductory chapter describes the company on which the present study is conducted; its specific market, competitive environment and current strategic priorities are indicated. In this chapter, the research questions, goals and objectives are formulated.

A literature review is carried out in the second chapter, where the supply chain strategies, the theoretical aspects related to integration, such as stakeholder theory, the resource-based view, the relational View, the main problems and challenges that the supply chain faces, conflict of interest, late delivery, the bullwhip effect and data quality are discussed. The best practices for managing business processes are considered, their strengths and weaknesses identified, as well as the factors that contribute to the successful implementation of change. The most important result of the literature review is the identification of gaps in the existing literature, which form the basis of the development of the research questions and objectives.

The third chapter is aimed at creating the conceptual framework, which is based on information derived from the literature review. In this chapter, a diagram is presented, which shows the relationships between the constructs and variables, on the basis of which the study was conducted. The previously identified problems in the literature review serve as the basis for the development of a conceptual model of research and hypotheses, as well as the formation of questions for conducting semi-structured interviews.

The fourth chapter is devoted to a discussion of the research methodology and identification of the tools, from which the research results are obtained. This chapter defines the order of the study and its design. It also discusses issues related to the timing of the study, the specifics of the data collection, the data analysis, validation and reliability, as well as the ethics of the research.

The fifth chapter presents empirical results obtained on the basis of testing the hypotheses using statistical methods. Following this, an analysis of a semi-structured interview is conducted, where priorities, problems and improvements are extracted from real practice, which, alongside the results of hypothesis testing, form the basis for developing the requirements for a business process model.

The sixth chapter is the final chapter and is devoted to the development of a business process conceptual model, taking into account the theoretical foundations and requirements drawn from real practice, which reflect both the specifics of the supply chain and factors that increase the efficiency of integration of supply chain partners. It includes the most complete information on the results of this research. The chapter provides conclusions and

recommendations, as well as managerial implications. The limitations of the study are also discussed and suggestions for future research are formulated.

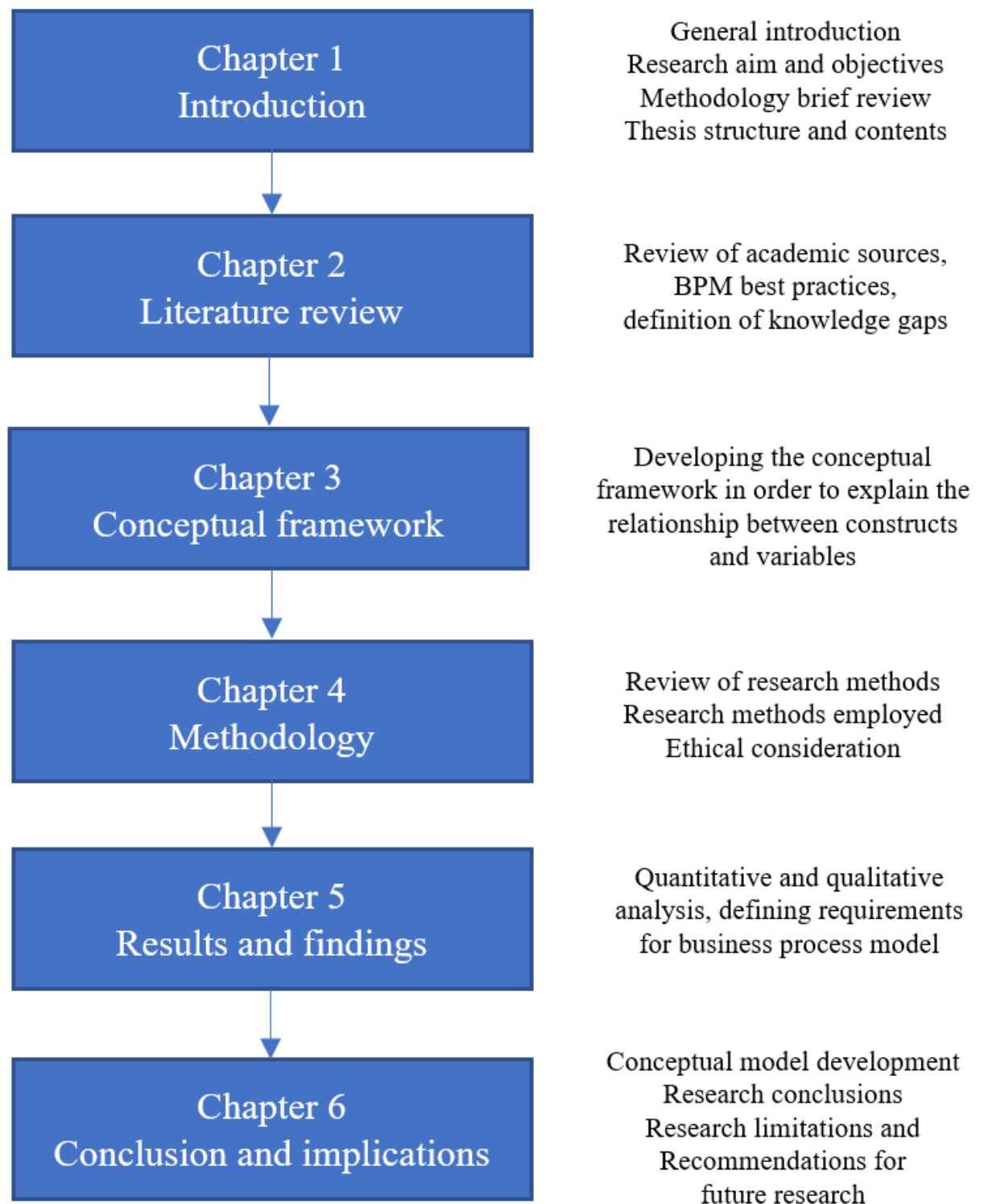


Figure 1.2: Thesis structure. Source: author's own elaboration.

1.7 Summary of the chapter

At the end of this chapter, it should be noted that the rationale for the study is justified, and a number of issues relating to the integration of supply chain partners, and the benefits that these activities can provide, are considered. Supply chain integration increases the efficiency of the internal environment, as well as significantly increasing the creation of value for customers. Thereby, SCM is the systematic, strategic coordination of the traditional business functions and the tactics for the purpose of improving the long-term performance (Mentzer *et al.*, 2001).

The objectives and problems of the study are examined and clearly show that this research is focused on finding the optimal mechanisms that should be implemented in the business process model to achieve the company's competitive advantage and sustainability in the long term. The competitiveness of companies depends on many factors that contribute to sustainability and growth. Consideration of competitive advantage through closed partnerships increases the chances of success in business.

The research methodology describes in detail the process of forming requirements for a conceptual model of business processes. The validity of the study is examined, and limitations that should be borne in mind when implementing the business process model are indicated.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

This chapter provides the theoretical basis for defining approaches to requirements for the business processes of an international supply chain. In the previous chapter, the prehistory, rationale and methods used for the present study were considered. This chapter focuses on justifying the rationale of the study and determines its practical relevance by examining in detail the theoretical aspects of supply chain management (SCM) in the relevant literature sources. In this chapter there is a consideration of and discussion on the previously developed supply chain management concepts, analyse activities on supply chain process improvement, as well as identifying unsolved problems in the field of research interest.

The evolution of SCM involves the matching of external suppliers of products and services with the definition of the appropriate service level, as companies focus their attention and resources on creating value for the end user. In this way, partners join forces to increase the overall supply chain efficiency. Partners provide the appropriate level of information exchange, carry out joint planning, manage risks in the whole supply chain, reduce costs, and eliminate function duplication and inefficient activities. The quality of services and products provided by partners in a supply chain determines reliability and efficiency, which in turn leads to the creation of competitive advantage. Creating processes for engaging stakeholders and understanding value creation from their perspective is critical to a firm's success and the ability to remain a vibrant business in the future (Harrison & Wicks, 2013).

SCM incorporates many activities that must be considered as a single process. These include: the purchase and delivery of raw materials, production of products, order management, inventory management, and delivery of products for storage and transportation to the final customer. When designing the supply chain, companies analyse a large number of factors that can affect the material, product and information flows from suppliers, focus companies, and service providers to end consumers. With these factors and limitations in mind, supply chain managers are most often aware of the processing times, production capacity, availability of raw materials, the inventory levels, transportation times, and so on, when defining the ordering policies and manufacturing plans to satisfy expected demand (Perea-López, Ydstie & Grossmann, 2003).

2.2 Supply chain priorities

The competitive advantages of a supply chain are currently a strategic factor that determines the success of companies. The supply chain brings together many partners who integrate

their competitive advantages to achieve common goals. This approach is based on the fact that the business processes of supply chain partners, at the integration stage, are subject to optimization as a whole. The greatest productivity is achieved by optimizing business processes throughout a supply chain, for example, reducing delivery time for order fulfilment, increasing delivery reliability, quickly responding to changes in customer preferences, the ability to introduce new products to the market as soon as possible, and reducing costs.

The supply chain consists not only of a focus company, but also of its partners, with whom it is necessary to establish close relationships, streamline processes and determine the necessary levels of integration for the most effective interaction. This is needed in order to meet the changing market requirements based on core-competencies, as well as leveraging people and information in the most cost-effective manner (Gunasekaran, Lai & Edwin Cheng, 2008). Factors that directly affect the company's strategy should be viewed as the pattern of decisions related to sourcing product, capacity planning, conversion of finished product, deployment of finished product, demand management and communication, and delivery (Lummus & Vokurka, 1997). Thus, companies are guided primarily by the dynamics of the market environment, the expectation of consumers, competitors, the quality of products, demand forecasts, product matrix management, pricing, technologies used (in production, delivery, storage, and information exchange between partners), marketing activities, and the launching of new products with new consumer properties. At the same time, companies that differentiate themselves through innovation must tread carefully between the dangers of over-optimistic forecasting and the risks of wasted opportunity (Christopher, Peck & Towill, 2006).

In most cases, supply chain priorities are determined by the type of product and the market in which the company operates. The choice of type of demand-driven or forecast-driven strategy depends on supply chain priorities. Lean concepts work well where demand is stable, predictable and where variety is low (Christopher, Peck & Towill, 2006). In contrast to this, agility is concerned primarily with responsiveness, i.e., to match supply and demand in turbulent and unpredictable markets (Christopher, Peck & Towill, 2006).

Considering the competitive environment in which supply chains with a mass product operate, there is a great need for a streamline supply chain and, therefore, an agile strategy is more effective in responding to changing customer needs (Tarafdar & Qrunfleh, 2017a). Understanding what contributes to achieving agility requires focusing on strategic planning, virtual enterprise and knowledge, and IT management (Gunasekaran, Lai & Edwin Cheng,

2008). There are many problems that an agility strategy can solve, but the main ones should be highlighted. These are: uncertainty regarding satisfying customer demand, uncertainty relating to reducing the total cycle time and, hence, of being flexible and responsive (Gunasekaran, Lai & Edwin Cheng, 2008).

Identified problems in the supply chain are the basis for improvement; these activities alone, however, have little value if they are not linked to the goals of the focus company and other participants in the supply chain, i.e., the overall focus of the supply chain with respect to cost and responsiveness (Tarafdar & Qrunfleh, 2017a).

The nature of key supply chain processes, such as procurement, inventory management, logistics and customer service is influenced by the supply chain strategy (Tarafdar & Qrunfleh, 2017a). Strategy can be viewed as a continuing search for rent, where rent is defined as return in excess of a resource owner's opportunity costs (Mahoney & Pandian, 1992). The supply chain strategy determines the long-term development and interaction with all stakeholders of the company, since by sharing more information among supply chain partners, firms can develop a higher level of trust, which is a key driver to motivating supply chain collaboration (Holweg *et al.*, 2005). Material and product flow parameters within the supply chain are: service level, rate of return and the unit cost of production, which are very important in reducing uncertainty. Moreover, transparency of information flow is a major objective in external supply chain collaboration (Holweg *et al.*, 2005).

Depending on which goals the company pursues, management determines its development priorities. The four strategy determinants of supply chain networks are: relation-specific assets, knowledge-sharing routines, complementary resources and capabilities, and network position (Chang, Chiang & Pai, 2012). The evolution of approaches for managing supply chains has greatly complicated performance measurement and has become more challenging, since it must serve the interests of several firms requiring the collection of data from many sources, as well as a common platform of information sharing (Maestrini *et al.*, 2017). This phenomenon certainly forces companies to look for new ways to increase efficiency, which in turn is expressed in supply chain integration beyond functional silos and firm boundaries to develop a unified value creation process (Ralston *et al.*, 2015).

The supply chain strategy is primarily aimed at the optimal use of company resources with the simultaneous effective management of material and information flows. Common strategies include reducing order lead times, sharing point of sale (POS) data, and centralizing ordering decisions (Croson & Donohue, 2006).

As a rule, the strategic goals of a company involve the establishment of performance indicators, which are also transmitted to the supply chain. How optimal and less expensive the supply chain depends on the effectiveness of the company as a whole. Supply network performance is positively influenced by the effectiveness of the information technology used and the depth of supplier integration (So & Sun, 2010).

The challenges facing supply chains are quite different in content, as supply chains they are systems with four highly interconnected elements: suppliers, manufacturing, distribution networks and customers (Perea-López, Ydstie & Grossmann, 2003). These, in turn, include: a definition of demand for products, customer classification by type and priority of the sales region, the formation of the optimal size of the order, determining the optimal type of transport and the route of delivery, the placement and storage of products, the determination of safety stock options, and so on.

Each supply chain is unique and operates by its own principles and, thus, simply copying successful models to enhance competitive advantage is not always a justified step. Companies, in order to achieve the maximum effect, study best practices, identify their strengths and weaknesses, and modify and adapt them carefully. When creating an integrated supply chain, within the activities of all the participants, particular attention is required for the optimization of the business processes of the company and its participants, for increasing transparency and reducing costs, as well as for these harmoniously synchronizing with each other. In this connection, the proper integration of established business processes of suppliers, manufacturers, logistics partners, distributors and retailers into a single mechanism is of strategic importance for all participants and stakeholders within the supply chain.

2.3 Supply chain structure

The supply chain is formed by a focus company, which is most often a trading or manufacturing company, where at the level of contractual relations, interaction is defined with suppliers and customers that form the supply chain. The members of a supply chain include those with whom the focus company interacts through its suppliers or customers, from the point of origin to the point of consumption (Lambert & Cooper, 2000), managing the supply chain, therefore, as one system with a clear, strategic intent (Braziotis *et al.*, 2013), The focus company directly defines the structure of the supply chain and how they will be engaging with all of its partners as a single mechanism. Determining the number of supply chain tiers is part of business process modelling, where at each tier the number of suppliers and consumers can be different.

The focus company can be located at any part of the supply chain, depending on the nature and focus of its activities, i.e., sales or production focus. Supply chains that decompose to many tier-1 customers/suppliers will place a strain on the resources (Lambert & Cooper, 2000). It should be noted that a supply chain, consisting of a large number of diverse partners, significantly complicates the modelling of business processes. When taking complexity into consideration,, it is important to refer to the total number of nodes and the total number of flows, not to the number of distinctive raw materials suppliers required for the final product (Adenso-Diaz *et al.*, 2012).

The most complete attention should be paid to determining the number of participants in the supply chain, ranking them by the level of influence on the achievement of results, determining the most important business processes in which partners are involved. The need for multiple suppliers to mitigate risk and to build close relationships can help to develop the number of suppliers and allow the supply network to recover more quickly from disruptions (Adenso-Diaz *et al.*, 2012). The integration of partners involves the establishment of various kinds of relationships and determines the feasibility of such relationships. Horizontal structure refers to the number of tiers across the supply chain, while metrical structure refers to the number of suppliers/customers represented within each tier (Lambert & Cooper, 2000). In this regard, there is a need to classify these relationships by type as these will directly determine business processes, i.e., the relationship of the focus company with major suppliers and large consumers, relationships with suppliers and consumers that are less important, and relationships between suppliers and consumers that are not in the interest area of the focus company. Each focus company has different sorts of turbulence in its environment that are driven by factors, such as industrial forces, branches, locations and downstream supply chain factors, for example distributors, customers, and so on. (Trkman & McCormack, 2009).

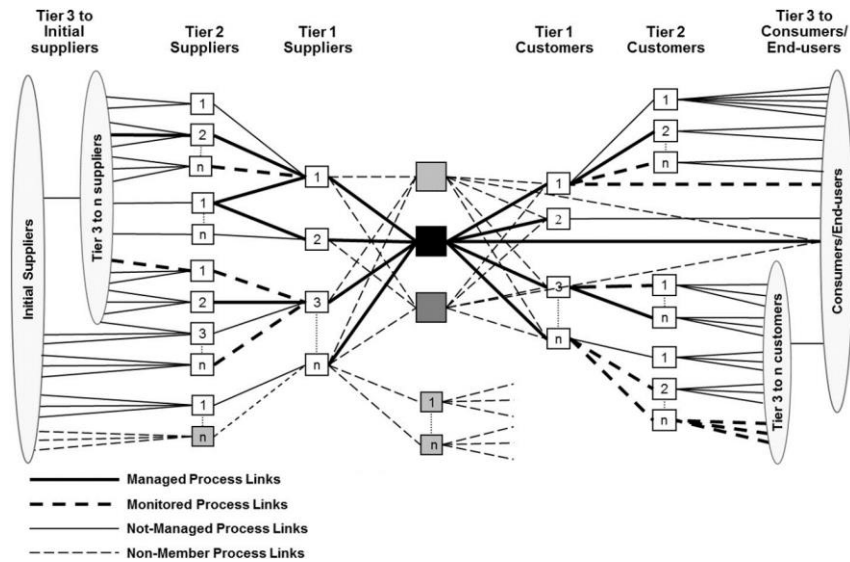


Figure 2.1: Supply chain network structure. Source: (Lambert & Enz, 2017).

Relationships with companies that are not part of the supply chain, but may have an impact on supply chain partners, should also be considered. This type of relationship suggests that these companies can also interact with competing supply chains. The horizontal position within the supply chain is where a company can be positioned at or near to the initial source of supply, or be at or near to the ultimate customer (Lambert & Cooper, 2000). The focus company determines the optimal number of links in the supply chain, including which operations will be carried out by the focus company independently and which will be acquired externally as services. The product flow facility structure refers to the network structure for sourcing, manufacturing, and distributing across the supply chain (Lambert & Cooper, 2000); the modelling of the supply chain, therefore, should take into account: the location of the production and storage sites, the delivery of products to customers, and the selection of storage locations, e.g., distribution centres, and determination of product delivery routes based on the location of production and location of distribution centres. The costs of keeping an inventory are generally significant; the manufacturing processes can be improved to employ more efficient current working capital and labour (Papageorgiou, 2009). In this connection, it is necessary to determine the optimal order sizes, as well as the supply volumes via trade channels and the necessary inventory levels to meet demand in the sales regions. This complexity is required to manage all shipments from the point of origin to the point of consumption, because whoever has the relationship with the end user holds the power in the supply chain (Lambert & Cooper, 2000). The level of integration between partners depends on many factors, e.g., the similarity of the company in its structure, the tasks of planning and control, and the similarity of information and material flows that

determine the operations. A company is no more sustainable than the suppliers from which it sources its materials (Krause *et al.*, 2009).

The integration of planning processes between different levels of the supply chain has a significant impact upon supply chain. Planning and control of operations are keys to moving an organization or supply chain in a desired direction. (Lambert & Cooper, 2000). At this stage, collaborative planning is a necessary element of integration with the establishment of mandatory performance metrics, where it is possible also to trace the relationship between strategy and operations. Fully understanding a company's sustainability profile, however, requires a view of its extended supply chain or even the wider network within which it operates (Miemczyk, Johnsen & Macquet, 2012). The use of infrastructure for operations reflects how the integration at the process level will occur with an assessment of the compatibility of the used IT systems, types of equipment, and storage and transportation capacities; it is important to the focus company that process links are integrated and managed appropriately between the other member companies. (Lambert & Cooper, 2000).

The task of allocating scarce resources among the different business process links across the supply chain becomes crucial (Lambert & Cooper, 2000). The focus company and partners must have the necessary qualified personnel who will interact in order to provide integration tasks. They also require an assessment of the necessary resources (production, storage, transportation, financial, and so on.) to perform operations and determine the potential for increasing efficiency based on the growth / decrease in the volume of product flow. The reliability of individual suppliers and logistics providers is bound to have an impact on the reliability of the supply network (Adenso-Diaz *et al.*, 2012). An optimal information flow and information exchange is necessary for the timely receipt of high-quality information, which determines the efficiency and consistency of the entire supply chain as disturbances disrupt the flow of goods, delay the delivery of goods to the customer, lose profit and increase cost (Chaghooshi *et al.*, 2018). The optimization of the process of supply, production and distribution of products, e.g., the selected inventory management strategy and optimal production strategy, are employed to prevent the possibility of unpredictable events occurring in a supply chain network. This is important as today's supply chain networks are becoming more globalized and complex in their structures (Chaghooshi *et al.*, 2018).

Establishing meaningful boundaries for the network is critical to supply network research (Sraih & Gregory, 2008). Based on marketing research, whatever determines that the product is in demand on the market and its competitiveness, i.e., the geography, sales channels,

market capacity, product characteristics, should be identified. At this stage, where and how the products will be produced and stored, which suppliers of raw materials are needed, and the capacity and productivity of the equipment is also determined.

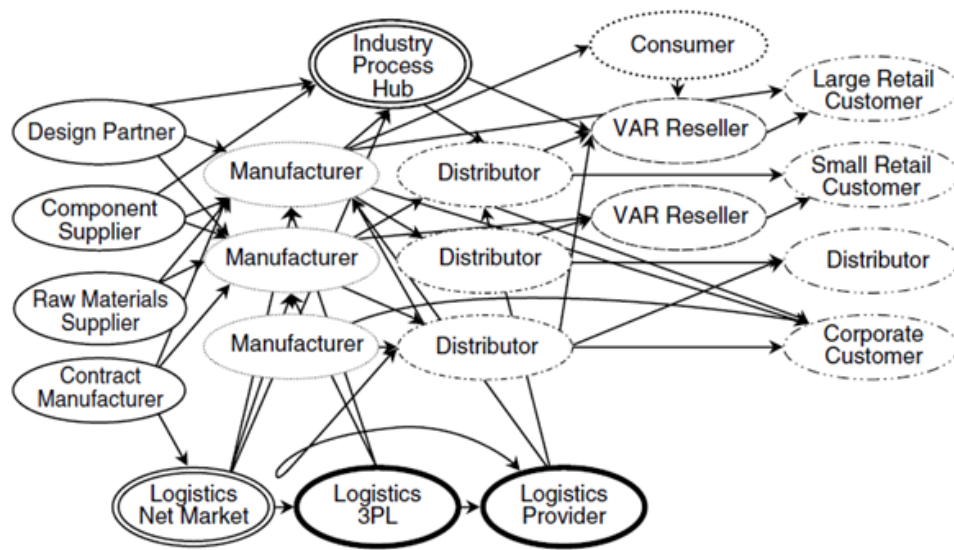


Figure 2.2: A Complex supply chain network. Source: (Poirier, 2003).

The ability to implement the selected configuration of the supply chain in the relevant regions, by taking into account the analysis and the supply network as a unit of analysis, encompasses the concept of an integrated network of key supply units, operating throughout the length of the supply chain (Sraih & Gregory, 2008). The features of regions should also be considered in terms of technological infrastructure, e.g., the availability of warehouses and their proper characteristics, the manufacturers of products and their capabilities, delivery routes, modes of transport by which products are delivered, climatic conditions which may affect the seasonality of supply, technological cycles of production, and features of local legislation that may complicate or facilitate supply chain operations.

Adaptability is about reconfiguring the connectivity to adequately fit with new demands (Hearnshaw & Wilson, 2013). As noted earlier, there is competition between supply chains, so increasing competitiveness also depends on optimally formed requirements for SC partners' integration because each firm is a member of the other's supply chain. It is important, therefore, for the management of each firm to understand the companies' interrelated roles and perspectives (Lambert & Cooper, 2000).

The modelling of technological and economic compatibility between partners in the supply chain is carried out in order to achieve performance indicators, i.e. the timing, quality and cost of products and services that partners provide within the supply chain. For these

purposes, four fundamentally different types of business process links should be considered: 1) managed business process links; 2) monitored business process links; 3) non-managed business process links; and 4) non-member business process links (Lambert & Cooper, 2000).

2.4 Stakeholder theory approach

The theory of stakeholders determines the company's order of interaction with the external environment. Richard Edward Freeman created stakeholder theory and described it in his book, *Strategic Management: A Stakeholder Approach*, to address the issue of the "principle of who or what really counts" for the success of an enterprise (Freeman, 1984, pp.46). Most often, managers face a high level of pressure, which involves the adoption of managerial decisions and the need for change. This concept suggests a new look at a company's responsibilities to serve its shareholders where success in doing so is likely to be affected by other stakeholders (Jamali, 2008).

This concept is that any company has stakeholders both internally and externally. To achieve the objectives of a company's management should take into account and meet the interests and needs of stakeholders. Managing for stakeholders involves attention to more than simply maximizing shareholder wealth (Phillips, Freeman & Wicks, 2003). Stakeholders, as a basis for creating a competitive advantage, facilitate performance, legitimacy and a good reputation (Laplume, Sonpar & Litz, 2008). The strategy of any company involves obtaining competitive advantage. In relation to the theory of stakeholders, this approach implies managing the relationships between different stakeholders to achieve a balance of interests and, at the same time, getting support from all parties to implement the strategy. Freeman defined the term "stakeholder" as follows: "any group or individual who can affect or is affected by the achievement of an organization's purpose" (Freeman, 1984, pp.53).

According to Freeman's definition, the company will receive sustainable competitive advantages that will contribute to its long-term (development for acquisition of) profit. Every business needs to create value for its customers, suppliers, employees, communities and financiers (Freeman, 1984). According to Freeman's theory, stakeholders are divided into two groups: internal and external. The stakeholder of an internal group usually includes business owners, clients, company employees and suppliers. External stakeholders include government agencies, competitors, environmentalists, the media, and so on. (Freeman, 1984).

There are several types of relationships that determine the order of interaction with stakeholders, for example, stakeholder power, high inter-dependence, low inter-dependence

and firm power; and the balance of power implied by the partners relationship (Frooman, 1999).

Stakeholders should be considered as a single community with common interests that impose responsibility on a company and determine its development. Thus, a system of beliefs, values and practices for solving stakeholder-related problems, and otherwise managing relationships with stakeholders is formed (Jones, Felps & Bigley, 2007). At the same time, a company's responsibility to its stakeholders obliges them to exercise caution towards traditional interest groups, as well as silent stakeholders, such as local communities and the environment (Jamali, 2008).

The concept of stakeholders is primarily focused on management, who make decisions, as well as on those who benefit from the outcomes of such decisions (Crane & Ruebottom, 2011). Confirmation of this is expressed by Mitchell *et al.* (1997) who discuss the idea that stakeholders influence management in such a way that they are perceived as possessing power, legitimacy and urgency (Friedman & Miles, 2002). The power of suppliers arises because many companies have a need for competitive and comparable resources in terms of quality and cost. This resource dependence arises from relationships with others who supply resources to a focus firm (Frooman, 1999). This phenomenon may have an explanation in that suppliers provide goods and services, as well as time and other resources, and are subject to transaction uncertainties (Harrison & Wicks, 2013). Dependence on financiers is determined by the fact that they hope for financial returns from the firms in which they invest (Harrison & Wicks, 2013). Of course, there is another group of stakeholders that is not part of the external or internal environment of the company. Nevertheless, this group, which is the community, undoubtedly plays an important part in the life of a company; communities provide locations, infrastructure and a workforce in exchange for tangible benefits, such as employment, tax revenues and economic growth (Harrison & Wicks, 2013). There is, therefore, a group of powerful stakeholders that are most likely to place intense pressure on a firm (Jones, Felps & Bigley, 2007).

When considering customers as stakeholders, companies often try to create the maximum value, which in terms of consumers would be sufficient to warrant continued, cooperative engagement with the firm (Harrison & Wicks, 2013). Companies try to find common interests in order to achieve compliance goals through advertising and programmes that encourage dual membership in more than one stakeholder group (Scott & Lane, 2000). Focusing only on making a profit and creating value for a company can have a rather limited approach, since it can justify itself in the short or medium term but, at the same time, can

reduce the ability and/or desire of managers to think more broadly about what a firm might do to increase total value across all stakeholders (Harrison & Wicks, 2013).

Given the importance of stakeholder theory, it should be noted that its influence on management practice appears largely dependent on the extent of its diffusion (Laplume, Sonpar & Litz, 2008). At the same time, it should be noted that some stakeholders are voluntary associations and are not part of the basic structure of the society (Phillips, Freeman & Wicks, 2003). Of course, all stakeholders influence each other and it is very important to understand how companies respond to those influences (Rowley, 1997). In these conditions, where everything is very interconnected, and even under conditions of high centrality, managers do attend to certain stakeholders more than others because of time and cognitive constraints (Scott & Lane, 2000). This fact once again confirms the assertion that the power of stakeholders has a direct impact on the development of a company and the achievement of its strategic goals.

2.5 Resources for gaining competitive advantage

2.5.1 Resource based view

A resource based view (RBV) gives an understanding of how companies develop a competitive advantage from resources and capabilities owned and controlled by them (Wernerfelt, 1995), and how they can use their strategic resources to increase their competitive advantage. Companies use personnel competencies, experience and knowledge to manage their material resources, as well as their own unique practices in managing business processes.

A detailed consideration of this approach should provide the most capacious and accurate definition of the resource; the meaning of resource here is anything which can be considered a strength or weakness of a given firm (Wernerfelt, 1984).

The characteristics of intangible resources are: rare, inimitable and non-substitutable products or services (Barney, 1991). Knowledge, unlike other resources, is not easily imitable owing to knowledge and information barriers (Das & Teng, 2000). Competitive advantages that are difficult to reproduce are unique and, at the same time, are an effective tool for creating value for stakeholders. Imperfect imitability means that no other firm will be able to obtain the valuable and rare resources of the focus firm (Barney, 1991). Resource management involves a company assessing its own strengths and weaknesses, in order to decide on the required level of collaboration (Ramanathan & Gunasekaran, 2014). Thus, resource sharing, both material and non-material, including the form of information, is an

important component of effective cooperation between supply chain partners. Firms rely on their bargaining power at the stage of alliance formation and contract formulation (Lavie, 2006).

Determining the principles of strategic development allows companies to increase their competitive advantages and achieve a stable market position, since technological discontinuities or shifts may render existing competencies obsolete or, at a minimum, invite the rapid development of new resources (Hart, 1995). In applying the most effective methods and principles for the formation of competitive advantages, companies achieve their strategic goals. Key resources and capabilities also affect the ability of a firm in sustaining its competitive advantage (Hart, 1995). As already noted above, resources are part of a competitive advantage; they are, therefore, rather difficult to identify and even more so to reproduce. Companies trying to increase their profitability require assets to complement their collection of existing resources and frequently need to obtain these from existing firms (Lockett, 2002). The resources accumulated by a company have a critical impact on competitive strategy. (Das & Teng, 2000). Companies operating in similar markets certainly have similar resources and potential, demonstrating approximately the same behaviour and performance patterns (Lockett, 2002).

When creating competitive advantages, managers should identify the most valuable resources that will contribute to the most effective value creation for all consumers. This requires an analysis of strengths and weaknesses to differentiate between available resources according to the degree of influence on the value chain. In this case, partners should conduct a risk analysis, increase the level of trust in each other, and form the required project management procedures for keeping transaction costs low and creating great products from design to distribution (Sánchez & Schmid, 2013). Each company has a unique past experience that defines its opportunity set (Lockett, 2002).

Resource constraints should be taken into account when assessing their competitive advantages; these most often include a shortage of labour or physical inputs, a shortage of finance, a lack of suitable investment opportunities and a lack of sufficient managerial capacity (Mahoney & Pandian, 1992). At the same time, it is important for the company to integrate resources, but this does not imply that industry product analysis merely yields normal returns (Mahoney & Pandian, 1992).

This approach is applicable for describing and understanding industries in which demand is known and the industry structure is relatively certain (McWilliams & Smart, 1995), as in these sectors, resources are usually of the same type and their strengths and weaknesses are

fairly well understood. When discussing how the use of resources contributes to the implementation of the strategy, it should be noted that their main feature, which is distinguished as a competitive advantage, is the effect of lowering a firm's net costs and/or increasing a firm's net revenues beyond what would have been the case if these resources had not been used to develop and implement these strategies (Xiao, Arian & Barney, 2016). Developing this discussion, it should further be noted that RBV develops the idea that a firm's competitive position is defined by a collection of unique resources and relationships (Das & Teng, 2000).

2.5.2 Relational view

The concept of relational view suggests that the best use of resources is a way to develop complementary capabilities in order to achieve competitive advantage by combining resources from different companies (Dyer and Singh 1998). At the same time, in order to meet the requirements of clients and sensitively respond to their requirements and wishes, it is necessary to maximize the opportunities of the partners, since supply chains cannot be responsive to the demand without cooperation and support from other supply chains partners (Ramanathan & Gunasekaran, 2014). In these conditions, competition shifts from that of individual companies to competition between supply chains. It should be noted that internal/cross-functional collaboration and external integration with customers and suppliers can be complex and requires unique capabilities that may be difficult or costly to implement (Leuschner, Rogers & Charvet, 2013).

Supply chain management (SCM) typically focuses on issues related to the mechanism of design and delivery of goods (Zacharia, Sanders & Fugate, 2014). Materials and information flows are, therefore, created and ultimately transformed into goods and services that are of value to all stakeholders. The priorities that can be evaluated by supply chain performance measures, either singly or jointly, are: cost, activity time, customer responsiveness and flexibility (Beamon, 1999).

Collaboration between supply chain partners encourages companies to engage suppliers in long-term relationships and, within the relationship, they are better able to learn from each other (Castaldi, ten Kate & den Braber, 2011). The companies interact with each other for profit and try to focus on one particular benefit associated with collaboration, such as learning, lower transaction costs or the pooling of resources (Dyer & Singh, 1998). The Relational view, therefore, provides a company with tangible advantages over its competitors, who are unable or unwilling to collaborate (Dyer & Singh, 1998). The opportunities that are created as a result of partnerships create benefits in many areas.

Companies are trying to achieve the most advantageous relationships with suppliers, distributors and customers, in order to innovate their activities and regularly connect with them. They are also trying to commit to relationships with organizations outside of their boundaries in order to create distinctive competencies (Sánchez & Schmid, 2013).

2.5.3 Critical evaluation and discussion

A firm can leverage the value of its own resources by accessing the complementary resources of an alliance partner (Lavie, 2006). When studying the integration of business processes between partners in the supply chain, it should be borne in mind that the main link between the partners is collaborative planning and orders processing, where there is a predetermined volume of goods and services that circulate through the supply chain.

When analysing the above approaches, it is necessary to understand how they can contribute to increased efficiency and what the competitive advantages are. These approaches provide an explanation of value creation through the use of unique advantages, competencies, knowledge and other resources to obtain competitive advantages. Applying these approaches helps integrating companies succeed in the long term because competitiveness is a result of inter-firm sources of advantage, not the resources of a single firm (Sánchez & Schmid, 2013).

In continuing this discussion, it can be assumed that the more partners with unique knowledge and resources in the supply chain, the more competitive advantages a focus company can achieve. Of course, this requires reflection and critical evaluation, since the complexity of managing unique resources is much higher than when managing ordinary resources, and it is very important here not to lose competitive advantages.

Approach	Advantages	Limitations	References
Resourced-based view	• Each firm has a unique portfolio of resources. • A set of unique resources and relationships leads to a competitive advantage and superior performance. • Numerous resources used by firms are inelastic in their supply and are possible sources of economic rents.	• Firm's resources are difficult to obtain in the market place. • High transaction costs. • RBV applies only to firms in predictable environments. • RBV does not sufficiently consider the synergy within a set of resources as a source of sustained competitive advantage. • Imperfect mobility, loss of value if moved, the lack of	(Kraaijenbrink, Spender & Groen, 2010). (Kull, Mena & Korschun, 2016). (Das & Teng, 2000). (Xiao, Arikan & Barney, 2016).

		transparency what resources are the parts of competitive advantage. • Resource heterogeneity and immobility.	
Relational view	• RV provides the company with tangible advantages over competitors. • RV creates relationships that are more beneficial than normal this may generate relational rents.	• Success to generate relational rents depends on the degree of compatibility in organizational systems, processes and cultures. • Abuse may arise owing to opportunistic analysing by one of the exchange partners who identifies a gap in the system for exploitation purposes. • The buyer may experience being locked-in to supplier dominance as a result of heavy relation-specific investments (Lonsdale, 2001, p.22).	(Dyer & Singh, 1998). (Sánchez & Schmid, 2013). (Lonsdale, 2001).

Table 2.1: Critical evaluation of RBV and RV. Source: compiled by the author.

Of course, in the supply chain, such a model of relations should be based on mutually beneficial cooperation. The value that is created in these relationships should be distributed among participants who share knowledge and technologies, share resources, and train and develop each other's competencies. In addition, the hallmark of resource sharing is the economic benefit, which should be to obtain additional profit or reduce costs. Relational rents are supernormal profits jointly generated in an exchange relationship that cannot be generated by either firm in isolation and can only be created through the joint idiosyncratic contributions of the specific alliance partners (Sánchez & Schmid, 2013).

2.6 Supply chain problems and challenges

When considering the supply chain as a complex system in a dynamic and turbulent environment, it should first be understood that uncertainty and random events limiting stable operation have a direct impact on reducing efficiency and not achieving strategic goals. The supply chain, therefore, can be regarded as a multiple-input, multiple-output (MIMO) system, with all customer demands as the inputs, and all supplier orders as the outputs (Ouyang & Li, 2010). Supply chain management is quite complex because it permeates many partners and depends on a large number of factors. The different focus of the interests of partners in the supply chain, the multiple transfer of responsibility from one partner to

another, and the management of material and information flows create situations in which the supply chain is forced to look for solutions in order to maintain its competitive advantage.

2.6.1 Conflict of interest

Referring to the theory of stakeholders, it should be noted that a conflict of interests often occurs when the goals of stakeholders are not clear or are contradictory, thus creating conflict between value maximising and stakeholder theory for those interested in improving management, organisational governance and performance (Jensen, 2001). These phenomena significantly reduce the performance of the supply chain and are not conducive to achieving the strategic goals of the company. There are a number of situations that pose potential conflicts of interest that are especially relevant to supply chain management, for example, procurement decisions, consulting activities and the use of company resources and services (Handfield & Baumer, 2006). Supply chain partners can make decisions on improving the efficiency and optimization of business processes within their company, ignoring the interests of other partners. Stakeholder analysts argue that all persons or groups with legitimate interests participating in an enterprise do so to obtain benefits; they also argue that there is no *prima facie* priority of one set of interests and benefits over another (Donaldson & Preston, 1995).

In addition, the pursuit of interests by each partner to maximize profit from the relationship also causes a conflict. In confirmation of this, stakeholder theory is completely consistent with value maximization which implies that managers must pay attention to all constituencies that can affect the firm (Jensen, 2001). Ineffective cross-functional interaction between departments within the company reduces the effectiveness of efforts aimed at achieving strategic goals. To avoid possible negative effects and excessive tension, there is a need to collaborate, coordinate and integrate the operational areas within the company so that the departments and functions are to be considered as an interrelated process (Kamal & Irani, 2014). Organizational culture can provide managers with guidance regarding how this tension should be resolved (Jones, Felps & Bigley, 2007).

2.6.2 Late deliveries

Seasonality and unpredictability of demand pose a serious risk to timely deliveries, since supply chains need to plan resources in advance for operations and, at the same time, minimize inventory volume (Metters, 1997). Late deliveries of goods and services between partners in the supply chain can create significant difficulties for operations and, as a result, unpredictable or non-transparent demand patterns have been found to cause artificial demand amplification in a range of settings (Holweg *et al.*, 2005). This phenomenon negatively

affects the creation of value for the client and this leads to poor service levels, high inventories and frequent stock-outs. Typically, studies cite demand visibility as the key antidote to deal with this costly effect (Holweg *et al.*, 2005).

Delays in delivery of information may be caused by delays in providing needed data, internal problems of the partner, poor planning of operations, poor control over execution of the order and inefficiency of business processes. These information flows have a direct impact on the production scheduling, inventory control and delivery plans of individual members in the supply chain (Lee, Padmanabhan & Whang, 1997). In order to cope with untimely deliveries, companies are trying to implement information sharing to create more visible and predictable demand in the system (Holweg *et al.*, 2005).

2.6.3 Bullwhip effect

Inconsistency of purpose and action among the participants of the supply chain, leading to the so-called bullwhip effect, which can be described as a rejection of supply chain partners as a result of changes in demand, suggests that the variability of orders increases as we move upstream supply chain from retail to manufacturing (Sucky, 2009). Achieving balance between production / ordering related cost and inventory related cost governs whether one should amplify or smooth production (Wang & Disney, 2016). The nature of the appearance of uncertainty may be different, for example., participants placing orders in one period, but not accounting for them in their inventory calculations when placing orders in the next period (Croson & Donohue, 2006). This may also include changes in demand, inaccuracy of the initial data for planning operations, information gaps in the transmission of information, incorrect interpretation of events and phenomena, inconsistency of actions between partners in the supply chain, and so on. Part of this relationship is that the basic form and policies used by an organization can give rise to characteristic and undesirable behaviours in the supply chain (Lee, Padmanabhan & Whang, 1997). Thus, minor changes in the supply chain, in particular demand, lead to serious deviations in the operations' plans of all partners, and this accordingly, leads to excessive inventory investments throughout the supply chain, as the parties involved need to protect themselves against demand variations (Sucky, 2009). This phenomenon violates the established relationships in the movement of material and information flows, since this effect is the amplification of both demand seasonality and variance (Metters, 1997). The negative consequences of the bullwhip effect are hard to quantify economically: the cost of hiring, firing, learning, training and idling (Wang & Disney, 2016).

2.6.4 Poor data quality

Inaccurate information significantly reduces the value of information exchange between companies and greatly affects any decisions made, the of result of which leads to improper action, loss, decrease in service level and operations planning. In this regard, the importance of information exchange between partners grows significantly. The quality of the information that is transmitted is undoubtedly a high priority because if it is reduced, the costs and losses of companies can be unreasonably high. Poor quality data can, therefore, have significantly negative impacts on the efficiency of an organization, while high quality data are often crucial to a company's success (Haug, Zachariassen & van Liempd, 2011).

Poor quality data can occur, for example, employee and customer dissatisfaction, increased cost of operations, poor decision making, mistrust and difficulty in defining and executing strategies, (Laranjeiro, Soydemir & Bernardino, 2016). Data quality in IT systems has a significant impact on daily operations. Incorrect data primarily leads to incorrect decisions, which ultimately has a huge impact on a company's profit and the quality of management decisions. Most errors in data quality are made at the time of entering information into IT systems.

2.6.5 Summary of the discussed problems and discussion

Summing up the analysis of supply chain problems, it should be noted that planning, production, procurement and supply of products are a complex process from a managerial point of view. It should be borne in mind that partners in the supply chain have their own interests and strategies, as well as different ways of achieving them. A large number of factors, both external and internal, contribute to the imbalance in supply chain operations. The table below summarizes the discussed problems.

SCM issue	Affected stakeholders	Implications for the company	References
Conflict of interest	• Employees. • Management. • Focus company. • Partners.	• Ineffective cross-functional interaction between departments within the company. • Reduced performance. • Ignoring the interests of other partners. • Not achieving the strategic goals of the company.	(Jensen, 2001). (Donaldson & Preston, 1995). (Handfield & Baumer, 2006).
Late deliveries	• Focus company. • Partners. • Customers.	• Serious risk to timely deliveries • Unpredictable or non-transparent demand.	(Metters, 1997). (Holweg <i>et al.</i> , 2005). (Lee, Padmanabhan & Whang, 1997).

		• Poor service levels, high inventories and frequent stock-outs.	
Bullwhip effect	• Focus company. • Partners. • Customers.	• Serious deviations in the operations' plans. • Excessive inventory investments. • Cost of hiring, firing, learning, training and idling.	(Sucky, 2009) (Wang & Disney, 2016). (Croson & Donohue, 2006). (Metters, 1997).
Poor quality data	• Employees. • Management. • Focus company. • Partners. • Customers.	• Employee and customer dissatisfaction. • Increased cost of operations. • Poor decision making. • Mistrust. • Difficulty in defining and executing strategies.	(Laranjeiro, Soydemir & Bernardino, 2016).

Table 2.2: Summary of the discussed problems. Source: compiled by the author.

Managing the factors that cause problems should be considered as one of the priority areas for increasing efficiency. In addition to effective resource management and joint planning, participants and deliveries should work carefully with emerging issues that interfere with planning operations, resources, prioritizing, and increasing the flexibility of the supply chain to a point of possible deviation. This requires the coordination of partners in actions and the availability of high-quality data that allow timely operations, coordinate order processing, and monitor and increase the efficiency of current activities.

2.7 Supply chain visibility

One of the most important elements of supply chain management is supply chain visibility. Operating an integrated supply chain requires continuous information flows, which in turn help to create the best product flows. (Lambert & Cooper, 2000). Visibility in the supply chain is most often understood as the traceability of information and material product flows from the moment they occur to the (moment they arrive with the final consumer. The purpose of achieving visibility is primarily for improving the company's internal decision making and operating performance (Barratt & Oke, 2007). Supply chain visibility also allows monitoring of the execution of the order from its shipment to the date of delivery of the products to the end customer, and it requires complete integration of the retailer's and manufacturer's information systems (Chopra, 2003).

Supply chain visibility can be described as quality of transparent information sharing between partners in a supply chain (Bartlett, Julien & Baines, 2007). Having up-to-date information on the speed and effectiveness of the operation, the equation of safety stocks and other parameters in the online supply chain can ensure a quick response to changes in

demand or market conditions, in order to prevent any erroneous actions. Inventory visibility (IV) has three stages: shipment tracking, supply chain event/disruption management, and the continuous improvement of the supply chain. (Zhang, Goh & Meng, 2011). By increasing supply chain visibility, companies significantly increase their capabilities and make the supply chain more manageable. Visibility represents the extent to which the information and knowledge of partner firms regarding supply chain cooperation is visible to the focus company (Lee, Kim & Kim, 2014). By having all of the necessary information regarding the supply chain in real time, supply chain partners manage events more efficiently, making quick and correct decisions that are based on accurate data. Visibility is widely used but is open to interpretation; it means different things to different people, thereby adding to miscommunication and confusion (Francis, 2008). Moreover, visibility eliminates many bottlenecks in business processes since the availability of all the necessary information helps to increase the service level for customers; better visibility can lead to improved business performance by using different methodologies (Caridi, Perego & Tumino, 2013).

A supply chain visibility value is enhanced by managing information flows between supply chain partners. By managing relationships between suppliers, 3PL providers for collaborative planning operations allow balancing demand and supply chain capabilities in a short time. Supply chain visibility emerges from shared information, which offers value and advantages for supply chain management (Papert, Rimpler & Pflaum, 2016).

2.8 Integrated business planning

Integrated supply chain planning is based on the joint activities of partners, on the unification of business processes throughout the supply chain, and on the development of sales and operations plans, which are based on a thorough understanding of the market and the current competitive environment. Integrated business planning (IBP) refers to the technologies, applications and processes which connect the planning function across the enterprise and improve organizational alignment and financial performance (Toor & Dhir, 2011) with supportive tools for integrating partners, e.g., vendor managed inventory (VMI) collaborative planning, forecasting and replenishment (CPFR).

Integrated planning requires the use of unified information channels for the data exchange between suppliers, the focus company and customers, who gain the benefits of various elements of supply chain collaborations, e.g., cost reduction, profit, forecast accuracy and inventory control (Ramanathan & Gunasekaran, 2014).

2.9 Supply chain operational attributes

As mentioned before, a supply chain is a multi-objective system (economic, productive, strategic, environmental, social, and so on.) crossed by a variety of flows, e.g., financial, material, information, technology, and so on. (Cerchione & Esposito, 2016). Supply chain partners' integration is a rather complicated process, since effective integration implementation remains a mystery for many companies (Chen, Daugherty & Landry, 2009). Based on this, the issue should be considered in more detail and in more depth. Supply chain integration depth can be related to coordinative practices, involving coordinating the flow of materials, money and information along the supply chain, and collaborative practices regarding the collaborative improvement of products and processes (Wiengarten & Longoni, 2015a); in other words, creating common business rules that fit the goals of the supply chain. Guided by common goals, partners collaboratively manage intra- and inter-organizational processes, in order to achieve effective and efficient flows of products and services, information, money and decisions, to provide maximum value to the customer (Flynn, Huo & Zhao, 2010).

2.9.1 Supply chain integration

Each supply chain is unique and operates by its own principles; simply copying successful models to enhance competitive advantage is not always a justified step. Companies, in order to achieve maximum effect, study best practices, identify their strengths and weaknesses, and modify and adapt them carefully. The necessity to coordinate several business partners, internal corporate departments, business processes and diverse customers across the supply chain gave rise to the field of supply chain management (Palma-Mendoza, Neailey & Roy, 2014).

Supply chain management integrates value creation activities from a raw material supplier to a customer, so focus companies often call for supply chain partners to implement common business processes and sources of knowledge (Irani *et al*, 2017). The proper integration of established business processes of suppliers, manufacturers, logistics partners, distributors, retailers into a single mechanism is of strategic importance for all participants and stakeholders. Supply chain integration facilitates all partners to achieve the common goal of enhancing productivity and environmental performance, to share knowledge and enable decision-making process (Kamal & Irani, 2014). Below there is a list of factors identified as those driving and inhibiting supply chain integration.

Factors driving supply chain integration	Factors inhibiting supply chain integration
Improving firm performance.	- Lack of unified IT infrastructure. - Lack of technical resources.

• Effective coordination and communication. • Facilitating information sharing. • Operational efficiency and performance. • Improved financial performance. • Effective customer service and responsiveness. • Followed by improved product quality, management and delivery. • Supply chain agility. • Flexibility and visibility.	• Skills and knowledge on integration. • Resistant to change. • Lack in cross-trained experienced workforce.
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Table 2.3: Key factors affecting supply chain integration. Source: adopted from Kamal & Irani, 2014.

The authors further show that three-echelon levels of approaches to supply chain integration include integration of operations, planning and controlling, and strategy implementation with the widespread use of information and communication technologies, thereby creating new opportunities for increasing supply chain productivity and lowering costs (Kamal & Irani, 2014).

For a more precise understanding of the mechanism of integration of a supply chain, two dimensions should be highlighted: internal integration focuses on intra-organizational aspects whereas external integration measures the breadth and depth of relationships that firms maintain with their upstream and downstream business partners (Ataseven & Nair, 2017). Companies that concentrate on internal integration can improve a firm's performance and prevent internal departments from creating pockets of power that harm other corporate functions (Ralston *et al.*, 2015). Internal integration improves the performance of multiple responsibilities and, concurrently, makes cross-functional interaction more complex. At the same time, if we consider the impact on the consumer, internal integration can create value by eliminating redundancies, creating efficiencies and reducing costs (Ralston *et al.*, 2015). Considering the impact of communications in the supply chain as a whole, long-term relationships can increase collaboration between customers and suppliers, which is necessary for sharing strategically important knowledge for mutual gain (Cerchione & Esposito, 2016).

The complexity of managing integration is to establish optimal management mechanisms and interrelations between partners, which are aimed at acquiring and sharing objectives, plans and related knowledge pertaining to business and operational strategies (Swink, Narasimhan & Wang, 2007) in order to exclude information gaps in the multiple transfer of responsibility. It should be noted that integration positively impacts upon a supplier's

communication performance; however, it does not influence a supplier's operational performance (Ataseven & Nair, 2017).

Collaboration performance is measured through operational efficiency and risk/return ratio (Anand & Grover, 2015), and is required to run projects (on operational excellence. Maintaining projects on operational excellence to reduce costs requires constant interaction between supply chain participants and, at the same time, cross-functional activities with the involvement of various departments in collaboration at the functional/operational and strategic levels (Anand & Grover, 2015). The integration of business processes, therefore, allows companies to significantly increase the performance of their supply chains, which contributes to increasing profitability for shareholders and ultimately creating value for customers. The ultimate goal of any business is to create value for customers and shareholders.

2.9.2 Supply chain resilience

Supply chain resilience is considered as an adaptive capability of the supply chain when preparing for unexpected events, responding to disruptions, and recovering from these by maintaining continuity of operations (Ponomarov & Holcomb, 2009). The complexity of managing companies and limited resources is a challenge for the strategy's implementation and, at the same time, is the driver for seeking best solutions for business processes management in supply chains.

Constant monitoring of deviations is aimed at determining their cause and making management decisions, as an efficient supply chain should respond quickly to market demand (Xia, Ma & Lim, 2008). Business rules that protect the structure of the business, improve it'. Supply chain performance is dependent on the supply chain partners' ability to adapt to a dynamic environment (Vanderhaeghe & De Treville, 2003).

Supply chain collaboration can improve organisational performance by reducing ambiguity and identifying priorities, which can speed up business operations and ensure that the business runs smoothly (Pradabwong *et al.*, 2017). The complexity of supply chain management arises because firms have trouble in forging relationships with external partners because they are busy coordinating internal activities (Fawcett & Magnan, 2002), which contributes to the appearance of bottlenecks throughout the supply chain.

2.9.3 Supply chain performance

Performance management is an important tool for achieving the strategic goals of a company; this is achieved by measuring the effectiveness of a supply chain (Zhang &

Reimann, 2014). In other words, performance can be defined as the process of quantifying the effectiveness and efficiency of past actions (Neely, Adams & Crowe, 2001). For a cost management most often consists of focusing on creating optimal safety stocks, improving data sharing between participants in the supply chain, conducting regular monitoring of costs and quickly responding to identified deviations. All of this is necessary to evaluate changes and to assess supply chain performance at an overall customer service level in order to increase competitiveness and profitability (Cho *et al.*, 2012). For these purposes, performance indicators and business processes must be aligned, both internally and externally, throughout the supply chain in order to attain the ultimate goal of competitive advantage (Whitten, Kenneth & Zelbst, 2012). When considering supply chain performance, it should be noted that the focus company needs to develop close relationships with its key customers; it also needs to foster such relationships with its key suppliers (Lambert & Enz, 2017b). In this case, the criteria for performance evaluation are: inclusiveness, universality, measurability and consistency (Beamon, 1999).

Supply chain cost measurement allows senior managers to evaluate the whole scope of costs, define effective and ineffective managerial decisions, and design timely solutions to increase performance. Business process integration in the supply chain suggests interrelated goals, and may also involve transferring knowledge and technological skills between engaged firms, creating further opportunities to achieve their collaborative objectives (Pradabwong *et al.*, 2017).

2.9.4 Service level

Supply chain management is seen as a continuous balance between customer needs and the desire to maximize profits. The consumer is primarily interested in the supply of good quality products, in the shortest possible time, at a competitive price and, in this situation, the effective coordination of the supply chain and logistics remains critical to managing and balancing supply and demand (Ellram, Tate & Feitzinger, 2013). Thus, consumer satisfaction requires the continuous improvement of the entire supply chain mechanism, rather than its individual parts. All participants in the supply chain focus their processes on customers' needs, as companies will not seek to achieve cost reductions or profit improvement at the expense of their supply chain partners, but rather seek to make the supply chain, as a whole, more competitive (Croom, Romano & Giannakis, 2000). The client is primarily interested in obtaining the highest quality products and services. At the same time, from the supplier's point of view, a high service level may not always be justified because

it may be unreasonably expensive; as there is no marginality, firms have to deliver value to customers while remaining profitable (Ralston *et al.*, 2015).

2.9.5 Summary and discussion

The operational attributes that were discussed in this section play an important role in the stable operation of the supply chain. Establishing a strong relationship between partners in the supply chain and measuring the effectiveness of operations helps eliminate deviations and achieve targets in an efficient and timely manner. Customer requirements are a priority; supply chains, therefore, need to reduce costs, increase the speed of operations, and maximize the satisfaction of demand through a timely and complete supply of products.

The main tasks of a supply chain are related to demand forecasting and planning with maximum accuracy, increasing the service level, reducing inventory and costs, improving warehousing and delivery, and increasing the utilization of production and logistics' facilities. In general, supply chains operate as pull systems driven by the orders that customers place with retailers; their general operation is as follows: retailers accumulate orders from customers during the day, and commit to fulfilling them, for instance, within the next day, as long as they arrive before a certain deadline (Perea-López, Ydstie & Grossmann, 2003). When studying the integration of business processes between partners in the supply chain, it should be borne in mind that the main link between the partners is the collaborative planning of customer orders and their subsequent processing, where the volume of goods and services is determined in advance, and then circulated along the supply chain. Customer responsiveness measures include: lead time, stockout probability and fill rate (Beamon, 1999).

SC operational attribute	Major features	References
Integration	Flows of products and services, information, money and decisions, to provide maximum value to the customer.	(Flynn, Huo & Zhao, 2010).
Resilience	Capability of preparing for unexpected events, responding to disruptions, and recovery.	(Ponomarov & Holcomb, 2009).
Performance	Measuring the effectiveness of a supply chain.	(Zhang & Reimann, 2014).
Service level	Managing and balancing supply and demand.	(Ellram, Tate & Feitzinger, 2013).

Table 2.4: Operational attributes description. Source: compiled by the author.

It was concluded that the main integration process between partners in the supply chain is collaborative planning of sales and operations, and receiving, executing and tracking orders for goods and services that circulate throughout the supply chain to the end customer. In this regard, the importance of information exchange between partners is growing significantly. Data quality has a high priority because, if it is reduced, the costs and losses of companies can be unreasonably high, owing to non-optimal planning and use of resources to carry out operations.

2.10 Business process management best practices

Selected strategies cannot always be put into practice. Unpredictability and market competition forces companies to periodically update their strategies in order to continuously improve the supply chain and make it the most competitive. Supply chain strategies determine, among other tasks, whether a company will independently store and deliver products, or whether it will acquire appropriate services from external providers. Traditional strategy research suggests that firms need to seek a strategic match for their internal characteristics (strengths and weaknesses) and their external environment (opportunities and threats) (Das & Teng, 2000).

Creating value for all stakeholders is essential, as supply chain processes are defined as the set of activities used to carry out the movement of material through the supply chain network (Stavrulaki & Davis, 2010). In this regard, optimization in one company will not bring the desired results because it is necessary to consider all of the stages of value creation throughout the supply chain; all of the features and opportunities are taken into account, as well as the strengths and weaknesses of partners to communicate a firm's strategic vision, as it relates to a product and its supply chain (Stavrulaki & Davis, 2010).

Different companies choose different forms of integration and the composition of business processes is at their discretion. At the same time, the focus company and its partners often have a different composition of business processes, a different number of levels and different names. In addition, there is often a wide variety of information systems that sometimes conflict with each other and greatly complicate the integration process. Identification of business processes is a prerequisite for integration. There is a large number of academic and business sources providing information on how to effectively integrate business processes; they can, however, only be applied in those cases for which they were originally conceived. Many companies lack the experience to carry out such work, which greatly complicates the modelling of business processes. Using unified reference models takes into account the best practices that contribute to the solution of these problems.

The modelling of business processes is aimed at determining the stages of implementing the optimization of business processes between partners; a detailed description of the results of the partners' work will be digested by other participants, and performance indicators should assess the quality of inputs and outputs, and the formulation of the supply chain problems that must be solved. Business process integration in a supply chain suggests interrelated goals, and may also involve transferring knowledge and technological skills between engaged firms, creating further opportunities for achieving their collaborative objectives (Pradabwong *et al.*, 2017).

The task of increasing the efficiency of the supply chain determines the need to find new ways that could increase competitiveness and improve its daily operations. Achieving company performance targets depends on measuring all types of costs / most costly processes, as delivery heavily relies on the quality of information exchanged (Anand & Grover, 2015). The difficulty in this case lies in the fact that this task affects all of the participants in the supply chain who are in a dynamic environment, where the system of managing business processes and efficiency is significantly complicated, owing to the fact that many internal and external factors have to be taken into account. It also means that the ability of processes to scale upwards depends on the absence of discontinuities of logic, the ambiguities or contradictions in them to be more responsive to customer demand and increasing the delivery reliability and consistency of lead time (Anand & Grover, 2015).

Identification and analysis of the main problems of the supply chain allows understanding of how it can prevent them and, at the same time, improve its functioning. This requirement is due to the need for alignment between the strategic capability of a supply chain (leanness, leagility¹ or agility) and the operational objectives of its manufacturing and logistics processes (efficiency or flexibility) (Stavroulaki & Davis, 2010).

In this regard, a fair question arises: how can companies achieve supply chain integration if there is not a common understanding of the key business processes? (Croxtan *et al.*, 2001). For this purpose, SCM professionals use process frameworks, the purpose of which is to clarify the business process characteristics, identify possible bottlenecks and compare any potential process alternatives (Vergidis, Tiwari & Maieed, 2008). In order to answer this question, the "best practices" of managing business processes in supply chains should be considered most fully; these are SCOR and GSCF, which have been widely used in production, and SCM (Mohammadi & Mukhtar, 2017). In scientific sources, two types of supply chain management models are most often found: the supply chain operations model

¹ lean + agility

(SCOR) (Chae, 2009; Bala & Kumar, 2011; Okongwu *et al.*, 2016; Rybakov, 2018; Knowles *et al.*, 2005; Huan, Sheoran & Wang, 2004; Thunberg & Persson, 2014) and the Global supply chain Forum Model (GSCF) (Penteado Marchesini & Chicarelli Alcantara, 2016; Mohammadi, 2017; Khorheh, Eslami & Davarzani, 2013; Olaogbebikan & Oloruntoba, 2017). Each of the models has its advantages and disadvantages; however, it should be highlighted what combines them is their purpose, i.e., to determine the most critical business relationships for the on-going success of the focus company and to devise appropriate relationships with outside parties (Badurdeen *et al.*, 2010).

2.10.1 SCOR model

SCOR is a standard for supply chain management. It was developed by the International Council for supply chains and covers only the company's operational strategy. The SCOR framework contains five typical top-level business processes: plan, source, make, deliver and return, which are directly related to supply chains (APICS Supply chain Council, 2017). The SCOR model helps to design typical processes within the supply chain, apply performance metrics to measure the current state of operations, form horizontal and vertical relationships between partners, establish integration rules, and structure the management of supply chain business processes. The SCOR model aids the understanding of a particular supply chain by means of mapping it in business process terms (Palma-Mendoza, 2014).

The model includes a multivariate structure, organised in a 4×4 matrix, relating all of the SCOR processes except plan (source, make, deliver and return), and performance standards (reliability, responsiveness, agility, cost, assets, and so on) (Sellitto *et al.*, 2015). This model graphically depicts the supply chain in the form of a structure in which information, material and product flows circulate. The model is an excellent tool for identifying bottlenecks and offers a large number of options for creating a supply chain based on current operating conditions and supply chain requirements. The model contains three key components of business process management: reengineering, benchmarking and best practices. The SCOR reference model is intended to be industry-independent and linked to existing models of the Supply chain Council – DCOR (design chain), CCOR (customer chain) and PLCOR (product lifecycle chain) (Ricken and Meinberg, 2012).

The SCOR model is unquestionably the main world reference for supply chain assessment, as the 800 or so participating companies attest. It serves as a reference point for estimating how the supply chain is positioned, how it is structured and what type of functioning it adopts (Chardine-Baumann & Botta-Genoulaz, 2014).

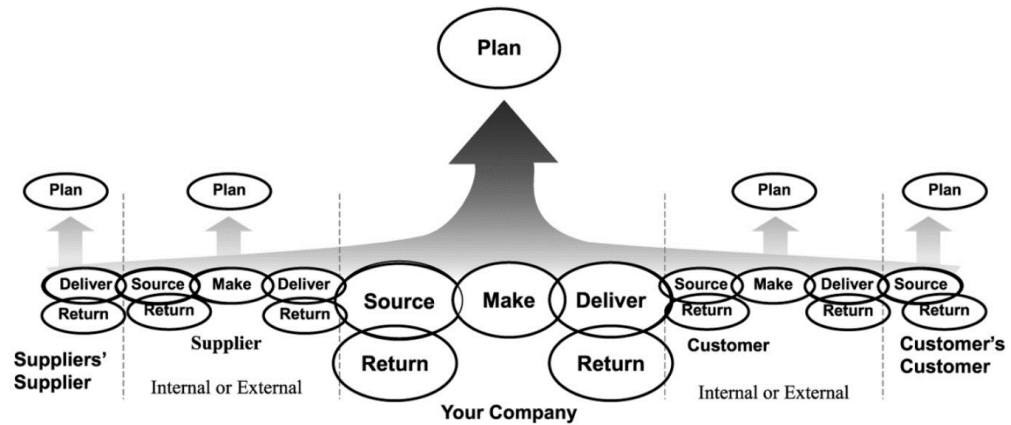
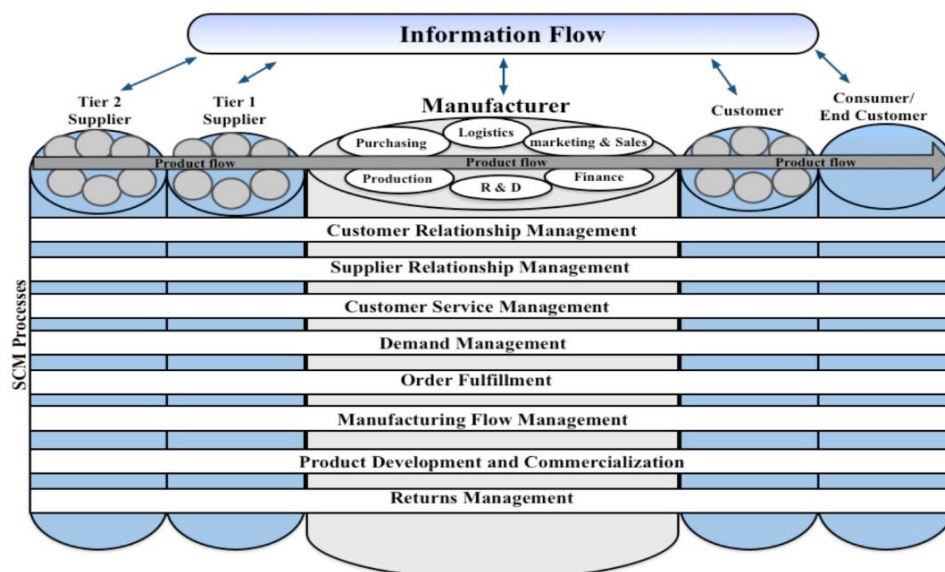


Figure 2.3: The supply chain operating reference model (SCOR). Source: (Lambert & Enz, 2017).

The SCOR model follows a hierarchical structure with different levels of decomposition (Palma-Mendoza, 2014).

2.10.2 GSCF model

The GSCF² Model is a Global supply chain forum business process model that encompasses the corporate and functional strategies of the company (Penteado Marchesini & Chicarelli Alcantara, 2016). The GSCF model includes eight business processes (customer relationship management, manufacturing flow management, supplier relationship management, product development and commercialization, customer service management, order fulfillment, demand management, returns management), including those that go beyond the supply chain.



² Also called SCM framework. Source: (Lambert & Enz, 2017).

Figure 2.4: SCM processes in GSCF model. Source: (Mohammadi & Mukhtar, 2017).

This model is aimed at implementing corporate and functional strategies and covers most of the company's functions and cross-functional business processes. The focus on corporate integration of functions, taking into account integration between partners in the supply chain, complicates the implementation of the model. Moreover, the benefit of the model is created not only by operations with partners, but also by the relationship within the company between business functions. The GSCF framework is believed to be both broader and more difficult to implement than the SCOR model which manages SCI without critical input from marketing, finance, and research and development (Lambert, García-Dastugue & Croxton, 2011).

2.10.3 APQC process classification framework

The APQC's Process Classification Framework is a standard for terminology on process definitions and measures for benchmarking (Srivastava & Mazzoleni, 2010). This model allows the company to look at its activities and processes in terms of a unified approach. It is used by many companies around the world and is an open standard, suitable for almost any company. The model is useful for identifying business processes and their further improvement. The cross-industry Process Classification Framework[®] was originally envisioned as a taxonomy of business processes and a common language through which APQC member organizations could benchmark their processes (APQC, 2019).

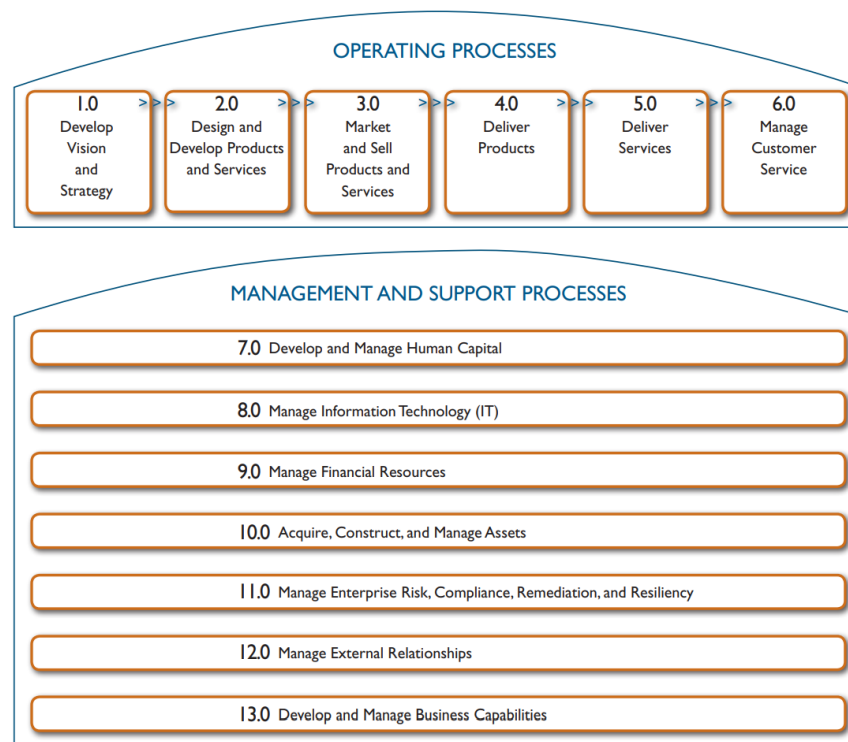


Figure 2.5: APQC process classification framework. Source: (APQC, 2019).

The APQC model helps with understanding which processes need improvement and which should be left “as is”. This model also contains benchmark analysis and allows companies to compare their activities with similar companies. The initial design involved the APQC and more than 80 organizations with a strong interest in advancing the use of benchmarking in the United States and worldwide (APQC, 2019).

2.10.4 BPM best practices comparison and discussion

Best practices, which are reference models of business processes, help identify and shape business processes, and monitor performance. Usually they are a description of business processes giving an idea of the relationship between processes, offering performance metrics, as well as best practices that can be borrowed. Reference models of business processes help companies improve their operations and compare them with competing companies or companies with similar market specifications.

Best practices give companies a large number of advantages because they offer standardized terminology that is understood by most partners of the supply chain; they also provide a general description of business processes, methods for measuring specific operations and offer unified benchmarking standards. As a tool for making changes, business processes reference models determine the scope of work in order to determine the operational requirements of the supply chain, as well as identifying problems, finding solutions and implementing them in real practice.

BPM best practice	Strong points	Weak points	References
SCOR model	- Widespread framework consists of standard supply chain processes, standard performance attributes and metrics, standard practices and standard job skills. - A solution for the identification of relevant supply chain processes. - Provides companies with a basic process modelling tool, an extensive benchmark database, and guidelines on how to measure the supply chain operations. - Includes best practices that help companies with their benchmark and improvement activities. - Possible to adapt the model to different scenarios that suit the different environments it operates within. - Provides a common language for communication and is used to describe	- The need for paying attention to differences on maturity levels among the chain partners. - It is a static tool that does not include any possibilities for dynamic analyses.	(Sellitto <i>et al.</i>, 2015). (Palma-Mendoza, 2014). (Persson, 2011). (Georgise, Wuest & Thoben, 2017).

	and evaluate the supply chain configuration. • Combines the concepts of business process reengineering, benchmarking and best practices.		
GSCF model	• Includes all types of business functions in association with the main supply chain processes, while SCOR does not include functions such as finance, marketing and R&D. • Meets SCM strategy while SCOR meets operation strategy.	• It is not yet an “industry standard”. • Its framework is believed to be both broader and more difficult to implement than SCOR.	(Lambert & Enz, 2017a) (Mohammadi & Mukhtar, 2017). (Lambert, García-Dastugue & Croxton, 2011).
APQC framework	• An enrichment of its terminology is created by analysing hundreds of process. documentations from live client projects. • An addition to the enriched APQC for mapping data sources from different vendors. • An addition to the enriched APQC for mapping heterogeneous business transformation methodologies.	• Only defines the ID and the name of each business process node	(Srivastava & Mazzoleni, 2010).

Table 2.5: Best practices comparison. Source: compiled by the author.

Each framework has its own strengths and weaknesses. The SCOR focuses on transactional efficiency, while the SCM framework (GSCF) is focused on relationship management. While managers need to achieve transactional efficiency, failure to recognize the value of a relationship orientation will limit supply chain efficiency (Lambert & Enz, 2017).

2.11 Change management approach

Improving the company’s competitiveness is certainly an important step. One of the tools to match the external and internal environment of the company is to make changes. The current rate of technological advancement and growing global competition allows us to foresee a continuing need for change in the future (Appelbaum *et al.*, 2012). Crisis phenomena in the global and regional economies force many companies to regularly review their current situation and make changes to their strategy and operations.

2.11.1 Organizational culture

Returning to the previous chapter, there is a need to turn again to the theory of stakeholders and determine its relationship with organizational culture. Considering the company’s employees as stakeholders, it should be noted how employees respond to problems by constituting a common interpretive frame of information about stakeholder attributes and

issues, and by motivating behaviours and practices that preserve, enhance, or otherwise support the organization's culture (Jones, Felps & Bigley, 2007). Organizational culture determines the behaviour of the employees of each company. Culture refers to norms of behaviour and shared values among a group of people (Kotter, 1996).

When expanding the definition of organizational culture, it should be noted that this is the collection of overt and covert rules, values and principles that are enduring and guide organizational behaviour. (Burke & Litwin, 1992). Organizational culture creates the order in which employees, at their workplace, express their preferences, demonstrate different solutions to problems and manage, at least satisfactorily, external demands and internal needs for coordination and integration (Jones, Felps & Bigley, 2007). Common experience contributes to the formation of a deep-rooted understanding, in accordance with which the organization works, as well as the implementation of practices and standards that are appropriate and effective within that reality (Jones, Felps & Bigley, 2007).

Organizational culture has a significant influence on the management of a global supply chain for improved flexibility and responsiveness (Gunasekaran, Lai & Edwin Cheng, 2008). This is inextricably linked with the philosophy and values of the company. Organizational culture is a tool to influence the behaviour of staff so that the company achieves its goals. Companies need tools to measure both ongoing business processes and to evaluate strategies across their supply chains (Gunasekaran, Lai & Edwin Cheng, 2008). For these purposes, companies use various tools that help evaluate the execution of objectives and management of operations by providing necessary information for making decisions (Al-Haddad & Kotnour, 2015).

Organizational culture is aimed at improving the efficiency of staff, achieving targets and, at the same time, achieving satisfaction for employees from the results of their work. The culture is defined by various human resource policies, such as staffing, training, compensation and evaluation of employees (Gunasekaran, Lai & Edwin Cheng, 2008).

Organizational culture is, concurrently, the medium that helps members make sense of their own and others' behaviour (Golden, 1992) (Jones, Felps & Bigley, 2007). For this purpose, companies form values that determine standards of behaviour and interaction both within the company and with external partners. In this way, culture provides a "meaning system" for organizational members (Burke & Litwin, 1992).

When environmental conditions change, internal requirements for operational processes are reviewed. Kotter notes that culture has been a driver in change management theory for years (Kotter, 1996). When changing the external and internal environment, companies form new

goals, which may cause a revision of values; for the proponents of managerialism, there is not only an “enemy outside”, but also an “enemy inside” – the people (Diefenbach, 2007).

2.11.2 Drivers of and sources for change

Advances in technology affect the appearance of new types of goods and services. In this regard, approaches to the management of operational activities are changing, which significantly affects changes in business processes as, for example, when individual parts of an organisation deal increasingly and separately with one problem and one objective at a time (Todnem By, 2005). No less important is change in the external environment, where consumers also alter their preferences, resulting in companies having to revise strategies and parameters by which to judge their effectiveness. In this way, change can be triggered by major internal problems or by considerable external shock (Oakland & Tanner, 2007).

The sources of the changes can be categorized as follows (Kast and Rosenweig, 1974):

- Changes in environment (technological, economic, legal, political, demographic, ecological and cultural factors);
- Changes in goals and values;
- Changes in technical systems;
- Changes in structural subsystems;
- Changes in psychological systems and changes in managerial systems.

Changes affect various organizational levels, including: individual, group, organization, population and even larger communities of organizations (Van De Ven, 1995). Leadership guides organizational behaviour and serves as a behavioural role model for all employees. (Burke & Litwin, 1992). Moreover, it sets the direction that inspires change and ensures that change is implemented (Oakland & Tanner, 2007).

Change management directly affects and requires effective leadership. A model of successful change should be based on effective leadership practices that take into account the company’s strategy and values, as well as exploring opportunities and incorporating elements of effective motivation. Effective emotional and behavioural leadership, without valid vision and strategic thinking, can be misguided and even dangerous (Gill, 2002).

2.11.3 Behaviours and reasons for employee resistance

When considering a company from the point of view of stakeholder theory, it should be noted that employees give their time, effort, and other resources in exchange for wages and other firm-specific tangible benefits (Harrison & Wicks, 2013). When a change occurs in a

company, this usually interrupts normal patterns of organization that can be highly ambiguous (Ford, Ford & D'Amelio, 2008). This ambiguity is certainly a source of fear and, at the same time, breaks agreements both before and during change by failing to restore the subsequent loss of trust (Ford, Ford & D'Amelio, 2008). Violating the usual order, affects the interests of employees and raises concerns about wages and job stability (Crane & Ruebottom, 2011).

The ambiguity of prospects gives rise to employee resistance in view of the fact that former values and methods are being called into question. Resistance can be explicit or implicit, but whatever its form, it will certainly increase. In this case, it is preferable to build a communication strategy which should be carefully planned to account for the initial resistance (Klein, 1996). Making changes is a complex process, where there is a high probability of failure. Often trying to change behaviours should include such matters as attitudes and empowerment, without bedding these things into the business reality (Oakland & Tanner, 2007).

Changes may vary in duration. Long-term changes require the involvement of both senior management and employees, where the role of leadership is the most important. Involvement of employees positively affects their attitude toward change, as it values their past experiences, which influences the likelihood of change success (Al-Haddad & Kotnour, 2015). Resistance should be considered as the expected reaction to the implementation of change, and is a completely natural phenomenon. At the same time, it should be considered that there are circumstances in which resistance can be a positive contribution to change (Ford, Ford & D'Amelio, 2008).

In order to prepare for change, therefore, it is necessary to build a communication strategy that should coincide with the general stages of a planned change and the relevant associated information requirements (Klein, 1996). Moreover, when constructing a communication strategy, the influence of leadership must be taken into account, in order to influence intrinsic acceptance while reducing resistance (Al-Haddad & Kotnour, 2015).

2.12 Knowledge gaps and research objectives

A review of the literature demonstrated that a large number of academic sources are devoted to improving the efficiency of the supply chain, integrating partners and increasing productivity, as well as creating value for all stakeholders. They also focus on the effects that inter-organizational factors, such as trust, power and commitment have on the relationships that firms have with their suppliers or customers (Cao *et al.*, 2015). The presence of a large number of publications on the topic of improving the efficiency of the

supply chain, such as (Ramanathan & Gunasekaran, 2014; Sánchez & Schmid, 2013; Wang & Disney, 2016; Lee, Kim & Kim, 2014; Caridi, Perego & Tumino, 2013; Toor & Dhir, 2011; Ataseven & Nair, 2017; Ralston *et al.*, 2015; Lambert & Enz, 2017b ; Palma-Mendoza, 2014) indicates that this area is critical for many supply chains.

The analysed sources of literature contain a large number of tools, including integrated planning, business process frameworks (SCOR, APQC, GSCF), supply chain integration, RBV, performance measurement, visibility, and so on, for improving the efficiency of the supply chain and interaction between partners. This means that designing a reasonable model to describe the elements of a supply chain is a research priority for many practitioners and researchers (Liu *et al.*, 2014). At the same time, there is no clear understanding of exactly which tools can form a mechanism for achieving effective interaction between partners that might be described as not having the appropriate supply chain measures, leading to misidentification of a customer's expectations, obstacles for achieving competitive advantages and conflicts among companies (Dissanayake & Cross, 2018). Thus by expanding this field of knowledge in the area of SCM, companies get benefits of supplier and customer integration in the form of a knowledge base and joint capabilities (Wiengarten & Longoni, 2015).

Accordingly, for the supply chain, it is necessary to have an understanding of which set of tools should include an effective mechanism for interaction between partners and which principles should be employed for supply chain integration. The creation of such a mechanism in practice will contribute to successful, collaborative inter-firm relationships which, in turn, will significantly increase the efficiency of inventory reduction, delivery, reduction of costs, customer service and market share increase (Banchuen, Sadler & Shee, 2017).

Based on the above, the research objectives are reformulated in a more specific way, as follows:

Research objective 1: Define mechanisms that will promote efficient interaction of supply chain partners.

The priorities, typical problems and challenges discussed are inherent in many supply chains. There are no correlations in the literature sources on how problems and challenges affect each other, and vice versa, nor on how priorities can cause problems, how improvements in the supply chain can solve problems, how problems can cause other problems, shift strategic priorities and create bottlenecks in the supply chain. Since effective interaction between partners assumes the existence of criteria, tools, an understanding of the interconnectedness

of problems, challenges and priorities, improvements make it possible to accurately formulate requirements for a business process model. Based on this, research objective 2 is formed as follows:

Research objective 2: Extract targets, problems, challenges and improvement measures from real practice to formulate the requirements for supply chain business process modelling.

The best practices for managing business processes considered in the literature review have both strengths and weaknesses. Of course, all business processes reference models are aimed at improving efficiency, implementing and achieving established priorities, increasing the manageability of the supply chain, and measuring the current state with the possibility of subsequent comparison with competitors.

This is a positive moment for the formation of business process models because they contain a typical set of business processes, metrics and practices; how to implement them, however, is often the choice of the companies that plan to use them. The literature sources reviewed do not give an understanding of how best practices should be redesigned and integrated into existing realities and relationships with supply chain partners for achieving effective integration. There is also no step-by-step algorithm in the literature on specific examples of implementing best practices, as there is a lack of an adequate methodological framework for guiding its implementation (Palma-Mendoza, 2014). Thus, the absence of a step-by-step algorithm creates the issue of developing a methodology that should help to most optimally implement the selected model of business processes. Based on this, research objective 3 is formed as follows:

Research objective 3: Develop a comprehensive methodology for business process modelling for an International FMCG supply chain.

The creation of an effective mechanism for integrating partners in the supply chain is based on the modelling of business processes, taking into account the requirements drawn from real practice. Based on this, research objective 4 is formed as follows:

Research objective 4: Develop an optimal business process model of an International FMCG supply chain for all of its participants and stakeholders.

The ultimate goal of this study is to increase the efficiency of the integration of partners in the supply chain by creating an optimal model of business processes, which should take into account the features of current realities and, at the same time, best practices. The considered process models have their strengths and weaknesses. The use of such models is an effective

tool for supply chain management, which allows the identification of bottlenecks and provides supply chain managers with a reliable tool for the formation of the logistics and production chain. APQC and GSCF models are certainly good tools for managing business processes, but their specificity implies process management not only in the supply chain, but also in the focus company as a whole. Given the goals and objectives of this study, where it is necessary to determine the factors of effective integration between partners in the supply chain, the use of an SCOR model is most preferable, since this model specializes in business processes of the supply chain only, which indicates its narrow professional affiliation. Moreover, it should be noted that the SCOR model is inextricably linked with other specialized models: DCOR (link R&D business processes, metrics and practices), CCOR (link sales operations and customer support business process, metrics and practices) and PLCOR (link product life cycle processes, metrics and practices) (Curiazzi *et al*, 2016). This integration of specialized reference models, taking into account the presence of best practices in them, significantly strengthens the position of the SCOR model and the creation of value for the final customer. Such focus and details make the SCOR model the most preferable. The use of a standardized SCOR reference model in the supply chain allows for quicker model building and introduces understandable processes and metrics already defined in the SCOR model (Persson, 2011).

2.13 Summary of the chapter

This literature review demonstrates that the successful integration of supply chain partners depends on many factors and is a complex process. Market uncertainty and high competition are forcing companies to shift their strategic priorities towards greater flexibility and continuous efficiency gains. A wide range of tasks are identified that need to be solved in this study. This literature review examines a wide range of elements that are necessary for the efficient functioning of the supply chain. Supply chain partners need to ensure that transaction costs and responsiveness are in line with a dynamic market environment; companies need to interact closely with each other, continuously exchanging good quality information, while sharing available resources to achieve a synergistic effect. The target priorities of the supply chain were identified and the types of strategies considered, for example, lean and agile. Given that the focus company is operating in the mass market, the most acceptable priority is an agile supply chain strategy. Supply chain priorities are considered as the main facilitator of creating competitive advantage by managing all types of stakeholders and identifying partners' capabilities.

The academic literature on the integration of partners involves a large number of elements, for example, managing stakeholders, understanding what can improve the efficiency of operational activities, joint resource management, determining the structure of the supply chain, understanding the main problems that can arise in front of supply chains, using best practices that have proved their effectiveness and managing change in order to achieve competitive advantage.

CHAPTER 3. CONCEPTUAL FRAMEWORK

3.1.Introduction

This chapter is devoted to the development of conceptual framework that determines the direction of the research. In this chapter, the rationale for research elements is given. The conceptual framework aims at grounding the study in what has already been investigated and is accepted as scientific knowledge (Pruzan, 2016).

3.2.Theoretical approaches framework

Based on the literature review, theoretical approaches should be classified into three types of attributes, which should contribute to the formation of an optimal model of business processes. Thus, the choice of research approaches increases awareness of the consequences that different approaches have on theory and practice (Nilsson and Gammelgaard, 2012).

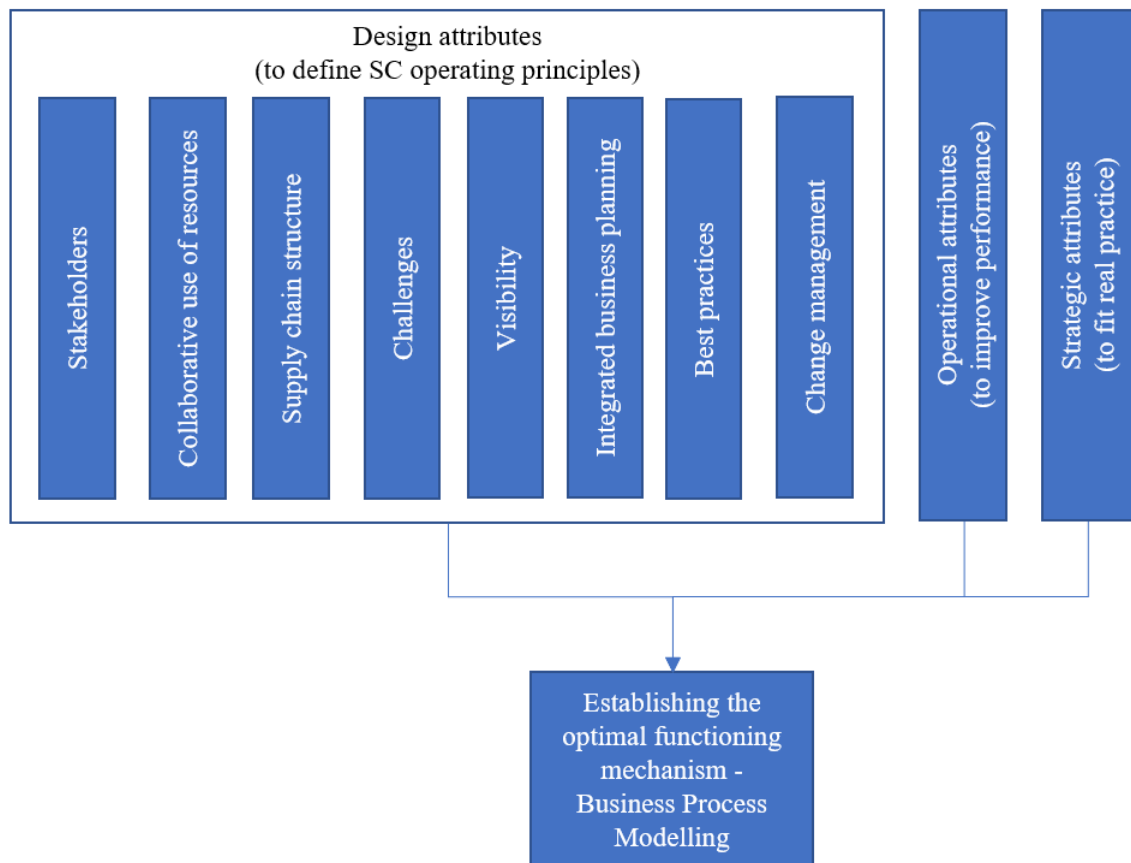


Figure 3.1: Theoretical approaches of the research. Source: compiled by the author.

The first type is a design that defines the principles on the basis on which the supply chain functions, i.e., how to interact with stakeholders, manage resources, the structure of the company, how to develop standard solutions for working with deviations, how to use best practices and manage change.

The second type is operational attributes, which are aimed at increasing the efficiency of daily operations. This should include performance management, supply chain stability, integration parameters that determine the speed of movement of information flows, and certainly the level of service that characterizes the ability of the supply chain to satisfy customer needs.

The third type is the correspondence of strategic priorities with the real practice of the company. The main priorities, problems and improvements identified on the basis of a literature review should be correlated with the actual practice of the company, in order to best understand the specifications, taking them into account when forming requirements for developing a business processes model.

3.3.Design attributes

This type of attribute is fully covered by the literature review and gives an understanding of how to formulate the principles of supply chain functioning. There is a need to re-conceptualize supply chains, moving away from simple linear systems towards more complex adaptive systems (Hearnshaw & Wilson, 2013). The principles of the functioning of the supply chain determine the structure and order of relations with the external and internal environment of the company. To achieve supply chain efficiency, companies need to consider many factors. One of the first should include interaction with internal and external stakeholders, where managing these relationships involves obtaining a competitive advantage for the company. The greatest return on these relationships can be obtained when value is created for all interested parties, and the goals are consistent.

The next factor that has an impact on creating a competitive advantage is resource-based view. The use of unique and difficult to reproduce resources certainly creates a competitive advantage for supply chains. The clearly stated goals of the supply chain partners and their consistency with each other is a significant factor for a successful relationship, as competition for resources based on resource profiles can have important implications for the ability of firms to gain advantages in implementing product market strategies (Xiao, Arikan & Barney, 2016).

The quality of information and the continuous exchange of data between partners minimize the timeliness of deliveries, and also allow control of the bullwhip effect. Delays in information and material flow, e.g., the lead-times, are a driving factor of demand amplification (Wang & Disney, 2016). In this regard, data accuracy in information systems for the supply chain is essential, which in turn creates the conditions by which the quality of

relationships between partners is satisfactory, whereas obtaining the demand information from customers has been shown to decrease inventory costs in a supply chain (Sezen, 2008).

The supply chain structure determines the relationship between partners and the number of tiers. Considering the supply chain as a single mechanism requires determination of the number of levels, information, product and material flows in the business processes, as well as establishing horizontal and vertical relationships. Supply chain design involves decisions about the number of suppliers, proximity to suppliers, supplier selection and evaluation, planned capacities, definition of contractual terms, and reactions to the possible disagreements between channel members (Sezen, 2008). The structure of the supply chain is directly related to the order of interaction between branches, regional offices, interaction with suppliers and customers.

Daily supply chain operations are a fairly complex management process that focus on value-added processes delivering innovative, high-quality, low-cost products on time, with shorter cycle times and greater responsiveness (Ramesh, Banwet, and Shankar, 2010). Building an understanding of how to respond to challenges and emerging problems, the supply chain improves its efficiency and, at the same time, improves operational flexibility and willingness to eliminate various deviations. Problems cause inconsistency, additional costs, incorrect decisions, reduced trust between partners in the supply chain and in the quality of the company's strategy.

The successful companies of tomorrow will be those that drive the use of supply chain collaboration more strategically, creating new revenue opportunities, efficiencies and customer loyalty. (Ramesh, Banwet, and Shankar, 2010). At the same time, it should be noted that the lack of resources for daily operations and supply chain development projects negatively affects productivity. In order to keep track of information, material, and product flows at a qualitative level, companies should pay attention to the development of information systems and tools for their support. Visibility is valuable from a management point of view since the availability of accurate information in real time allows companies to quickly and correctly make decisions in a dynamic and turbulent market environment.

The integration of supply chain partners requires the creation of business process models. This stage presents significant difficulties for companies since many simply do not have experience in developing a structure of business processes that would ensure not only effective interaction between partners. Supply chain collaboration between independent firms often provides larger benefits from effectively satisfying end customers (Ramesh, Banwet, and Shankar, 2010). The most likely way out of this situation is to use best practices

that incorporate the most effective models of business processes and have been tested in practice by a large number of global companies. According to the results of the literature review, the use of the three most effective models was revealed: SCOR, APQC and GSCF. For the purposes of this study, the goals of using these models, as well as their strengths and weaknesses were considered, in order to understand which model is the most suitable for solving research problems.

More advanced integration allows supply chain members to collaborate with, or consign planning and replenishment decisions to, their peers (Wang & Disney, 2016). Integrated business planning (IBP) refers to the technologies, applications and processes which connect the planning function across the enterprise and improve organizational alignment and financial performance (Toor & Dhir, 2011) with supportive tools to integrate partners, e.g., vendor managed inventory (VMI) and collaborative planning, forecasting and replenishment (CPFR). Therefore, there is a need to develop common schemes for sharing information on inventory levels, sales data, sales forecast, order status and production/delivery schedules (Wang & Disney, 2016). Creating the conditions for the implementation of the most effective business processes requires the readiness of the company and staff to make the necessary changes. For these purposes, an organizational culture was considered, which defines a set of rules and principles for the behaviour of personnel, in order for the company to achieve its goals. In addition, drivers of the sources of change were considered, as well as the reasons why employees might implement resistance to innovation. It should be noted that building communication with staff, as well as positive examples of leadership and attracting employees directly to change, create the basic conditions for making change happen. As a result, any effective business process model can be useless if it has not been put into practice. Thus, it should be understood that support for the implementation of effective models of business processes depends, among other things, on the readiness of the company itself for change and also that these changes are accepted by the staff.

3.4. Operational attributes as the elements of a conceptual framework

The operational attributes of the supply chain are considered as constructs and determine how the service level will be achieved, how the stability of the supply chain will increase, as well as determining the performance targets and the integration of different flows in daily operations between partners.

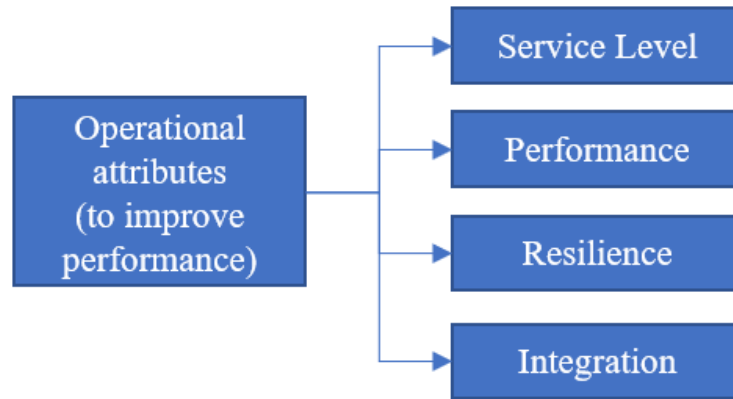


Figure 3.2: Operational attributes. Source: compiled by the author.

These attributes should be considered together, since the coordinated rhythmic work of the entire supply chain primarily depends on how much partners trust each other and, thus, how the effective relationships between them are established, whether or not the supply chain is capable of solving various kinds of force majeure. Thus, companies should exclude defined deviations, restore their ability with negative consequences, evaluate their own effectiveness with appropriate tools and adjust their actions in order to achieve target values. These attributes are primarily aimed at satisfying the needs of the client and creating value by achieving the target level of service, which ultimately creates value for the client and other stakeholders. Increasing the level of integration and information sharing among the members of a supply chain, therefore, has become a necessity for improving the effectiveness of supply chains (Sezen, 2008).

Supply chain resilience is the ability to respond to deviations, to maintain the rhythm and continuity of the operation, and to restore the usual course of work. Well-integrated supply chains create value for the shareholders by decreasing costs and increasing the market share (Lee, 2000). The ability to adapt to a dynamic market environment is most often achieved through the search for the best solutions for managing business processes. In order for the supply chain to be sustainable, companies need to increase the level of scalability with an increase or decrease in volumes; they also need to be able to predict the appearance of any deviations that can reduce supply chain efficiency or lead to a force majeure.

Supply chain performance is the ability to carry out operations with low costs and high quality. The complexity of inter-firm performance measures poses great challenges, for example, the need to integrate, to share data between multiple firms, to coordinate interfirm processes and infrastructures. (Maestrini *et al.*, 2017). Performance, however, is a basic criterion for the continuous improvement of business processes and should be considered as

a source of competitive advantage reflecting the speed, reliability, flexibility and operations' efficiency of the supply chain.

The service level is a basic indicator of the competitiveness of the supply chain. Satisfying the customers' demands on time will lead to cost reductions and will also increase the service level of the supply chain (Farahani, and Elahipanah, 2008). The supply chain aggregates consumer requirements for goods supply and assesses their feasibility. Moreover, the long-term relationship between suppliers and consumers depends on the service level.

There is a need to broaden the understanding of operational attributes, as some points are not covered in the literature review. The following is a subject area that needs to be clarified. Based on this need for clarification, an understanding of why it is necessary for a company to correlate its own priorities and the priorities of the rest of the partners in the supply chain should be developed. Despite the fact that this factor is relatively well disclosed in previous studies, it should be noted that it is necessary to clarify the impact of partner goals on the value chain in the supply chain and represent a way to improve supply chain governance by ensuring more value-adding, conscious and timely decisions (Maestrini *et al.*, 2017). The achievement of target indicators by each partner is a significant factor, which creates the need for their continuous monitoring and timely decision-making in case of deviations. How the goals of the partners correspond to the requirements of the supply chain should be understood, as information gaps may occur, whether or not there are conflicting business rules, as well as redundant steps; all of this determines the need for checking the actual state of supply chain integration and accordingly encourages the researcher to develop new measures to study the factors of effective integration in terms of achieving target values, eliminating information gaps, studying the problems of scaling the supply chain, identifying bottlenecks, main cost-drivers, information exchange and conflicting business logic, which reduces the effectiveness of interaction. For these purposes, it is necessary to identify dependencies and patterns that determine not only the effectiveness of integration, but also the effectiveness of the supply chain in terms of the ability to cope with emerging problems, challenges and deviations and, at the same time, contribute to the implementation of strategic priorities. The above arguments demonstrate that the effectiveness of the integration of partners in the supply chain is both a complex and not fully explored phenomenon.

Based on the semantic content of each construct, a selection of variables was made that can indicate the significance or absence of the relationship between factors or phenomena. For these purposes, a set of variables is proposed, the relationships between which are the basis for the formation of a conceptual model. The table below shows the names of the variables.

№	Variables	Description	№	Variables	Description
1	<i>Impact</i>	Impact on value creation.	16	<i>Increase</i>	Production volume increase.
2	<i>Risks</i>	Risks for supply chain.	17	<i>Decrease</i>	Production volume decrease.
3	<i>Performance</i>	Performance of supply chain.	18	<i>Lack</i>	Lack of resources.
4	<i>Monitoring</i>	Monitoring the KPIs.	19	<i>Factor</i>	Bottleneck factors.
5	<i>Priority</i>	Priority goals for supply chain.	20	<i>Constraints</i>	Constraints on performance.
6	<i>Source</i>	Source for monitoring.	21	<i>Misunderstanding</i>	Bottlenecks because of misunderstanding.
7	<i>Reaction</i>	Reaction to deviations.	22	<i>Removal</i>	Removal of bottlenecks.
8	<i>Control</i>	Performance metrics control.	23	<i>Benchmarking</i>	Benchmarking.
9	<i>Responsibility</i>	Bottlenecks because of multiple responsibility transmission.	24	<i>Improvement</i>	Process improvement.
10	<i>Bottlenecks</i>	Bottlenecks.	25	<i>Excellence</i>	Conducting operational excellence projects.
11	<i>Res_Transmit</i>	Responsibility transmits.	26	<i>LY_Costs</i>	Previous year's costs.
12	<i>BR_covering</i>	Business rules coverage.	27	<i>Budget</i>	Budget overrun.
13	<i>Gaps</i>	Gaps in business rules.	28	<i>Integration</i>	Information interchange.
14	<i>Compliance</i>	Business rules compliance with goals.	29	<i>Requirements</i>	Requirements for supply chain partners.
15	<i>Interference</i>	Unnecessary coordination.			

Table 3.1: Variables for quantitative research. Source: author's own elaboration.

Considering the integration of supply chain partners as the main tool for creating value and increasing the efficiency of the supply chain as a whole, several issues remain unclear. Identifying the best integration strategy requires a wide understanding of trade-offs and strategic alternatives (Sabet, Yazdani, and De Leeuw, 2017). It is necessary to determine which factors contribute to increasing and decreasing the effectiveness of integration between partners, taking into account the multiple transfer of responsibility. In addition, it is necessary to clarify the factors that cause bottlenecks and their impact on the speed of operations in the supply chain, as well as to correlate the company's goals with increased efficiency, as the main driver for the integration of supply chain partners.

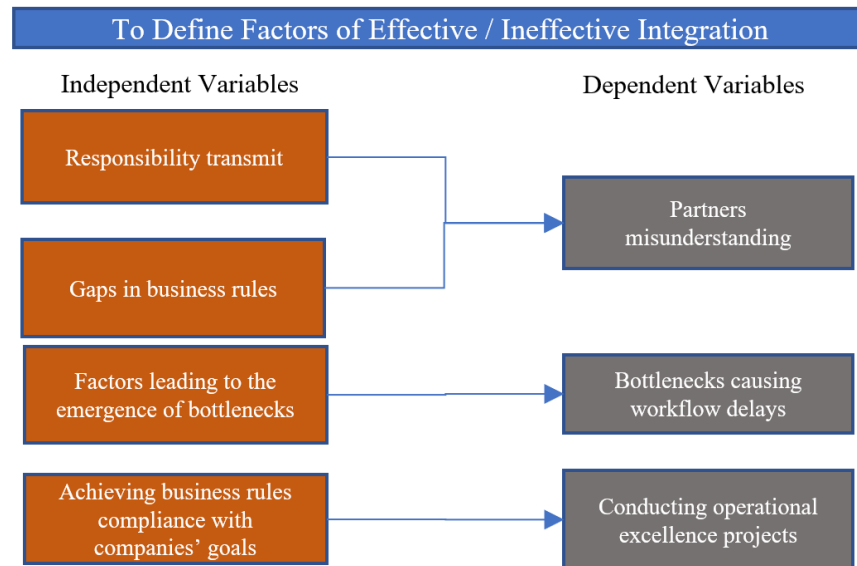


Figure 3.3: Variables for defining factors of effective / ineffective integration. Source: author's own elaboration.

The literature review confirms that the ability of the supply chain to adapt to external conditions and changes significantly increases resilience. Supply chain resilience describes the ability of a supply chain to overcome vulnerability (Heckmann, Comes & Nickel, 2015). It should be clarified how a timely response to deviations increases resilience, how the logic of business process implementation affects the quality of transfer of responsibility from one partner to another, and whether there is a relationship between partners' goals and the gap in business logic.

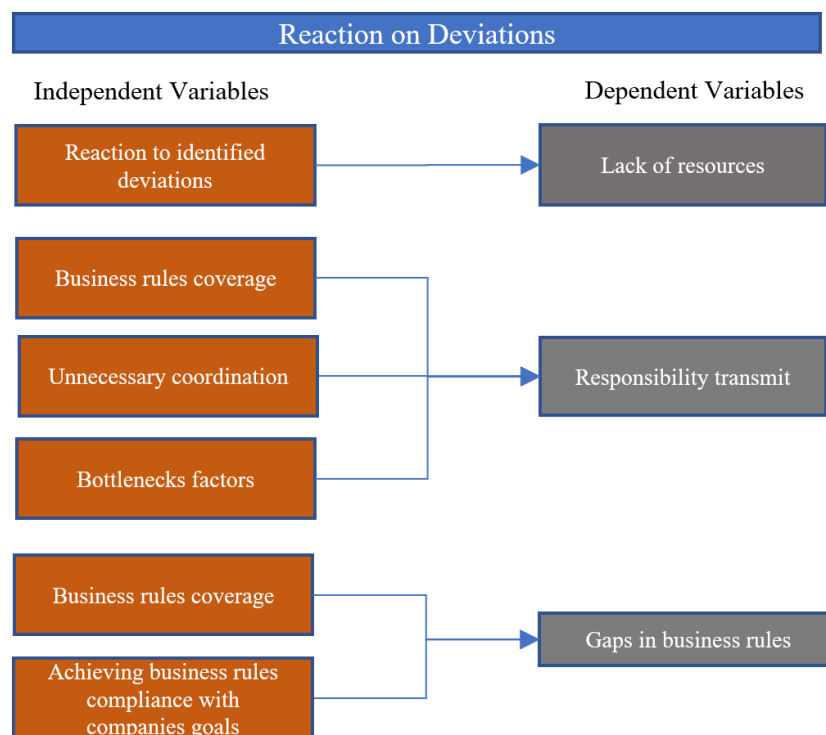


Figure 3.5: Variables for defining supply chain performance factors. Source: author's own elaboration.

Upon reaching target performance levels, companies are guided by the best indicators in the industry and try to increase the speed of operations, translate strategic priorities into operational activities, monitor costs, take into account market risks and improve the manageability of business processes. Performance measurement serves the purpose of several firms and requires the collection of data from many sources, the sharing of information with supply chain partners and collaboration with them on strategy implementation (Maestrini *et al.*, 2017). Thus, those factors which increase the efficiency of the supply chain should be empirically justified.

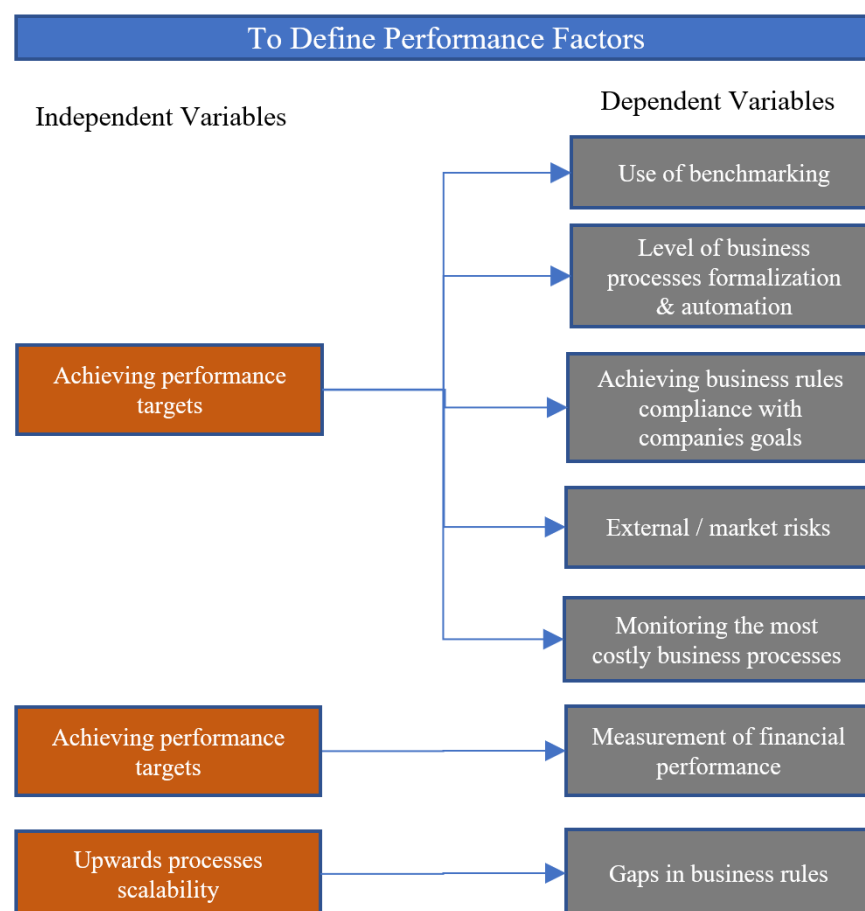


Figure 3.5: Variables for defining supply chain performance factors. Source: author's own elaboration.

Based on the literature review, matching the supply chain to customer requirements is a critical priority which determines the focus on reducing transaction costs and the amount of time spent on improving quality. Supply chain strategy specifies the goals of the supply chain; it determines the overall focus of the supply chain with respect to cost and

responsiveness (Tarafdar & Qrunfleh, 2017). It is necessary, therefore, to clarify how this critical priority relates to value creation for the client in the long term.

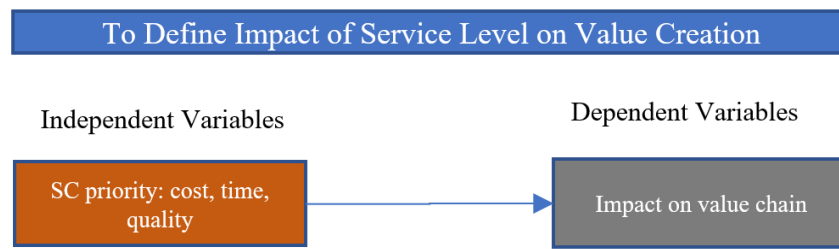


Figure 3.6: Variables for defining impact on value creation. Source: author's own elaboration.

The formed approaches to the analysis of operational attributes, as well as the formation of independent, dependent and moderated variables for conducting a detailed analysis will be considered in this study below.

3.5.Strategic attributes

By integrating the theoretical approaches discussed earlier, it is possible to assess the priorities of the supply chain, identify stakeholders, understand how to build optimal business processes, evaluate the benefits of integrating partners in the supply chain, and form the basis for change. Moreover, a systematic, strategic coordination of the traditional business functions within a supply chain maintains the improvement of the long-term performance of individual companies and the supply chain as a whole (Maestrini *et al.*, 2017).

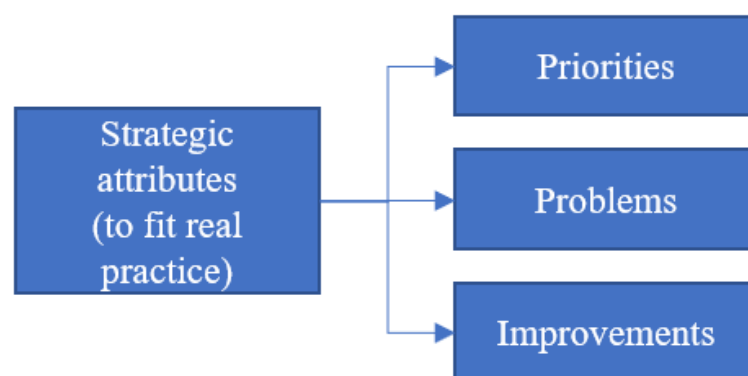


Figure 3.7: Strategic attributes. Source: compiled by the author.

There is a need to expand understanding of strategic attributes based on real practice and to reveal their practical specifications.

3.6. Summary of the chapter

This chapter provides an explanation of the formation of the conceptual framework, its components and its relationships. By being an analytical tool, the conceptual framework is an important part of the study and is the basis on which a methodology should be developed, and a subsequent analysis carried out. The generated conceptual framework is the starting point for this study.

CHAPTER 4. METHODOLOGY

4.1.Introduction

This chapter describes the methods used to conduct this study. The methodology is the way in which a researcher conducts their research, choosing how to deal with a particular question (Jonker and Pennink, 2010). The methodology defines how one will go about studying any phenomenon and includes choosing which cases to study, methods of data gathering, forms of data analysis, and so on, in planning and executing a research study (Silverman, 2013).

In this chapter, the procedure for testing hypotheses based on a literature review is described in detail. The rationale for using positivism and interpretivism is explained, and the subsequent use of the mixed research method, based on quantitative and qualitative research, is carried out. The results of the study are used to formulate the requirements for the supply chain business process model. The chapter concludes with a discussion of the ethics of conducting the study, how the results of the study will be used, and the unified approaches for analysing the data obtained are developed.

The purpose of this chapter is to give an understanding of how the data was collected, as well as to describe its sources, and determine the time horizons of the study and approaches to the data analysis. The hypotheses that were formed on the basis of the literature review were tested in accordance with the chosen methodology. This chapter discusses in detail the research philosophy, in accordance with which the research methods were formed, and includes a description of the advantages and disadvantages.

4.2.Research philosophy

The concept of a “philosophy” of the study is quite multifaceted. Saunders *et al.*, (2009) give the following understanding of research philosophy they describe it as an overarching term that relates to the development of knowledge and the nature of that knowledge with regard to particular research (Saunders *et. al.*, 2009). This is primarily due to the critical assumptions of how researchers cognize the world and form assumptions about the order of things in it. Based on this, the methods and strategy of the study were determined. How the results will be analysed depends on the chosen research methods, since the same results can be interpreted in different ways.

4.2.1. Ontology and epistemology

Saunders *et al.* (2009) suggested that ontology and epistemology are two major ways to think about research philosophy, and these are often used in the social science context (Saunders

et. al., 2009). Ontology is concerned with the nature of reality (Saunders, Lewis & Thornhill, 2016); it is inextricably linked with the study of being, and the questions are what is the reality surrounding us and how much of it is objectively and independently perceived by people. Ontology is a philosophical belief system about the nature of the social world (Creswell and Creswell, 2017). To a greater extent than epistemological considerations, this raises questions about the assumptions that researchers have made regarding the way the world operates and their commitment to particular views (Saunders, Lewis & Thornhill, 2016). In other words, ontology can be characterized as identifying a person's place in the world surrounding them. Ontology forms knowledge by studying various phenomena and facts. All sorts of discussions on ontology have been ongoing for many years and are based on issues of objectivity and subjectivity. From the point of view of objectivity, the surrounding reality is independent, while subjectivity is based on the fact that the surrounding reality is formed by the imagination of people and their experience, and on the basis of the phenomena they interpret.

Epistemology studies the relationship between object and subject, the ratio of the acquired knowledge of the surrounding reality, the abilities and opportunities surrounding that knowledge, as well as obtaining true and reliable knowledge. Epistemology concerns what constitutes acceptable knowledge in a field of study (Saunders, Lewis & Thornhill, 2016). It is based on a person's attitude to the surrounding reality and is a part of philosophy that deals with the origin, limitations and core essentials of knowledge (Eisend and Kuss, 2019). Continuing this discussion, it should be further noted that this approach should be considered as the philosophy of knowledge, especially with regard to its methods, validity, nature, sources, limits and scope (Jonker and Pennink, 2010).

These concepts are important for understanding the world as a whole because they determine the essence and basis of philosophical world views, form an understanding of a person's place in their surrounding reality.

An epistemological approach was chosen in order to generate new knowledge based on the study and analysis of any problems arising from it. The present study focuses on the formation of a model of optimization of business processes in the supply chain, in connection with which the choice of the epistemological approach will be aimed at identifying and analysing problems, which is fully consistent with the objectives of the study.

The process of cognition of the world is based on philosophy, since knowledge consists of both individual claims and the links between them and, hence, must be expressed through arguments and explanations (Allen, 2004). The methods of cognition move either from the

general to the particular, or from the particular to the general. Most often they are opposed to each other and are based both on intuition and on the logic of reasoning. Induction builds evidence depending on the weight of evidence (Allen, 2004), while deduction applies the logical rules to prove the truth (Eisend and Kuss, 2019). Providing a justification for the fundamental differences between these reasonings, it should be noted that induction deals with drawing conclusions from data and observations and is the primary logical method upon which science is based (Pruzan, 2016).

At the same time, the abductive approach is aimed at trying to find a simple explanation for what is happening, at interpreting or re-contextualizing individual phenomena within a contextual framework (Danermark, 2005); it assumes the existence of possible alternative causes (Moroşan, 2014). Abductive reasoning helps the researcher to understand the reality by using one or more events that are filtered through the statements already known to the scientific community and may be linked to those situations, in order to find the best explanation for their occurrence (Moroşan, 2014).

	Induction	Deduction	Abduction	References
Major features	Induction is reasoning from specific cases to a general conclusion.	Deduction is a form of reasoning from general rules to specific premises.	Abduction is concerned with the particularities of specific situations and assumes the existence of possible alternative causes.	(Allen, 2004) (Danermark, 2005). (Moroşan, 2014).
Distinctions	Induction creates new knowledge; induction is knowledge-expanding.	Deduction transfers already existing general knowledge to corresponding more specific cases.	Interprets or re-contextualizes individual phenomena within a contextual framework by using one or more events that are filtered through the statements already known.	(Eisend and Kuss, 2019). (Danermark, 2005). (Moroşan, 2014).

Table 4.1: Reasoning methods comparison. Source: compiled by the author.

4.2.2. Research methods

The choice of a research method depends on the context and depth of both the studied problems and phenomena. There are two types of research: qualitative and quantitative.

Various methods are used to analyse the collected data, which allow researchers to best understand the problem or subject area.

Qualitative research is based on the collection of various data: personal experience, various life situations, observations, interviews, and so on. Qualitative research is any type of research that produces findings not arrived at by statistical procedures or other means of quantification (Cassell, Cunliffe & Grandy, 2018). In this way, qualitative data analysis is all about identifying themes, categories, patterns, or answers to one's research questions (Merriam and Tisdell, 2017). When choosing a research method, weaknesses should certainly be evaluated. During the interview, fairly complete information about the research problem can be obtained; this information will, however, be reliable and objective only from the point of view of the interviewee. In confirmation of this, some author's try to distinguish between qualitative and quantitative research, the nature of evidence generated or compiled and the method of processing evidence (Mukherjee, *et al.*, 2018).

Quantitative research, should begin by establishing a set of variables and methods (often using already existing, proven measures) (Silverman, 2013). At the same time, quantitative studies are based on a collection of data that is subject to analysis by using statistical and mathematical methods. The quantitative research process is deductive; it is theory driven and starts and ends with theory (Stockemer, 2019). At the same time, data arrays can be generalized and analysed in order to find patterns fairly quickly; they can, however, be less accurate since respondents follow a predetermined logic when completing surveys and, at the same time, may not express their opinion, which may contain the most important details for the researcher. By using statistics, quantitative methods help to determine relationships between two or more variables (Stockemer, 2019).

When expressing the strengths of the quantitative method, it should be mentioned that collecting a large amount of data is less resource-intensive than doing so with a qualitative study. Qualitative research allows acquiring the necessary details at a fairly deep level, which gives an understanding of the occurring phenomena. Mixed methods designs are those that include at least one quantitative method designed to collect numbers and one qualitative method designed to collect non-numeric data (Cassell, Cunliffe & Grandy, 2018).

	Qualitative research	Quantitative research	Mixed method	References
Features	•All about identifying themes, categories, patterns, or answers to research questions.	•Is purely scientific, justifiable, precise and based on facts and often	•The logic of inquiry may include the use of induction,	(Merriam and Tisdell, 2017). (Jonker and Pennink, 2010).

	• Regarded as ‘messaging around’, being ‘vague’, not scientific and not following a structured plan.	reflected in exact figures.	deduction, and abduction. • Allows researchers to further examine constructs at a “deeper” level.	(Creswell and Creswell, 2017).
	• Approach for exploring and understanding the meaning that individuals or groups ascribe to a social or human problem.	• Approach for testing objective theories by examining the relationship among variables.		
Limitations	• Poor distinction between diagnosis, design and change. • Lack of an explicit theoretical framework, concept or model at the start of the research. • Problematic relationship with a classical research design. • Character of qualitative data – ‘difficult to revise’. • Explicit acknowledgement of the researcher’s subjectivity. • Low applicability of ‘classical’ methodological criteria, in order to assess results.	• Examines a ‘reality’ that is detached from the one in which ‘real’ people live. • Meticulously adheres to a strict methodical approach that does not leave any margin for unexpected developments in the field. • Works with a conceptual model that is methodically and technically sound, but does not provide information about the actual phenomenon.	• Time consuming & expensive. • Difficult finding a researcher with experience in both qualitative and quantitative research. • Researcher has to learn multiple methods and to know how to mix each method effectively. • Methodological purists believe that a researcher should choose either the qualitative or quantitative paradigm.	(Jonker and Pennink, 2010). (Johnson & Onwuegbuzie, 2004).

Table 4.2: Research methods comparison. Source: compiled by the author.

4.2.3. Research paradigm description

A methodology indicates the main research path, but without specifying the individual steps (Jonker and Pennink, 2010). The formation of the research methodology is based on a theoretical perspective, which in turn is formed on philosophical worldviews as a general philosophical orientation about the world and the nature of research that a researcher brings to a study (Creswell and Creswell, 2017).

The research paradigm answers the question, “How will the study be conducted”? Saunders *et al.* (2009) distinguish three categories of research paradigm: positivism, post-positivism and interpretation. The most suitable approaches for research purposes are positivism and

interpretation. The methodology of positivism is based on the fact that many phenomena and factors in the surrounding world have common patterns that can be explained by the researcher. The objectives of the study, in this case, are not only to find these patterns, but also to verify their relationship empirically. The academic approach to cognition is based on facts and, therefore, these facts must be verified and measured in practice. In positivist, qualitative research, the input of the research process typically consists of a variety of data, especially unstructured data (Cassell, Cunliffe & Grandy, 2018). It should be noted that positivism and post-positivism are most often associated with quantitative research methods. For a long time, positivism has been the best method for conducting sociological research, which aims to study people and a major paradigm of academic inquiry, and represents a basic worldview collectively held by a community (Cassell, Cunliffe & Grandy, 2018). Interpretation is used to interpret the explanation of the research results obtained and is usually used in qualitative methods of interview research, observation, text analysis, and so on.

The table below shows the main philosophical worldviews: positivism, realism, interpretivism and pragmatism (Saunders *et al.*, 2009).

Philosophical worldviews	Features	References
Post-positivism	Involves making and testing claims, including identifying and testing causal relationships.	(Creswell and Creswell, 2017).
Interpretivism (or constructivism)	Relies as much as possible on the participants' views of the situation being studied.	(Edmonds and Kennedy, 2016).
Pragmatism	Arises from actions, situations and consequences Uses all of the available approaches to understand the problem.	(Edmonds and Kennedy, 2016).
Realism	Based on objects having an existence independent of the human mind.	(Saunders <i>et al.</i> , 2009).

Table 4.3: Philosophical worldviews. Source: compiled by the author.

Consideration of positivism as an approach to research should pay attention to its fundamental difference from interpretivism. Objective reality is a reference point of positivism, regardless of human perception. Interpretivism, in turn, draws attention to a reality in which there are many interactions and actions that can be understood by explaining their logic and motives. At the same time, people form reality on the basis of their internal needs, which accordingly determines the dependence of reality on people's consciousness.

Nevertheless, positivism should not be regarded as an alternative to interpretivism but as an approach that can complement and enrich it. The use of quantitative data to establish patterns and other laws allows the researcher to more accurately form the representation and order of relationships in objective reality.

Based on the objectives of the study, both approaches should be considered as a theoretical perspective. Interpretivism should be used to solve the problems of research in terms of the formation of ideas about the priorities, problems and improvements which are extracted from real practice. Positivism is the basis for an empirical study based on quantitative data that will reveal patterns in the relationship between partners in the supply chain. By using both quantitative and qualitative approaches, therefore, mixed methods researchers necessarily embrace and draw on the very different assumptions guiding both practices (Leavy, 2017).

4.3. Research strategy

In order to obtain high-quality results, it is necessary to carefully study the research strategy. The research strategy is part of the methodology, which indicates the way (or route) that the researcher will need to take in order to achieve a certain result (knowledge, insight, design, intervention, solution) (Jonker and Pennink, 2010). The purpose of choosing a strategy is to ensure compliance with the conceptual framework, in order to substantiate the research methods used. It is necessary to evaluate the advantages and disadvantages of qualitative and quantitative research methods and find the most optimal option.

As noted earlier, the research paradigm determines the choice of research method. In the scientific world, there is a large number of discussions about what research methods should be applied depending on a particular specificity. As noted above, triangulation significantly improves the quality of the interpretation of the results and, accordingly, the achievement of the most complete compliance with the goals and objectives that were set before the study. By combining several lines of sight, researchers obtain a better, more substantive picture of reality; a richer, more complete array of symbols and theoretical concepts, and a means of verifying many of these elements (Berg and Lune, 2017). Quantitative methods are quite effective, because they describe the facts, revealed patterns and are the primary tool to establish empirical relationships (Stockemer, 2019). Quantitative methods are largely effective and objectively evaluate phenomena and events, covering a large array of data; they cannot generate new theories, but can only be used to verify them. They are less well-suited to explain the constituents or causal mechanisms behind a statistical relationship (Stockemer, 2019).

By understanding the strengths and weaknesses of the above research methods, the researcher can achieve synergy from the use of both approaches – a mixed type of research, where the strengths of each of the methods complement each other. This approach is called triangulation, i.e., using more than one data collection method, multiple sources of data, multiple investigators, or multiple theories, and is a powerful strategy for increasing the credibility or internal validity of the research (Merriam and Tisdell, 2017). Moreover, the weaknesses of each method are de-activated owing to the synergy of using the strengths of both methods. The combination of these approaches is the most justified for the present study.

Mixed methods based on quantitative and qualitative research have a strong component because they contain both induction and deduction. In induction, premises provide support for the conclusion or inference made on the basis of evidence, while in deduction, the conclusion is warranted by the premises. (Mukherjee, *et al.*, 2018), i.e., the transition from general to particular or from particular to general; a generalization of different points of view from different positions for visualization and the formation of the most complete and accurate picture of what is happening. The overall purpose of mixed methods is providing a better understanding of research problems and complex phenomena (Cassell, Cunliffe & Grandy, 2018).

The strategy of this study is based on both quantitative and qualitative methods, where hypothesis testing is used, which involves determining the optimal mechanism and increasing the effectiveness of integration between partners in the supply chain. Using a mixed methods approach allows the researcher to take advantage of inductive reasoning based on qualitative research and then complement the deductive reasoning study based on quantitative research.

In the literature review, it has been shown that the effective management of business processes of the supply chain is a relevant and useful topic for many researchers. Research questions were developed that aim to cultivate the most appropriate business process model for the International supply chain. The business process model is based on one of the best practices and takes into account both positive experience and achievements. There are many approaches to improving the efficiency of communication with supply chain partners, but the applicability of the different approaches should be evaluated from a practical point of view. To do this, it is necessary to collect different points of view from both partners and managers of the focus company by conducting surveys and semi-structured interviews. For these purposes, a semi-structured interview was conducted and aimed at extracting priorities,

problems and improvements from real practice, which ultimately allows for the formulation of requirements for the development of business process models, in order to correspond to the requirements of real practice in the best way.

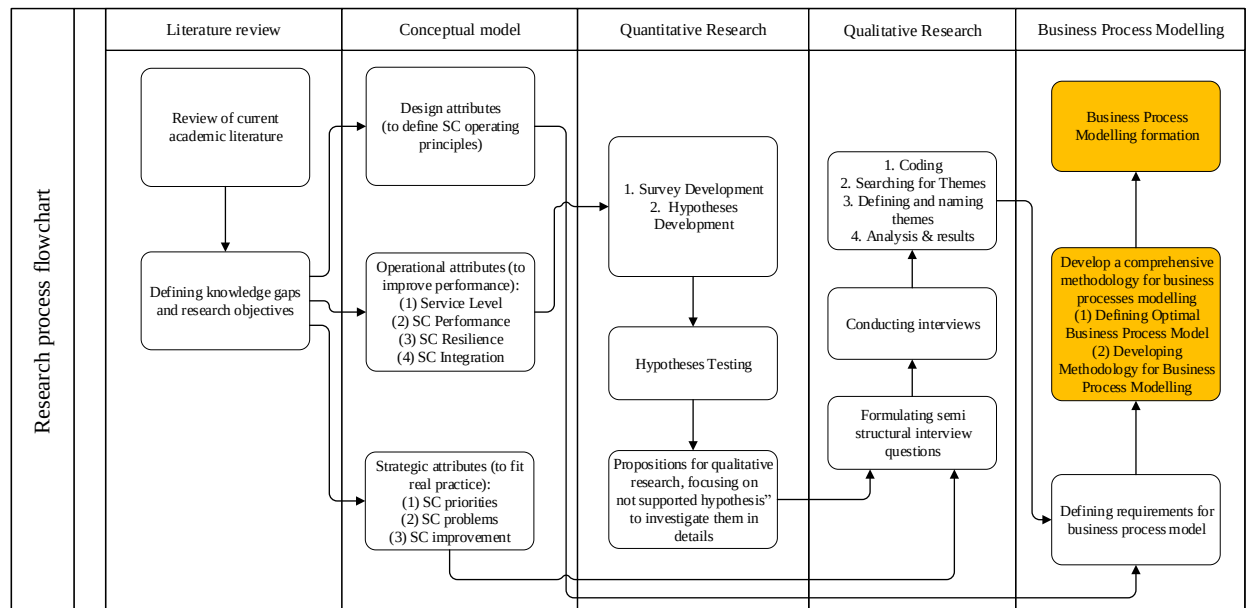


Figure 4.1: Research process flowchart. Source: compiled by the author.

4.4. Research design

To achieve the goal of the study, it is necessary to determine the type of study design. A research design is the overall plan that describes the study type, the data collection approaches, as well as the experimental designs and statistical approaches for data samples (Bairagi and Munot, 2019). A large number of factors can influence the choice of research design, including the type of problem being studied, features of data collection methods, the timing of the study, and the goals and objectives of the study. Thus, there is a need to adhere to the creation of a flexible set of guidelines that connect theoretical paradigms to strategies of inquiry and methods for collecting empirical material (Jonker, J. and Pennink, B., 2010).

The following are the main types of research design:

Type of research design	Key features	References
Exploratory	Begins by exploring with qualitative data and analysis and then uses the findings in a second quantitative phase.	(Creswell and Creswell, 2017).
Explanatory	Appeals to individuals with a strong quantitative background or from fields relatively new to qualitative approaches.	(Creswell and Creswell, 2017).

Descriptive	Is used to explore the status of certain phenomena and to describe what exists with respect to the individual, group or condition.	(Edmonds and Kennedy, 2016).
Causal	Comparing two or more groups in terms of a cause (or independent variable) that has already happened.	(Creswell and Creswell, 2017).

Table 4.4: Research designs comparison. Source: compiled by the author.

Based on the analysis of the above designs, it should be noted that the objectives of this study determine the choice of design type. Quantitative research, based on the formation and testing of hypotheses, is aimed at establishing and explaining the relationship between a variety of variables. On this basis, quantitative research has the characteristics of explanatory research in terms of determining the relationships and dependencies in the integration of supply chain partners. Qualitative research has the characteristics of descriptive research, since it describes existing priorities, problems, and improvements that are extracted from real practice. Thus, research design is based on quantitative and qualitative research. The approach chosen allows the fullest possible use of the positive aspects of the selected research methods at all stages. The choices that the researcher has made are based on research questions, theories and methodology (Jonker and Pennink, 2010).

4.5.Data collection method

Typically, data collection methods for research are divided into three types of tools: conducting interviews, filling out survey forms and participant observation. The following is a description of data collection methods' tools, including their strengths and weaknesses.

4.5.1. Participant observation

Observation is one way to verify the accuracy of the information that was collected for the study by participating fully in people's lives and activities and, thus, becoming a member of their group or organisation while attempting to learn about their symbolic world (Saunders *et al.*, 2009). Considering the fact that the researcher is part of the management team of the focus company, a good opportunity was available for formulating most of the questions in advance that were most appropriate to the research context and the external environment of the company.

In addition, the researcher had the opportunity to ask accurate and leading questions to interviewees that most fully revealed the subject of the study.

Of course, this method has its weaknesses, and it should be noted that sometimes participants can exhibit aspects of behaviour to the researcher that are not part of their everyday behaviour. To minimize the risks of obtaining inaccurate information, the researcher tried to double-check the information received from a large circle of managers and participants in the supply chain, including during the interview period, by asking questions. This can be considered as a “confrontational interview” i.e., a tactic to obtain information by confronting or challenging interviewees (Taylor, Bogdan and Devault, 2016).

4.5.2. Survey

Surveying is a popular tool in many areas of science and business. Due to its simplicity, the researcher quickly received structured information from the respondents; a survey should include as many questions as are necessary and as few questions as possible (Stockemer, 2019). In addition, this method significantly saves the researcher’s time by obtaining a large amount of data in a relatively short time. Moreover, the surveys are focused and addressed directly to the target audience, from which it is necessary to obtain answers. Close-ended questions lead to the acquisition of more accurate data and a more definitive analysis (Yin, 2016). For these purposes, a Likert scale is most often used, which makes the assumption that attitudes can be measured (Stockemer, 2019). With a close-ended question, the researcher establishes to what degree there appears to be a problem (Jonker and Pennink, 2010).

The disadvantages of the survey include the fact that when using closed questions, the respondent cannot always choose the right one, since the correct answer from the point of view of the respondent may simply be absent. In addition, the respondent may not understand the meaning of the question, casting doubt on some of the wording, or may consider that the question was not asked entirely correctly. Of course, not all questions developed by the researcher can be understood by a respondent or fully reveal meaning which is immediately clear; in addition, they might not contain all of the details necessary for a respondent.

When forming the survey, attention should be paid to the formulation of questions. “What” questions refer to exploratory research, which is a larger, more comprehensive investigation (Berg and Lune, 2017), while questions beginning with “how” refer to explanatory research for conducting causal studies or otherwise pursuing an inferential research question (Berg and Lune, 2017). Both types of questions are aimed at understanding the functioning of phenomena that are present in the subject or phenomenon being studied.

4.5.3. Semi-structured interviews

A semi-structured, qualitative research interview is performed in order to obtain descriptions of the life world of the interviewee for interpreting the meaning of the described phenomena (Denzin and Lincoln, 2018). The importance of semi-structured interviews for conducting a study is considerable. Interviewing provides access to the context of people's behaviour and, thereby, provides a way for researchers to understand the meaning of that behaviour (Seidman, 2013). This type of interview is prepared by formulating a certain number of open-ended questions where there is no predetermined logic, where the respondent has the opportunity to answer a question, and where interview responses are to be treated as giving direct access to 'experience' or as actively constructed narratives (Silverman, 2013).

Qualitative research helps to convey to the researcher his/her point of view with the indication of a large number of details that can often be absent during quantitative research. This type of interview involves the implementation of a number of predetermined questions and special topics (Berg and Lune, 2017). As the preparation for the interview takes place, the choice of the field of scientific interests, the structuring of questions, and the dynamics of the conversation may vary depending on the information received from the respondent; the interviewers are allowed freedom to digress and to probe far beyond the answers to their prepared, standardized questions (Berg and Lune, 2017).

The researcher may ask additional questions, may clarify some details that require additional disclosure and may raise new topics that might be related to previous questions; the researcher has the right to omit some pre-prepared questions depending on the context of the interview and the respondent, as interviewing is necessary when behaviour and feelings cannot be observed (Merriam and Tisdell, 2017).

4.5.4. Research tools selection and justification

To achieve the goal of the study in a limited time frame, it is necessary to conduct a survey among employees of the focus company and partner companies in the supply chain. The most suitable tool for implementing these tasks is to conduct a quantitative study based on a survey. In addition, during the survey, in order to save time and maximize the respondent's concentration, a semi-structured interview is supposed to be conducted. Thus, in order to carry out a data collection, owing to existing time restrictions, it is necessary to conduct meetings and to combine the data collection of quantitative and qualitative research by completing a survey and asking questions in a semi-structured interview.

Research tool	Description	References
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Participant observation	Attempting to learn about people's symbolic world by participating fully in people's lives and activities and thus becoming a member of their group/ organisation.	(Saunders <i>et al.</i> , 2009).
Survey	Quickly receiving structured information from respondents; a survey should include as many questions as are necessary and as few questions as possible.	(Stockemer, 2019).
Interview	Obtaining descriptions of the world of the interviewee in order to interpret the meaning of the described phenomena.	(Denzin and Lincoln, 2018).

Table 4.5: Research tools comparison. Source: compiled by the author.

Participant observation was used as a tool for collecting data, since the author of the present study is an employee of the focus company and has the opportunity to observe events which are directly related to the research topic. This significantly increases the reliability of the data obtained from the interviews and also allows gaining a deeper understanding of current events; it improves the quality of data collection and interpretation, and facilitates the development of new research questions or hypotheses (DeWalt & DeWalt, 2002).

This study aims to clarify factors that are relevant to effective integration. Priorities of partners in the supply chain have a significant impact on the effectiveness of integration since, upon reaching their interests, the partner can significantly reduce the effectiveness of the entire supply chain.

4.5.4.1. Survey development

The search for factors contributing to the effectiveness of integration is supposed to be carried out by conducting a quantitative study based on the survey. In this regard, there is a need to justify the structure and content of the survey. Based on the previously generated

operational attributes which consist of four constructs in the literature review (service level, resilience, efficiency, integration), it is necessary to develop an understanding of how it is necessary to correlate their own priorities and the priorities of the remaining partners in the supply chain. Despite the fact that this factor is relatively well disclosed in previous studies, it should be noted that it is necessary to clarify the impact of partner goals on the value chain in the supply chain. Achievement of target indicators by each partner is a significant factor, which creates the need for their continuous monitoring and timely decision-making in case of deviations. It should be understood how the goals of the partners correspond to the requirements of the supply chain, to information gaps that may occur, and whether or not there are conflicting business rules, as well as redundant steps. All of this determines the need for checking the actual state of business processes and accordingly encourages the researcher to develop new measures to study the factors of effective integration in terms of achieving target values, eliminating information gaps, studying the problems of scaling the supply chain, identifying bottlenecks, identifying main cost-drivers, information exchange and conflicting business logic which reduce the effectiveness of interaction. For these purposes, it is necessary to identify the dependencies and patterns that determine not only the effectiveness of integration, but also the effectiveness of the supply chain, in terms of the ability to cope with emerging problems, challenges, deviations and, at the same time, contribute to the implementation of strategic priorities. The above statements demonstrate that the effectiveness of the integration of partners in the supply chain is both a complex and not fully explored phenomenon.

A survey was based on the guidelines for BPM CBOK³ for auditing business processes³. All the questions included in the survey were closed questions. Some of the questions were presented in the form of a Likert scale, which assesses the degree of agreement or disagreement. The survey consists of 29 questions, united under the following headings: the company's business context, performance metrics, the transfer of responsibility, business rules, performance bottlenecks, costs, and integration of partner business processes along the supply chain. These sections were combined in such a way that it was possible to identify bottlenecks in business processes throughout the supply chain and determine the potential for efficiency gains. Previously, the survey was tested on managers of the focus company, who gave their recommendations for its improvement. Each subject was given the name of the corresponding variable.

³ Business Process Management Common Body of Knowledge developed by ABPMP International - a guidance for business process practitioners.

Based on the literature review, a survey designed to suit the previously formed requirements in order to achieve the objectives of the study. The survey consists of several sections.

Survey section description	Literature review outcomes relevance
Business context: The impact of the activities of the unit or partner of the company on the value chain to indicate risks that may impair performance, as well as how quickly it will be possible to adapt when they occur.	The basis for this section are stakeholder theory and supply chain priorities, which provide an understanding of the interrelationships of goals and interests of partners to create value for the customer.
Performance metrics describes: Achievement of target indicators, how they are measured, what kind of reaction is provided for deviations, how often and continuously their measurements occur.	Performance as an operational attribute forms an idea of the influence of emerging deviations in the supply chain and their elimination.
Transfer of responsibility This section is aimed at identifying information gaps, bottlenecks and determining how control is exercised.	Integration and resilience, as operational attributes, bring clarity to the understanding of partners' interaction and processes logic, but they should be clarified and supplemented on the basis of real practice.
Business rules: This section is aimed at identifying the level of business logic coverage, identifying contradictions and ambiguities, matching business rules to the goals of the company, as well as identifying redundant steps that should be eliminated.	
Productivity: The possibilities of scaling business processes or increasing costs while decreasing volumes, as well as how work is done with delays in the supply of resources.	Resilience and service level, as operational attributes, describe the ability of the supply chain to cope with deviations and meet customer requirements, while determining the ability of the supply chain to scale up and down without affecting the fulfilment of customer requirements and, at the same time, being cost-effective.

Bottlenecks: This section is aimed at identifying factors that lead to bottlenecks, identifying restrictions, the effect of inefficient communications on bottlenecks, and the ability to eliminate bottlenecks without significant financial investment.	Achieving effective integration and the required service level as operational attributes indicates the need to eliminate bottlenecks while avoiding cost increases. This will enable the supply chain to increase its competitiveness.
Costs: This section is aimed at understanding whether costs correspond to the best industrial international standards, the possibility of reducing them through automation, determining which costs can be optimized in the first place, the dynamics of cost increase / decrease, and also where budget overruns most often occur.	Performance, resilience and the service level as operational attributes focus on finding ways to reduce costs through various kinds of improvements and benchmarking, in order to continuously meet customer requirements with a simultaneous focus on sustainability and efficiency.
The business process integration: This section is aimed at creating understanding about the integration of information systems between partners in the supply chain: and the level of formalization of requirements for business processes in the supply chain.	Supply chain structure and integration as an operational attribute determines the need for a density of information exchange between partners and the establishment of requirements for a high-quality transfer of responsibility from one tier of partners to another.

Table 4.6: Survey sections description. Source: author's own elaboration.

4.5.4.2.Semi-structured interviews, questions and structure

The results of a quantitative study should be supplemented and verified by conducting a qualitative study by using two independent sources of data or data collection methods to corroborate research findings within a study (Saunders *et al.*, 2009). Questions for a semi-structured interview are also based on the findings of the literature review, which described the main problems of the supply chain, as well as priorities and improvements. Based on this, the formation of questions requires focusing on extracting from real practice and constantly arising problems that reduce the effectiveness of the supply chain, the priorities that partners set for themselves, as well as the improvements that they currently carry out or

plan to carry out. The combination of these factors is a reflection of real practice for their subsequent analysis and the establishment of the relationship between priorities and problems will help to better understand the cause of systemic deviations, analyse current improvement and formulate requirements for business process models.

4.5.4.3.Triangulation of data collection methods

An essential point is the triangulation of data collection methods from several sources, for example, surveys, semi-structured interviews and participant observations. Such triangulation will contribute to the most complete and detailed study, as it strengthens reliability, as well as internal validity (Creswell and Creswell, 2017), maintains definition of factors of effective integration, identifying problems, and creating the optimal model of business processes for the supply chain.

When conducting a data collection, respondents are not required to provide any personal or confidential data that could compromise them in any way or call into question their activities. Thus, by structuring the methods of data collection and filling the structure of the survey and questions for a semi-structured interview, the present study becomes more focused, and forms the logic that permeates all of its stages until the results are obtained and they are subsequently analysed.

To conduct the study, each potential participant received an invitation to participate by e-mail. Two to three days after sending the invitation, each potential participant was interviewed by phone and given the opportunity to participate in the study. Upon receiving a positive response, participants were emailed with a participant information sheet, a survey and questions for a semi-structured interview. Signing the participant information sheet was obligatory. It should be noted that the study did not involve the respondents in disclosing personal data, and in each survey, the lines containing the first and last names of the respondent were excluded. Before completing the survey, each participant had the objectives of the study explained to them, as well as the essence of the questions for their complete and unambiguous understanding. The participant information sheet sample is attached at Appendix A. The business correspondence with partners regarding the research is attached at Appendix B.

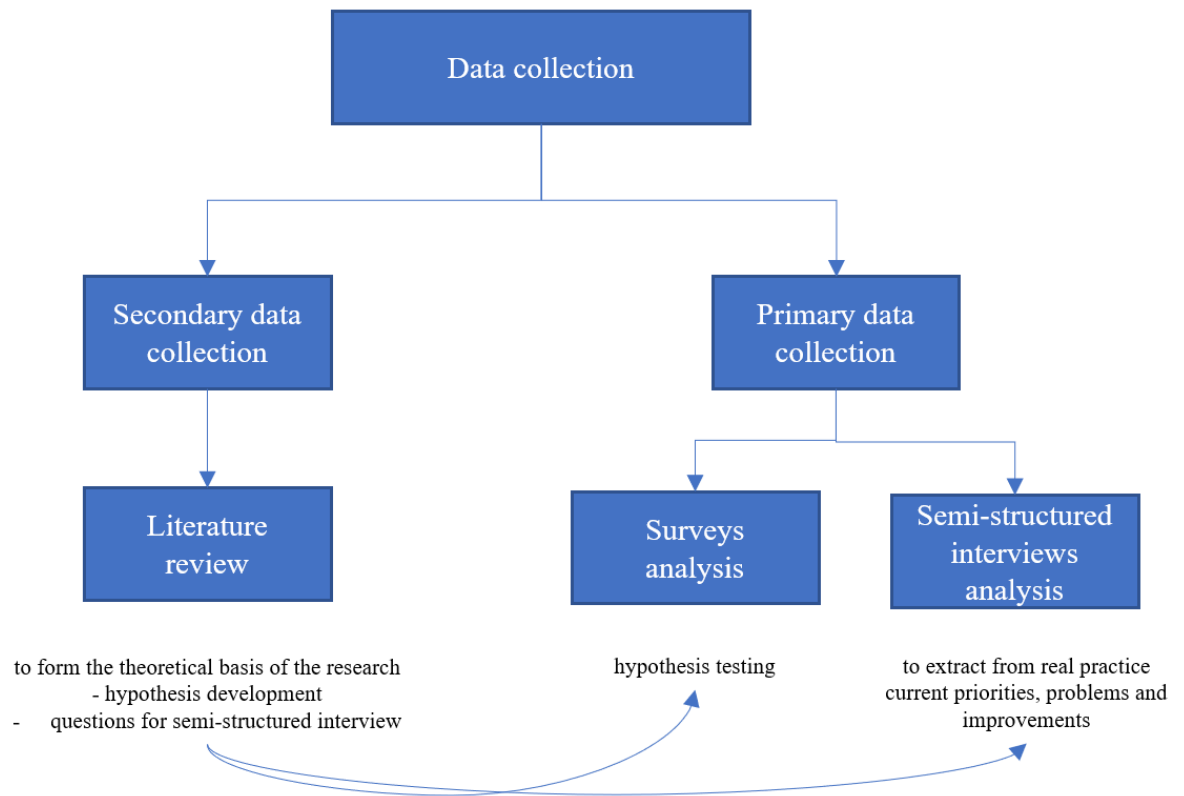


Figure 4.2: Data collection process map. Source: author’s own elaboration.

Despite the fact that the main goals and objectives of the study were indicated in the participant information sheet, before each interview, the researcher outlined the objectives of the study, the purpose of the interview, as well as outlining the main points that would be considered in the interview, explaining in detail the essence of each question so that the respondent was fully able to answer each question.

As noted earlier, the data array consisted of completed surveys to be processed in quantitative research and semi-structured interviews in qualitative research. The survey was conducted both during meetings with respondents and by telephone, followed by sending a scanned copy of the survey by email to the researcher. It was emphasized that it is highly undesirable to leave unanswered questions. To complete each form, the participant took about 30 to 40 minutes. After filling out the survey, a semi-structured interview was conducted with each respondent, lasting approximately 20 to 40 minutes. According to the results of the quantitative research, each respondent was provided with generalized feedback via e-mail, which contained the main conclusions without indicating the personal data of other participants. At the same time, the survey research involved the systematic collection of information from individuals using standardized procedures. (Stockemer, 2019).

4.6.Sample

A sample is a subset of the population that the researcher actually questions in order to gather data (Stockemer, 2019). The selection of the most suitable sample for the study is a rather complicated process and, therefore, it must be carefully and thoroughly examined; the selection of a sample that does not meet the requirements of the study may call into question the reliability of the results obtained. Moreover, the larger the number in the sample, the higher the likelihood of a representative distribution of the population (Jonker, J. and Pennink, B., 2010). Reviews of theories based on relatively large samples, therefore, are essential for decisions concerning the acceptance or rejection of hypotheses (Eisend and Kuss, 2019). It makes no sense, however, to analyse the entire population, since it is very laborious, and may cast doubt on the feasibility of the study; a good sample is a miniature version of the population of which it is a part—just like it, only smaller (Eisend and Kuss, 2019).

The target sample of the present research consists of representatives of the partners, for example, suppliers, transport companies, logistics operators who carry out the storage of products and delivery to consumers, as well as representatives of the focus company, for example, planning, logistics, manufacturing and procurement managers. The collected data from the sample aims at gaining information on the entire population (Stockemer, 2019).

4.6.1. Sampling technique and frame

Given that the number of partner companies in the supply chain is quite large, it is not advisable to conduct a survey of all companies. In this regard, there is a need for a survey of a specific target group which has expertise in a given area of interest (Stockemer, 2019). Thirty-seven representatives of various companies were surveyed. The respondents were senior managers, who possess the specifications of business processes implementation, of current gaps and the root causes of their appearance. Respondents are chosen based on purposive sampling within the segment of the population with the most information on the characteristic of interest (Guarte & Barrios, 2006):

- Planning, Procurement and Operational Logistics Departments, Director of supply chain management, Operations Director, Quality Director;
- Suppliers (equipment and materials);
- Production - plants / co-packers;
- Logistics 2/3PL operators;
- Transport companies.

The companies were selected on the Pareto principle (Simon, 2012) and constitute 20% of the most voluminous companies within the supply chain, which account for 80% of the volume of materials, finished goods, shipments and transportation for each mentioned function and the companies' participants. This sampling technique should allow the widest possibility of readers of the study to connect with what they are reading. (Seidman, 2013).

4.6.2. Sampling error

The difference between the sample value and the true value in the population is called the sampling error (Eisend and Kuss, 2019). The sample should reflect the largest number of characteristics of the population. The sampling error depicts the degree to which the results derived from a sample differ from the results derived from a population (Stockemer, 2019). The appearance of a sampling error is not expected in this study because, in order to achieve the high-quality results of the study, it is necessary to interview only the managers who work in large partner companies. Since the sampling error depends on the number of observations and the variability of the data (Stockemer, 2019), the selected number of respondents is sufficient to obtain quality results.

4.7.Data collection process

In preparation for the study, a list of partner companies was requested from the managers of the various departments of the focus company. At this stage, respondents were selected based on their level of influence on the supply chain, i.e., the provision of a large volume of deliveries of products or services. The uniqueness of products and services was also taken into account, as some partners have a special status and are 'one of a kind'. Once a draft survey was developed, it was necessary to check how many valuable questions it contained, could they be understood by the respondents and can be processed with the use of quantitative research methods.

Based on the feedback received, changes and adjustments were made to the survey. Given the specifics of the supply chain, managers who work directly with partners' representatives gave valuable recommendations on how to make the questions and their presentation more understandable for respondents. They emphasized incomprehensible points and substantiated why these words and phrases are incomprehensible. The goal of these activities was to identify issues, reflect or partially describe the situation in which the supply chain partners communicate, and fully cover all contexts of the relationships between supply chain participants, for example, business contexts, performance metrics, the transfer of responsibility, business rules, performance bottlenecks, costs and business processes

integration along the supply chain. The survey sample for quantitative research is attached at Appendix C.

The semi-structured interviews were divided into two types: those for managers of the focus company and those for managers of companies of the supply chain partners. In order for the respondents to be most open and provide the most truthful information, all interviewees were informed that the collected interview information would not be communicated or transferred to third parties, including the managers and competitors of supply chain partner companies. Semi-structured interviews can make better use of the knowledge-producing potentials of dialogues (Denzin and Lincoln, 2018). In order to save information in the most complete form, each interview was recorded on a voice recorder. Recorded interviews must be transcribed, corrected and edited before being indexed (Berg and Lune, 2017). Previously, written consent was received from each participant to use the information collected during the interview, as well as consent to the audio recording. The purpose of the interview is to identify gaps and the potential for improving the supply chain.

Below there is a list of participants in the study with an indication of companies, positions and type of research: quantitative and qualitative.

Respondent number	Respondent position	Company	Type of company	Survey	Semi-structured interviews
1	Director of supply chain management	IDS Borjomi Russia	Focus company	+	+
2	Regional Operations Logistics Manager East	IDS Borjomi Russia	Focus company	+	-
3	FEA Manager	IDS Borjomi Russia	Focus company	+	-
4	Head of Planning	IDS Borjomi Russia	Focus company	+	+
5	Head of Project Department	IDS Borjomi Russia	Focus company	+	+
6	Head of Analytics	IDS Borjomi Russia	Focus company	+	+
7	Regional Operations Logistics Manager West	IDS Borjomi Russia	Focus company	+	+
8	Head of Procurement	IDS Borjomi Russia	Focus company	+	+
9	Quality Director	IDS Borjomi International	Focus company	+	+
10	Head of Transport Logistics	IDS Borjomi Russia	Focus company	+	+
11	Key Account Manager	Resilux Distribution	Partner (Supplier)	+	+
12	Key Account Manager	Logistics company VESTA "	Partner (Transport provider)	+	+
13	CEO	Garant Trans Express	Partner (Transport provider)	+	+
14	Key Account Manager	ITECO Russia	Partner (Transport provider)	+	+
15	Sales Director	PlastiForm	Partner (Supplier)	+	+
16	Key Account Manager	L-Trans	Partner (Transport provider)	+	+
17	Production Manager Kostroma	IDS Borjomi Russia	Focus company	+	+
18	Operations Director	Lematon Packing Ltd.	Partner (Supplier)	+	+
19	Key Account Manager	Manuli Stretch	Partner (Supplier)	+	+
20	Head of Key Account Department	DENTRO	Partner (Transport provider)	+	+
21	Logistics Director	EUROPARTS	Partner (Transport provider)	+	+

22	Head of Key Account Management	KRAFTER-CFA	Partner (Transport provider)	+	+
23	Deputy of Sales Director	Retal AO	Partner (Supplier)	+	+
24	Head of Key Account Department	EUROPLAST TD OOO	Partner (Supplier)	+	+
25	Project Manager (Quality)	IDS Borjomi Russia	Focus company	+	+
26	Deputy Director	HAT	Partner (3PL-provider)	+	+
27	CEO	Total Terminal	Partner (3PL-provider)	+	+
28	Head of Development Department	MONOPOLIA LLC	Partner (Transport provider)	+	+
29	SPB Office Manager	LLC "Gardarika-Region"	Partner (Transport provider)	+	+
30	Production Manager Novosibirsk	IDS Borjomi Russia	Focus company	+	+
31	Account Manager	Aptar Food	Partner (Supplier)	+	-
32	CEO	UBG (Tver)	Partner (Co-packer)	+	+
33	CEO	Megapak (Vidnoe)	Partner (Co-packer)	+	+
34	Production Director	IDS Borjomi Russia	Focus company	+	+
35	Production Manager Lipetsk	IDS Borjomi Russia	Focus company	+	+
36	CEO	Boardline LLC	Partner (Transport provider)	+	+
37	Leading Sales Specialist	Polymers Ltd.	Partner (Supplier)	+	+

Table 4.7: List of targeted interviewees and their companies. Source: author's own elaboration.

4.7.1. Contribution to the knowledge

In addition to the strengths, the above methods have their weaknesses. Improving the efficiency of business processes and communication between partners in the supply chain requires examining the details that might be omitted in quantitative research when testing hypotheses, while semi-structured interviews are significantly saturated with details. Moreover, the generalization of large amounts of textual information is significantly complicated, owing to the large time costs for transcribing and identifying key points and details. Of particular importance for the study is the use of theoretical foundations and a methodology, which will be correlated with reality and ultimately bring a contribution to the existing knowledge.

4.8. Quantitative research analysis

Quantitative research involves the use of statistical analysis methods and tools. Data analysis is the process of making sense out of the data; it is the process of making meaning (Merriam & Tisdell, 2016). Quantitative research is based on closed questions (Jonker and Pennink, 2010). Identifying the statistical relationships between the responses of closed questions, as well as between the different questions is the task of quantitative research and is achieved by using various statistical tools. In the current research, it is planned to use the IBM SPSS program as an advanced tool for statistical analysis.

Closed questions are most often variables and are used to test hypotheses. The basic idea here is that a hypothesis predicts the result—typically with regard to a relationship of variables (Eisend and Kuss, 2019). Managerial decisions that can be made on the basis of testing hypotheses are primarily based on independent variables, where the order of the relationship with dependent variables is studied. Thus, variables that correspond to managerial decisions are used as independent variables but, on the other hand, it is important to what extent dependent variables are of interest to practitioners (Eisend and Kuss, 2019).

Using purposive sampling aims at selecting senior and high-level supply chain managers. The study involved representatives of partners and the focus company; thirty-seven senior and high-level managers, who took part in a quantitative and qualitative study by completing a survey and conducting a semi-structured interview. This sampling technique is used to identify and select the information-rich cases for the most proper utilization of available resources (Barratt, Ferris, and Lenton, 2015), in cases where key informants have certain expertise; it is especially useful when there are insufficient funds and other resources (Tongco, 2007). Of course, purposive sampling is not entirely statistically significant, since

the researcher exercises judgment on the informant's reliability and competency, as inappropriate informants will render the data meaningless and invalid (Tongco, 2007).

To eliminate possible systematic errors, stratification was carried out to divide interested groups of partners based on a shared characteristic (Leavy, 2017). This step allows the taking into account of all of the main representatives of the supply chain partners by type of activity, for which tests were carried out to define normal distribution. For these purposes, the selection was made from among the greatest suppliers of materials and services, whose activities are critical for the supply chain. This involves identification and selection of individuals or groups of individuals that are proficient and well-informed with a phenomenon of interest (Barratt, Ferris, and Lenton, 2015).

Normal distribution criteria					
Kholmogorov-Smirnov (a)			Shapiro-Wilk test		
Statistics	st. random variable	Value	Statistics	st. random variable	Value
0,482	10	0,000	0,509	10	0,000

a. significance correction of Lilliefors

Table 4.8: Normal distribution test. Source: author's own elaboration.

Given that purposive sampling is typically used in qualitative research to identify and select the information-rich cases for the most appropriate use of available resources (Barratt, Ferris, and Lenton, 2015), therefore, in accordance with the results of the Shapiro-Wilk and Kholmogorov-Smirnov test, considered, purposive sampling distorts the analysis of statistical significance; in this regard non-parametric statistical tests will be carried out (Pearson Chi-square, and so on.).

4.8.1. Descriptive statistics

Descriptive statistics are used to summarize the results that were obtained during the quantitative study. The results are grouped by values, distributed by frequency, and calculated according to trends depending on their values, as well as by the scatter of data relative to the calculated central trend. Descriptive statistics are a set of sample observations, whereas inferential statistics move beyond the description of a specific observation to make inferences about the larger population from which the sample observations were drawn (Jonker and Pennink, 2010). Descriptive statistics include averages, data scatter, variance, standard deviation, quartiles, deciles, confidence intervals, and so on. The use of these variables in a quantitative study will be very useful for providing an understanding of the distribution in the primary analysis of the results:

- In business processes management between supply chain partners;
- IT information processing tools;
- Information gaps between partners;
- Launched projects on operational excellence;
- Methods for improving the effectiveness of communication with partners.

4.8.2. Pearson chi-square

The Pearson Chi-Square allows determination of the statistical significance between two or more variables. The use of this method is justified as the quantitative research is conducted on the base of non-normal distribution, owing to its being very vulnerable to data outliers of any kind, not only very high (or low) values, but also deviations from the main structure of the data (Reimann *et al.*, 2008). The Pearson Chi Square is used to analyse cross-tables, which are presented as nominal data. In this case, the significance of the discrepancy between the empirical and theoretical frequencies is checked, as it expresses both the strength and direction of a relationship between two variables in a single number. (Stockemer, 2019). When comparing these frequencies, a null hypothesis is formed, which consists of the fact that these frequencies are consistent, and the observation meets expectations.

4.8.3. Spearman's rank correlation coefficient

Spearman's correlation is used to quantify the relationship between variables in nonparametric methods. The Spearman rank method provides a non-parametric (distribution free) measure of correlation between two variables (Reimann *et al.*, 2008). In this case, when calculating this coefficient, a linear relation is not taken into account but requires that the association is steadily either increasing or decreasing (Reimann *et al.*, 2008).

4.8.4. Multicollinearity

Multicollinearity is a linear relationship between two or more variables. The identification of such relationships is based on the correlation analysis, where it is necessary to identify the significance of the correlation and determination coefficients. Imperfect multicollinearity, characterized by high correlations between explanatory variables, is problematic (Eisend and Kuss, 2019).

4.8.5. R-squared

This is a measure of model fit (i.e., it is the squared correlation between the model's predicted values and the real values) (Stockemer, 2019). Thus, the corresponding measure

shows what proportion of the variance of the dependent variable is explained by all of the independent variables (Eisend and Kuss, 2019).

Moreover, it explains how much of the variation in the dependent variable is explained by the independent variables in the model. In theory, the R-squared values can range from 0 to 1 (Stockemer, 2019).

4.8.6. Regression

Using regression analysis allows the discovery of linear relationships between independent and dependent variables. Multiple regression analysis is an extension of bivariate regression analysis and allows one to test the influence of multiple independent (predictor) variables on a dependent variable (Stockemer, 2019). The use of regression analysis as an attempt to explain the change in the dependent variable, which is carried out by changes in a set of so-called explanatory or independent variables by quantifying a single equation (Eisend and Kuss, 2019).

4.9. Qualitative research analysis

The analysis of qualitative research aims to complement and verify the results of quantitative research, to identify the main problems on the basis of previously conducted semi-structured interviews, and to establish the relationship between events, phenomena and realities of the internal and external environment.

The given qualitative research is based on thematic analysis as a method for identifying, analysing, organizing, describing and reporting themes found within a data set (Braun & Clarke, 2006). Moreover, thematic analysis is considered as a translator for those speaking the languages of qualitative and quantitative analysis, enabling researchers who use different research methods to communicate with each other (Boyatzis, 1998).

In order to enrich the results of quantitative research, it is necessary to supplement and verify the conclusions drawn through qualitative research. When analysing the results of testing hypotheses, especially those that have not been confirmed, it is necessary to pay attention to the statements of respondents who can strengthen the confirmed hypotheses, or to best explain and find the reason in the statements of the respondents for not confirming the hypotheses.

The advantages and disadvantages of thematic analysis are given below:

Advantages	Disadvantages	References
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• Provides a highly flexible approach; a rich and detailed, yet complex account of data. • Does not require detailed theoretical and technological knowledge. • Offers a more accessible form of analysis. • Is easily grasped and can be relatively quick to learn. • Is a useful method for examining the perspectives of different research participants, highlighting similarities and differences, and generating unanticipated insights. • Useful for summarizing key features of a large data set.	• The lack of substantial literature on thematic analysis • It does not allow the researcher to make claims about language use. • Flexibility can lead to inconsistency and a lack of coherence when developing themes derived from the research data. • Consistency and cohesion can be promoted by applying and making an epistemological position explicit that can coherently underpin the study's empirical claims.	(Nowell <i>et al.</i> , 2017). (Braun & Clarke, 2006).
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Table 4.9: Advantages and disadvantages of thematic analysis. Source: author's own elaboration.

The present study uses elements of thematic analysis, such as coding, the distribution of codes by themes, and the grouping of themes by common features, i.e., formation of data sources to confirm or refute the results obtained from quantitative research.

4.9.1. Generating initial codes

For the initial processing of the interview results, a coding methodology was used, which made it possible to process large volumes of information in a relatively short time and obtain a list of the brief contents of the respondents' statements. Coding allows researchers to simplify and focus on specific characteristics of the data (Nowell *et al.*, 2017). Coding is aimed at processing the results of the interview, isolating the main meaning of the respondent and converting it into two or three words or phrases that most fully reveal the essence of the question asked. During coding, researchers identify important sections of text and attach labels to index them as they relate to a theme or issue in the data (King, 2004). The formed codes in accordance with the chosen methodology are subject to further analysis. For these purposes, participant observation greatly helped the researcher. Researchers define the codebook before commencing an in-depth analysis of the data. (Nowell *et al.*, 2017).

4.9.2. Searching for themes and reviewing

Based on the generated codes, it is necessary to group them according to common features, sorting and collating all of the potentially relevant coded data extracts into themes (Braun & Clarke, 2006). At this stage, the selected codes are grouped by similar meanings. The need for this is in order to further analyse the combination of codes for semantic content. Combining multiple codes in a single theme allows the generation of relevant data for later analysis. For this purpose, inductive and deductive approaches are used. Based on the inductive approach, the formation of topics from the statements of the respondents are made; the themes identified are strongly linked to the data itself and may bear little relation to the specific questions that were asked of the participants. (Nowell *et al.*, 2017). At the same time, the use of a deductive approach is aimed at finding answers to previously posed questions formed from the results of quantitative research; this may provide a more detailed analysis of some aspect of the data but tends to produce a less rich description of the overall data (Nowell *et al.*, 2017).

The next step is to determine if well-formed topics are correct and structured, as codes and themes can contain drawbacks (Braun & Clarke, 2006). When analysing the results of an interview, it is necessary to isolate all of the respondent's opinions. For this purpose, it is necessary to evaluate each sentence against the value contained in it, recode it in the categories to find more 'proof' to further support that category and then to find relations between the categories (Jonker and Pennink, 2010).

4.9.3. Defining and naming themes

The definition of theme names is inextricably linked with the analysis of each formed theme and the subsequent determination of the relationship between them, how each theme fits into the overall story about the entire data set in relation to the research questions (Braun & Clarke, 2006). Names should usually be short and describe the essence of each topic.

How each topic is interlinked with a common array of encoded data should also be determined. If necessary, in order to streamline the formed and named array of topics, an expert assessment should be used, involving domain experts in the analysis. A solo researcher may consult outside experts to determine whether the themes are sufficiently clear and comprehensive and, if so, call a halt to modifications (King, 2004). At this stage, it is possible to establish dependencies and relationships between the statements of different respondents, in order to form a single picture of what is happening.

4.9.4. Analysis and report

The theme analysis consists of the description of the data obtained, as well as the establishment of relationships between themes. The write-up of a thematic analysis should provide a concise, coherent, logical, non-repetitive and interesting account of the data within and across themes (Braun & Clarke, 2006). Direct quotes from participants are an essential component of analysis (King, 2004). Short quotations may help to interpret the data and provide an understanding of the relationship between themes, as well as an understanding of specific points of interpretation and demonstrate the prevalence of the themes (Nowell *et al.*, 2017). Direct citation, therefore, helps to show the reliability of the analysis.

The analysis consists primarily of the description, the isolation of the main essential points, their interpretation, and identifying patterns, where researchers attempt to theorize the significance of the patterns and their broader meanings and implications (Braun & Clarke, 2006). Disclosure of the significance of each theme through assumptions and subsequent interpretations, taking into account the patterns identified, leads to the final analysis that creates an overall story about what the different themes reveal about the topic (Nowell *et al.*, 2017).

Based on the results of the formation of a single picture of what is happening on the basis of the semi-structured interviews, three diagrams were formed in the following areas:

- Supply chain priorities;
- Problems and challenges of the supply chain;
- Supply chain improvements.

These diagrams were translated into an anonymous form with the exception of details that might deprive respondents of anonymity. Each diagram was then verified from the position of the Director of supply chain management, in order to have the most complete and balanced understanding of the relationship with the position of strategic priorities of the supply chain.

4.9.5. Summary of data collection and analysis methods

The table below presents the main conclusions based on the above descriptions of data collection and analysis methods.

Data collection method and target group	Expected sample size	Sampling technique	Data analysis method	References
<u>Survey</u> Respondents were selected from: Partners: suppliers, transport companies, logistics operators	37 senior managers.	Purposive sampling is to identify and select the information-rich cases for the most	Quantitative research (survey) involves the use of methods and tools of statistical analysis and helps	(Barratt, Ferris, and Lenton, 2015) (Merriam and Tisdell, 2017).

Focal company: planning, logistics, manufacturing, procurement, quality.		proper utilization of available resources.	to determine relationships between two or more variables by using various statistical tools with the IBM SPSS program.	(Stockemer, 2019).
<u>Semi-structured interviews</u> Respondents were selected from: Partners: suppliers, transport companies, logistics operators Focal company: planning, logistics, manufacturing, procurement, quality.	35 senior managers.	Purposive sampling is to identify and select the information-rich cases for the most proper utilization of available resources.	Qualitative research is based on thematic analysis as a method for identifying, analysing, organizing, describing and reporting themes identified within a data set.	(Barratt, Ferris, and Lenton, 2015) (Braun & Clarke, 2006).

Table 4.10: Summary of data collection and analysis processes. Source: author's own elaboration.

4.10. Reliability of the research

Regardless of the type of research, validity and reliability are concerns that can be approached through careful attention to a study's conceptualization and the ways in which the data is collected, analysed and interpreted (Merriam & Tisdell, 2016). In other words, data reliability is one of the main conditions for conducting research. When choosing a method of research, one must take into account the ways in which data is recorded, in order to ensure that this data is valid, and whether another researcher, in the same context, is able to reproduce the observed data. Reliability refers to the extent to which research findings can be replicated (Merriam and Tisdell, 2017).

The reliability of the study primarily depends on the compliance of the collected data with the goals and objectives of the study, which are set at the very beginning. In relation to this study, the reliability of the research data can be confirmed as follows: quantitative research methods based on surveys were formulated on the basis of the literature review and theoretical basis. Moreover, since the researcher is conducting a study based on participant observation, the results of the study can be considered as valid because reliability refers to the degree of consistency with which instances are assigned to the same category by different observers or by the same observer on different occasions (Silverman, 2013).

All completed paper surveys were scanned and converted to PDFs. Then all of the data in the surveys was processed and entered into an Excel table for subsequent processing by

statistical tools. When conducting a qualitative study, all of the semi-structured interviews were recorded so that no part of the information was lost. All of the recorded interviews were translated into text highlighting the key points that the respondent indicated.

4.11. Validity of the research

Research validity refers to research identifying what it aims to discover (Drake and Heath, 2010). In other words, a study result is considered valid if it actually reflects that the facts have been determined (Eisend and Kuss, 2019). The selected method, on the basis of quantitative and qualitative research, involves complementarity and improving the quality of analysis results, e.g., triangulation to increase the validity of an empirical study. Triangulation remains a principal strategy for ensuring validity and reliability (Merriam and Tisdell, 2017).

The variables were collected, evaluated and prepared along with the structures and processes accessed to identify expedient action recommendations (Kotzab *et al.*, 2005). In order to verify the obtained results and correctly design an adequate model of business processes, a separate session was held with the experts representing all of the major stakeholders for discussion of the proposed model and for gathering their opinions (Linstone & Turoff, 2002). To minimize the risk of obtaining inaccurate information, the obtained generalized information was checked by a large circle of managers and participants in the supply chain.

4.12. Representativeness of data collected

This study is limited to a relatively small sample of representatives of partners and the Focal company employees, which in total amounts to thirty-seven persons. More representatives of the supply chain partners could have been included in the sample but, in this case, the resulting conclusions would not have then met the initial requirements. Purposive or judgmental sampling enables the use of judgement in selecting cases that would best enable answering research question(s) and meeting objectives (Saunders *et al.*, 2009). This category of partners is not interesting in terms of identifying the main difficulties, contradictions and patterns, owing to its small size.

4.13. Time horizon

Obtaining the approval of the focus company's management to conduct this research was the starting point of this study. The focus company kindly provided the premises, the office equipment and the corporate information so that the researcher could both fully and efficiently achieve the research objectives. Undoubtedly, the research work ought not to interfere with the daily operational activities of the company and the researcher's

performance of his work duties as an employee of the company; neither should it create any risks for the company.

The implementation of this research project was launched immediately after the approval of the UWSTD Ethics Committee in late February and early March of 2019. As described earlier, the main work consisted of conducting a quantitative and qualitative study, which were performed simultaneously and took, together with the analysis, more than 10 months. The required data was collected from March until the end of May 2019. The literature review was conducted and completed throughout the research project.

Phase	Target completion date
Chapter 1 – Introduction.	September 2018.
Chapter 2 - Literature review.	July 2019.
Chapter 3 - Conceptual framework.	July 2019.
Chapter 4 – Methodology.	August 2019.
Chapter 5 - Results and findings.	August 2019.
Chapter 6 - Conceptual modelling and discussion.	September 2019.
Chapter 6 - Conclusions and implications.	October 2019.
Proof Reading, Footnotes and bibliography, corrections and binding of thesis.	December 2019 / February 2020.

Table 4.11: Time horizon of the research. Source: author's own elaboration.

4.14. Ethical considerations

Ensuring validity and reliability in qualitative research involves conducting the investigation in an ethical manner (Merriam & Tisdell, 2016).

4.14.1. Informed consent

Before the interview, all potential respondents were informed about the research objectives and basic details to ensure that they understood the goals and objectives of the research and could decide voluntarily whether or not to participate in it. For potential respondents, 2-3 days before the interview and completing the survey, appointments were arranged: a convenient time allocation and choice of location were set up, where they were psychologically comfortable and could make an informed decision on participation in the research. When explaining the main details of the study, it was noted that it would be possible to refuse taking part in the interview, beforehand or while it was taking place, and withdrawing the information at any time during the study. At these meetings, all potential

participants were asked to sign the participant information sheets; i.e., the consent forms, written in both English and Russian, explaining:

- The purpose of the study;
- The purpose of the interview and how long it would take;
- what the results of the interview would be used for and how that information would be used;
- How the participants could access the generalized research findings. These would be made available upon the participant's request: they could indicate, when signing the consent form, in what way they wished to receive this data (by e-mail or on paper);
- The conditions of the interview, i.e., that all interviews would be recorded; the participant would have the right to be anonymous (without specifying personal information); they need not answer all of the questions and could stop participating in the interview at any time;
- All information received would be confidential (without transfer to third parties);
- How the information would be kept and when it would be erased;
- All information received would be encrypted for security purposes;
- If necessary, the participant could have access to the information given during the study.

4.14.2. Risks to participants

The research was conducted within the framework of one company and its partners; these are not competitors. In the framework of cooperation, partners are required to maintain their service level and, therefore, partner companies are interested in meeting all of the requirements. At the same time, there was a risk that some participants may not have fully answered all of the questions, fearing that answers to their questions might become known to other participants, and they might express grievances against each other. For colleagues, there were some risks, but these could be effectively mitigated and minimized because the materials obtained from them would be confidential and access to them would be limited. None of their colleagues or managers would have access to the obtained data. Generalized information would not allow the identification of the research participants and would not create difficulties for them and their colleagues. To avoid this and reach the research goal, all of the participants were given the opportunity to answer questions anonymously. In addition, the researcher made a commitment that all of the information received would be used only for research purposes, without transmission to third parties. In the case of

publication of the research results, the data obtained would be summarized, without specifying individuals or companies.

4.14.3. Risks to investigator

All of the respondents are managers and all of them are involved in the development of an optimal business process, i.e., the supply chain. In this case, it should be borne in mind that results based on the conducted research can encourage a company to significantly review its approaches to assessing the effectiveness of its business processes and those of its partners. Conducting such optimization measures may pose a risk to the researcher as an employee of the company, since barriers might be created by individual managers. At the same time, the risks associated with the negative attitude of an employer were not expected in this study. To reduce the impact of this risk on the company, the researcher developed practical recommendations on how to transform existing business processes into appropriate best practices with the minimum possible discomfort for the business. It should also be noted that the management of the company understood that the present research would bring positive results and, thus, tried to contribute as much as possible. In this case, there was full support from the company's management.

4.14.4. University/institutional risks

This study affects the business environment and is not relevant to any kind of sensitive topics. At the same time, of course, any possible inconsistency with professional and academic standards is a serious risk for the University. To prevent fabrication, falsification, plagiarism or other kinds of unprofessional behaviour, so that the thesis meets the highest academic standards and the University's good name is maintained, the researcher undertook complying with the University's Research Integrity and Ethics Code of Practice. The researcher worked closely with their lead supervisor, i.e. the work was double checked and at this stage all possible shortcomings were eliminated. The recommendations received greatly helped the researcher to improve the quality of the thesis and meet the requirements of the University.

4.14.5. Anonymity

Respecting the anonymity and confidentiality of the research results is a priority for the researcher. For these purposes, all personal data in the surveys that could in any way identify the study participants was excluded. This study aims to fully comply with the ethical principles of the UWSTD and, therefore, all of the participants took part voluntarily. All of

the participants were reassured that all of the data would be stored securely in protected folders on the computer and would not be transferred to third parties.

4.14.6. Data protection and storage

The collected information is stored electronically on a home computer, without the access of third parties. All of the information has been kept in password protected folders on the computer. The use of personal mail (GMAIL) took place for the direction of research materials to the lead supervisor since it was not always possible to access university email. It should be noted that GMAIL has a two-factor identification for entry, which is a safe tool for working with information. At the same time, the sharing of data with other organizations was not supposed, except in the case of scientific journals for publishing research results. In this case, all of the necessary requirements for preserving the confidentiality and security of the data were met, without providing the personal data of the respondents and the company; only the industry (FMCG) and territorial affiliation were indicated.

It was planned to use Mendeley Data as the data management system, an IT product from Elsevier Research Intelligence. This system allows the user to safely record, store, archive, track and share research data, as well as reusing it. There is no doubt that it greatly increases the effectiveness of the study. In this case, the data were uploaded and archived in a way that limits the identification of the personal information of the respondents and the company.

All research data interview records, literature sources, completed surveys, research analysis materials and other materials relevant to the research topic were placed on the home computer. All of the information has been kept in password protected folders on the computer. The retention period of this data will continue until after the doctorate is awarded.

Copies of the information located on the home computer were placed on Cloud storage for recovery should the HDD malfunction. Once the information retention period is completed, the data will be removed from the cloud immediately. The results of the research, i.e., the analysis, key findings and materials for writing articles on the topic of the research were archived in Mendeley Data without the personally identifiable information of the respondents and the company. The retention period for this data will continue until after the doctorate is awarded.

4.15. Summary of the chapter

Based on the selected methodology, the study begins with the formation of research questions and hypotheses, the answers to which are the basis for the effective integration of the supply chain partners. A hypothesis can lead to predictions regarding observations, in

particular those of the outcome of experiments (Pruzan, 2016). Conducting a qualitative study is organized as a semi-structured interview and a quantitative study based on surveys for testing hypotheses. A hypothesis is a tentative, provisional, or unconfirmed statement derived from theory that can be either verified or falsified (Stockemer, 2019). The hypotheses in this study were formed on the basis of the findings of the literature review, so the results of testing the hypotheses help to generate recommendations to improve the efficiency of business processes along the supply chain as a whole. In order for each question to be understood and calculated in a quantitative study, it is necessary to formulate variables. A variable can be measured in short and is a measurable version of a concept (Stockemer, 2019). Qualitative research is aimed at identifying the main priorities and problems of the supply chain from semi-structured interviews, obtaining from partners their point of view regarding how to increase the effectiveness of interaction, and also to understand the main reasons for inefficiency. The interview is an especially effective method of collecting information for certain types of research and, as noted earlier in this chapter, for addressing certain types of assumptions (Berg and Lune, 2017). In addition, at this stage, the main directions of improving the supply chain will be identified.

CHAPTER 5. RESULTS AND FINDINGS

5.1. Introduction

Creating supply chain competitive advantages, based on the integration of resources and capabilities of all partners, significantly increases the efficiency of the company and contributes to value creation for customers. A resource-based view suggests that identification and possession of internal strategic resources contributes to a firm's ability to create and maintain a competitive advantage (Gligor, Esmark & Holcomb, 2015). Integration is of two types: forward and backward. Forward integration involves the physical flow of delivery schedules and capacity and product information from suppliers and customers, while backward integration is aimed at the backward integration of the flow of information, such as customer orders and demand forecasts from customers to suppliers (Chavez *et al.*, 2015a). Carrying out the optimization of supply chain business processes can, therefore, be achieved by the integration of supply chain partners to improve efficiency and more complete compliance with customer requirements. At the same time, it should be noted that leveraging the supply chain for competitive resources remains a key challenge for supply chain management (Pulles *et al.*, 2014), because it is required to constantly find, study and evaluate factors that contribute to both the success of integration and its failure.

5.2. Respondents' profiles

The starting point of the study was to disclose aspects related to the characteristics of the respondents, evaluate their total number, distribution by level, as well as by the type of company. The table below shows that of the total number of respondents, 35% were managers, and 65% were senior managers. The excess of twice the number of senior managers in relation to top managers is due to the fact that the most complete understanding of the essence of the ongoing business processes still lies with the key senior managers who directly interact with partners in the supply chain. The presence of one third of the respondents among the managers, indicates that a certain number of senior managers take over the function of interaction with partners in the supply chain, and have a much greater say in decision-making.

Particulars	Frequency	Percent
TOTAL		
Top managers ⁴	13	35%
Senior managers ⁵	24	65%

⁴ Directors and so on.

⁵ Heads of departments and other lower positions

Total	37	
Focus company		
Top managers	3	20%
Senior managers	12	80%
Total	15	
Co-packers		
Top managers	2	100%
Senior managers	0	0%
Total	2	
3 PL partners		
Top managers	2	100%
Senior managers	0	0%
Total	2	
Raw material suppliers		
Top managers	2	25%
Senior managers	6	75%
Total	8	
Transport companies		
Top managers	3	30%
Senior managers	7	70%
Total	10	

Table 5.1: Respondents' profiles. Source: author's own elaboration.

The fifteen representatives of the focus company completely covered all areas of the supply chain. There are 3 top managers who are responsible for supply chain operations, production and quality. The remaining 12 respondents cover all areas of the supply chain ranging from logistics, manufacturing and procurement to planning and transport management. At the same time, considering the respondents in the Co-packer and 3 PL Partners categories, it should be noted that all respondents were top managers. It should also be noted that the main points in the interaction with partners in the supply chain are carried out directly by top managers, who always try to reduce the number of deviations and implement changes manually, as quickly as possible, without delegating responsibility to lower levels of management.

When considering partners in the supply chain, e.g., suppliers of raw materials and other materials, as well as transport companies, the number of top managers, as a percentage, is presented as 25% and 30%, respectively. This indicates that the greatest work in interaction with partners in the supply chain is carried out by senior managers, since they deal with a large number of operations and the nomenclature of the materials supplied; they have to eliminate routine deviations that take a great deal of time. Given the high cost of employing top managers, it is simply impractical to assign them to such routine issues. Top managers in these companies are most often responsible for more strategic tasks that determine the

order of relations with the focus company; they tend not to participate in solving problems at the operational level.

Based on the analysed structure of the respondents, it should be noted that the sample is characterized mainly by senior managers, since they have the most direct experience of dealing with problems and deviations in the supply chain. Moreover, they are guided by the strategic priorities of their companies and are the dampers that reduce the amplitude of fluctuations in the case of deviations; at the same time, they help to increase the efficiency of operations.

5.3. Quantitative research

A quantitative study is aimed at identifying the relationship and dependencies between the responses of respondents in the survey. The dependencies thus identified will become the basis for further research in a qualitative study and the subsequent development of requirements for the formation of a business process model.

To conduct a quantitative study, a survey was formed where each question was assigned a variable. In each section of the survey, all of the elements are interrelated with each other and are aimed at finding solutions for research objectives (Jonker and Pennink, 2010). Each question has been assigned a variable. For the purposes of the study, that part of the question containing multiple answers was transformed into dichotomous variables. The survey was developed in such a way that the respondent quickly understood the essence of the issue. The survey consisted of sections containing group questions, the answers to which are found daily in the work of the partners. Thus, issues related to monitoring performance, company goals, cost control, improving activities, information exchange and automation - all of these forms a large part of the respondents' daily routine tasks, which they spend a great deal of time and effort on.

5.3.1. Hypotheses development

The combination of the theoretical base and the descriptions of practical tools made it possible to develop research hypotheses, test them and achieve practical results. Of course, prior to the development of hypotheses, preliminary inductive studies should be carried out aimed at confirmation by deductive logic, where the hypotheses can lead to predictions regarding observations (Pruzan, 2016). A preliminary basis for the development of hypotheses was considered in the conceptual model, along with the identification of gaps in the academic literature for their further completion in a quantitative study. Thus, a hypothesis can be related, directly or indirectly, to existing scientific knowledge (Pruzan, 2016).

The formation of the relationship and dependence between questions directly depends on the set of generated variables, where the independent variable is the one that is manipulated (i.e., controlled) by the researcher as a means to test its impact on the dependent variable (Edmonds and Kennedy, 2016).

5.3.1.1. Supply chain integration

For collaborative action to succeed, effective management of business processes and resources requires buyer and supplier groups to realize resource synergy while minimizing resource waste by effectively interacting with each other (Yan & Dooley, 2014). Eliminating bottlenecks can significantly increase the speed of business processes. Information sharing improves operational performance, as well as supply chain collaborations, and has a positive impact on supply chain practices, such as supply chain planning, just-in-time production and delivery practice (Kim & Chai, 2017). The process of maintaining constant communication between participants in the supply chain reduces the likelihood of bottlenecks in production and logistics, thereby ensuring achievement of balance between product demand and supply. Therefore,

Hypothesis 1.0. The imperfection of business processes, business rules and logic contribute to the emergence of bottlenecks, limiting the speed of the implementation of business processes.

An alternative hypothesis has also been developed that can be accepted if the null hypothesis is inconsistent according to the results of the significance analysis.

Hypothesis 1.1. The imperfection of business processes, business rules and logic does not cause bottlenecks and does not reduce the speed of implementation of business processes.

Informational gaps / non-transfer of responsibility in end-to-end business processes cause inefficiency. Supply chains unite many companies and divisions; to achieve a synergistic effect this single mechanism requires cross-functional and cross-firm business processes with appropriate levels of information sharing, operational coordination and select close partnerships (Leuschner, Rogers & Charvet, 2013). This is certainly difficult because a firm's position in a distribution channel causes various uncertainties that disrupt information flows, values and processing between chain partners (Lo, 2014).

To eliminate the negative effects associated with the existence of many links in supply chains, reliable information needs to be obtained, in a timely fashion, for forecasting and planning by data sharing between partners of the supply chain, reducing costs through the optimal choice of materials and their suppliers, and reducing production and logistics costs.

In such a complex system, management of the processes of adoption, creation, storage, transfer, sharing and application of knowledge appears to be the necessary response to the new challenges posed to the supply chain by globalization and sustainability issues (Cerchione & Esposito, 2016). Therefore,

Hypothesis 2.0. The multiple transfer of responsibility is most often the cause of inefficient communication between departments / supply chain partners.

An alternative hypothesis has also been developed that can be accepted if the null hypothesis is inconsistent according to the results of the significance analysis.

Hypothesis 2.1. The multiple transfer of responsibility is not the cause of the inefficient interaction between departments / supply chain partners.

When creating an integrated supply chain, within the activities of all participants, much attention is required for both the optimization of business processes of the focus company and its participants, to increase transparency and reduce costs by increasing operational excellence. In addition, supplier and customer integration creates a knowledge base and collaborative capabilities that can lead to higher quality products (Wiengarten & Longoni, 2015a). This in turn creates the basis for supporting business processes across a supply network which is closely related with the effort to overcome intra- and inter-organizational boundaries (Romano, 2003). Thus,

Hypothesis 3.0. Compliance with the business rules that apply to the goals of the company contributes to reducing costs by running the projects on operational excellence.

An alternative hypothesis has also been developed that would be acceptable if the null hypothesis is inconsistent according to the results of the significance analysis.

Hypothesis 3.1. The compliance of business rules with the goals of the company is not a basis for cost reduction by running projects on operational excellence.

5.3.1.2. Supply chain resilience

Integrating the business processes of the supply chain partners allows the optimal design and coordination of all of the activities of all of the supply chain entities for achieving a seamless operation for large-scale and complex supply chains experiencing uncertain conditions (Garcia & You, 2015). This, once again, emphasizes the need to control information, material and product flows from the initial supplier to the final consumer, at all stages, in order to prevent a decrease in management efficiency.

The prediction of delayed delivery resources and being able to immediately react to deviations considerably increase the resilience of the supply chain, as a whole, since too few resources can negatively affect the output and the flexibility of the system (Beamon, 1999). To achieve the resilience of the supply chain planning should be implemented that addresses allocation rules for resources, as well as usage rules that define production, distribution lead times, lot sizing and inventory policies (Okongwu *et al.*, 2016). Therefore,

Hypothesis 4.0. The resilience of the supply chain depends on the timeliness of the supply of the necessary resources and the immediate response to deviations in the business processes of supply chain partners.

An alternative hypothesis has also been developed that can be accepted if the null hypothesis is inconsistent according to the results of the significance analysis.

Hypothesis 4.1. The resilience of the supply chain does not depend on the presence or absence of (1) the timeliness of the supply of the necessary resources and (2) the immediate response to deviations in the business processes of supply chain partners.

All of the activities of partners, managers and employees should be consistent with the overall goal and business logic, which in turn eliminates unnecessary and redundant actions that reduce the overall efficiency of business processes. The new global reality that has emerged from the latest economic crisis calls for supply chains to be leaner and more cost effective (Khan, Hussain & Saber, 2016). Therefore,

Hypothesis 5.0. The managerial periodic control of sequence, timing and dependence suggests that existing business rules do not cover all possible scenarios and options, and that they interfere with unnecessary coordination / steps when considering factors contributing to the appearance of bottlenecks. An alternative hypothesis has also been developed that can be accepted if the null hypothesis is inconsistent according to the results of the significance analysis.

Hypothesis 5.1. The managerial periodic control of sequence, timing and dependence does not mean that existing business rules do not cover all possible scenarios and options, nor that they interfere with unnecessary coordination / steps, when considering factors contributing to the appearance of bottlenecks.

The compliance of business rules with the company's goals helps to eliminate gaps in logic, ambiguities or contradictions in business processes in order to increase their efficiency, where efficiency refers to minimal spending of resources to reach this goal (Heckmann, Comes & Nickel, 2015). Creating value for customers also depends on eliminating

difficulties associated with producing a good estimate of cost and time necessary to re-design a particular process (Palma-Mendoza, Neailey & Roy, 2014) without any contradictions regarding achieving a company's goals. Business rules based on the integration of business processes of all participants in a supply chain, contribute to the achievement of common goals; strategically integrating with collaborative partners can lead to coordinated actions which align the processes of multiple firms (Ralston *et al.*, 2015). Therefore,

Hypothesis 6.0. The lack of logic gaps, ambiguities or contradictions is achieved by determining the compliance of business rules with the goals of the company.

An alternative hypothesis has also been developed that can be accepted if the null hypothesis is inconsistent according to the results of the significance analysis.

Hypothesis 6.1. The lack of logic gaps, ambiguities or contradictions is not excluded by determining the compliance of business rules with the goals of the company.

5.3.1.3. Supply chain performance

Supply chain performance depends on the ability of companies to reduce costs, as well as to compare their current costs with their competitors. There are many reasons why a supply chain may not be effective; the problem is, however, in many organizations, managers are presented with raw performance data and left to draw their own conclusions (Powell, 2004), which often are incorrect and do not indicate the root causes of inefficiency. In this regard, an equally important point is the understanding of the main factors which cause a reduction in supply chain performance. Firms search and take note of market factors, including the characteristics of the industry, to compete with other firms (Ralston *et al.*, 2015). Thus,

Hypothesis 7.0. Supply chain performance depends on a number of factors that should be identifiable.

An alternative hypothesis has also been developed that can be accepted if the null hypothesis is inconsistent according to the results of the significance analysis.

Hypothesis 7.1. Supply chain performance does not depend on the presence or absence of all possible factors that can be defined.

Managers can conduct time-consuming and largely unnecessary debates to justify their individual figures while the focus should be on the current situation (Powell, 2004). To exclude an incorrect understanding of cost performance, a supply chain cost measurement requires a total view of the cost in the supply chain in order to reduce costs (Pettersson & Segerstedt, 2013). In this case, it is possible to assume that supply chain cost reduction has

become a new means of achieving a competitive advantage (Pettersson & Segerstedt, 2013). Therefore,

Hypothesis 8.0. Measurement of all types of costs or the costliest processes contribute to achieving a company's performance targets.

An alternative hypothesis has also been developed that can be accepted if the null hypothesis is inconsistent according to the results of the significance analysis.

Hypothesis 8.1. Measurement of all types of costs or the costliest processes do not contribute to achieving a company's performance targets.

Achieving company performance targets depends on measuring all types of costs / most costly processes, as delivery heavily relies on the quality of information exchanged (Anand & Grover, 2015). It also means that the ability of processes to scale upwards depends on the absence of discontinuities of logic, and ambiguities or contradictions within them, in order to be more responsive to customer demand, increasing delivery reliability and consistency of lead times (Anand & Grover, 2015). Therefore,

Hypothesis 9.0. The upward scalability of business processes is possible without discontinuities, logic ambiguities or inconsistencies therein.

An alternative hypothesis has also been developed that can be accepted if the null hypothesis is inconsistent according to the results of the significance analysis.

Hypothesis 9.1. The upwards scalability of business processes is possible with discontinuities, logic ambiguities or inconsistencies therein.

5.3.1.4. Service level

The service level is most often understood as the correspondence of the product items that clients have ordered with the appropriate quality, being in the right volume, in the right place, and being delivered on time. All of this contributes to an increase in the customer satisfaction rate. Measuring the associated increase in sales will challenge the belief that logistics only contributes to cost and asset reductions (Leuschner & Lambert, 2016). The service level of is a priority for any company for controlling all stages of delivery in order to improve quality and speed, while reducing costs to remain competitive; to achieve this they have to offer goods or services to customers that are of higher quality and/or priced lower than their competitors (Ralston *et al.*, 2015). Based on this statement, the following hypothesis can be proposed:

Hypothesis 10.0. The combination of cost, time and quality is critical to an international FMCG supply chain.

An alternative hypothesis has also been developed that can be accepted if the null hypothesis is inconsistent according to the results of the significance analysis.

Hypothesis 10.1. The combination of cost, time and quality is not critical to an international FMCG supply chain.

5.3.2. Hypotheses testing

As a preliminary step to the analysis, variables encoding multiple responses were converted to nominal scales. Descriptive statistics were also calculated for the variables appearing in the hypotheses. Descriptive statistics and intercorrelations are attached at Appendix E.

A regression analysis was carried out to define the multicollinearity of independent variables. If it was detected, one of a pair of correlating variables was excluded from the analysis. In the case of logistic regression, two iterations of the simulation were performed until a significant set of input factors was achieved.

To test **Hypothesis 1.0**, the elimination of bottlenecks can significantly increase the speed of business process implementation, a Chi-square test was conducted. Before proceeding with the test, a transformation of tested variables containing multiple answers was performed. As a result, one new variable was formed containing values corresponding to each possible combination of multiple answers. The Chi-square test showed the presence of significant ($p\text{-value} = 0.006$) links. This result, however, was not deemed reliable and, therefore, the next step was a correlation analysis, which did not confirm the presence of significant relationships ($p = 0.573$). It was concluded that factors eliminating bottlenecks and the perfection of business processes are not related to each other, or at least it cannot be asserted in this case.

Testing details:

To test this hypothesis, the variables BOTTLENECKS (“What is most often associated with the appearance of bottlenecks causing delays in the work flow?”) and FACTOR (“Which factors lead to a bottleneck?”), containing multiple answers, were presented as modified variables calculated by special transforming functions, resulting in each unique value of the new variables being associated with a unique combination of multiple respondents' answers. The variables in this form were used in the chi-square test, which showed the presence of significant ($p\text{-value} = 0.006 < 0.05$) connections between answers to questions about bottlenecks and factors of their occurrence. At the same time, one cannot completely trust

the results, since the condition necessary for its accuracy is not fulfilled (no more than 20% of cells with values less than 5). Ninety-eight percent of the cells in the table for constructing a chi-square test do not satisfy this condition. Thus, there is no evidence to support the hypothesis.

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	65,906 ^a	40	,006
Likelihood Ratio	45,251	40	,262
Linear-by-Linear Association	,451	1	,502
N of Valid Cases	37		

53 cells (98,1%) have an expected count of less than 5. The minimum expected count is ,05.

Table 5.2: Chi-square tests for testing hypothesis 1. Source: author's own elaboration.

Testing this hypothesis using a correlation analysis of a given pair of variables.

Correlations				
			FACTOR	BOTTLENECKS
Spearman's rho	FACTOR	Correlation Coefficient	1,000	,096
		Sig. (2-tailed)	.	,573
		N	37	37
	BOTTLENECKS	Correlation Coefficient	,096	1,000
		Sig. (2-tailed)	,573	.
		N	37	37

Table 5.3: The correlation analysis for testing hypothesis 1. Source: author's own elaboration.

The correlation analysis did not reveal the presence of significant relationships. Thus, the elimination of bottlenecks and the speed of implementation of business processes are not interconnected.

Next, **Hypothesis 2** was verified, i.e., that informational gaps / non-transfer of responsibility in end-to-end business processes are the cause of inefficiency. After the variable containing the multiple answers (responsibility) was transformed, it was used as one of the independent variables in the ordinary regression. Then a multicollinearity test was performed between independent variables by conducting a correlation analysis. Multicollinearity was not detected ($p = 0.268$), so as both variables are included in the regression equation. The results of the ordinal regression can be interpreted as insignificant. The doubled logarithm of likelihood function showed that there is no significant effect on the model ($p = 0.965$). The

proportion of variance of the target variable values explained by the model is also extremely small (Nagelkerke = 5.6%). Neither factor has a significant effect on the dependent variable (Sig.> 0.05 for all categories of both variables). Then a test was made by conducting a correlation analysis. As a result, it was concluded that there is no evidence that informational gaps / non-transfer of responsibility in end-to-end business processes are the cause of inefficiency.

Testing details:

To test this hypothesis, the responsibility variable (“Does multiple transfer of responsibility in your department / company delay the process?”), containing multiple responses, is presented as a modified variable calculated by a special transform function, resulting in each unique value of a new variable corresponding to a unique combination of multiple responses from respondents. A variable in this form can be used in the selected analysis method - ordinal regression. The misunderstanding variable was selected as the dependent variable (Do “problematic” communications cause bottlenecks within the supply chain?”). The input independent variables for testing the hypothesis are responsibility and gaps.

First, the presence of multicollinearity between independent variables should be checked.

Correlations				
			Gaps	RESPONSIBILITY
				Y
Spearman's rho	Gaps	Correlation Coefficient	1,000	,187
		Sig. (2-tailed)	.	,268
		N	37	37
	RESPONSIBILITY	Correlation Coefficient	,187	1,000
		Sig. (2-tailed)	,268	.
		N	37	37

Table 5.4: The correlation analysis for testing hypothesis 2. Source: author’s own elaboration.

No significant relationship was found ($p\text{-value} = 0.268 > 0.05$), multicollinearity is absent and, therefore, both variables are subject to verification by conducting a regression analysis.

A negative value of 2LL (double value of the logarithm of the likelihood function) serves as an estimate of the significance of the contribution of individual independent variables to the improvement of forecasts obtained using the model. The difference between the initial value (“Constant term only”) and the final value (“Final”) is indicated as the value of the chi-square test to which the corresponding significance level is assigned. In the above example, there is no significant improvement ($p = 0.965 > 0.05$).

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	54,633			
Final	52,723	1,909	7	,965

Link function: Logit.

Table 5.5: Model fitting information for testing hypothesis 2. Source: author's own elaboration.

To check whether the information generated by the model and the real values of the target variable are different, a Pearson chi-square test is performed. The result, for this example, is an insignificant difference in values ($p\text{-value} = 0.524$), which indicates the achievement of a high degree of approximation. Attention should be paid, however, to the fact that, owing to the large number of empty cells, the use of the chi-square test is not correct for obtaining qualitative data.

Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	24,913	26	,524
Deviance	30,531	26	,246

Link function: Logit.

Table 5.6: Goodness-of-fit for testing hypothesis 2. Source: author's own elaboration.

The proportion of the variance of the values of the target variable, explained by the model, is extremely small (Nagelkerke = 5.6%).

Pseudo R-Square

Cox and Snell	,052
Nagelkerke	,056
McFadden	,021

Link function: Logit.

Table 5.7: Pseudo r-square for testing hypothesis 2. Source: author's own elaboration.

Estimates of the regression parameters are given in the following table.

Parameter Estimates

	Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Threshold [Misunderstanding = 1]	-2,419	2,136	1,282	1	,258	-6,606	1,768
[Misunderstanding = 2]	-,498	2,092	,057	1	,812	-4,598	3,602

	[Misunderstanding = 3]	1,656	2,111	,615	1	,433	-2,481	5,793
Location	[RESPONSIBILITY=, 50]	-,760	2,321	,107	1	,743	-5,309	3,789
	[RESPONSIBILITY= 4,00]	-,660	2,017	,107	1	,744	-4,614	3,293
	[RESPONSIBILITY= 30,00]	-,147	1,985	,005	1	,941	-4,037	3,743
	[RESPONSIBILITY= 34,00]	-2,037	2,651	,591	1	,442	-7,233	3,159
	[RESPONSIBILITY= 200,00]	-,424	2,111	,040	1	,841	-4,562	3,714
	[RESPONSIBILITY= 1000,00]	0 ^a	.	.	0	.	.	.
	[Gaps=1]	,579	,919	,396	1	,529	-1,223	2,381
	[Gaps=2]	,004	,803	,000	1	,996	-1,570	1,578
	[Gaps=3]	0 ^a	.	.	0	.	.	.

Link function: Logit. a. This parameter is set to zero because it is redundant

Table 5.8: Parameter estimates for testing hypothesis 2. Source: author's own elaboration.

It can be seen from the table above that none of the factors has a significant effect on the dependent variable (Sig.> 0.05 column for all categories of both variables).

The multiple transfer of responsibility is, thus, not the reason for inefficient communication between departments / partners in the supply chain; information gaps / non-transfer of responsibility in end-to-end business processes are the cause of the inefficiency. The correlation analysis also indicates these results:

Correlations				
			Misunderstanding	RESPONSIBILITY
Spearman's rho	Misunderstanding	Correlation Coefficient	1,000	,024
		Sig. (2-tailed)	.	,891
		N	36	36
	RESPONSIBILITY	Correlation Coefficient	,024	1,000
		Sig. (2-tailed)	,891	.
		N	36	37

Table 5.9: The correlation analysis for testing hypothesis 2. Source: author's own elaboration.

The next step, that conducting operational excellence projects proves that business rules are consistent with the goals of the company, was verified by **Hypothesis 3.0**. The correlation

test method was used. Correlation analysis for this hypothesis showed the existence of a significant relationship ($p = 0.029$). The hypothesis was confirmed by showing a small positive relationship ($r = 0.368$).

Testing details:

The data corresponding to these issues contained in the compliance and variables have several categories of values, which lead to the use of the same methods of their analysis: correlation and chi-square test. As practice has shown, it makes no sense to perform a chi-square test on this set of information. There is not enough data to evenly complete all of the possible categories of answers to questions. The next step is to perform a correlation analysis.

The correlation analysis for this hypothesis showed the presence of a significant relationship ($p\text{-value} = 0.029 < 0.05$) between answers to questions about compliance with goals and project management for effectiveness. In this case, the correlation coefficient is 0.368, which means a positive direction of communication and its small significance. Since an increase in the values of both variables means deterioration (the degree of discrepancy increases, the level of project launch decreases), a positive relationship in this case suggests that the variables increase / decrease at the same time; that is, when conducting projects on efficiency, the compliance of business rules with the goals of the company is higher and, in the absence of such projects, there is a possibility that the business rules do not correspond to the goals of the company.

Correlations			Excellence	Compliance
Spearman's rho	Excellence	Correlation Coefficient	1,000	,368*
		Sig. (2-tailed)	.	,029
		N	36	35
	Compliance	Correlation Coefficient	,368*	1,000
		Sig. (2-tailed)	,029	.
		N	35	36

*, Correlation is significant at the 0.05 level (2-tailed).

Table 5.10: The correlation analysis for testing hypothesis 3. Source: author's own elaboration.

Next, the correlation and Chi-square analyses were carried out for verifying **Hypothesis 4.0** - the answer to the question of what kind of reaction occurs in response to the identified deviations in business processes and how it is related to supply chain resilience. The target variable with multiple answers was recoded. The Chi-square test did not give assurance,

because conditions for its accuracy were not met. The correlation analysis results did not show the presence of significant relationships ($p = 0.256$). There was no reason to assert that supply chain resilience depends on the timeliness of the supply of necessary resources and the immediate response to deviations in business processes, or that respondents who forecast the late delivery of resources and immediately respond to deviations are reliable partners.

Testing details:

To test this hypothesis, the Reaction variable (“What is the reaction to the identified deviations in business processes?”), containing multiple answers, is presented as a modified variable calculated by a special transform function, resulting in each unique value of the new reaction variable corresponding to a unique combination of multiple responses from respondents. We can use a variable in this form in the chi-square test, as well as in correlation analysis.

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7,223 ^a	12	,843
Likelihood Ratio	8,084	12	,779
Linear-by-Linear Association	,196	1	,658
N of Valid Cases	36		

Eighteen cells (90,0%) have an expected count of less than 5. The minimum expected count is ,03.

Table 5.11: Chi-square tests for testing hypothesis 4. Source: author’s own elaboration.

The results of this test are not significant, because the condition necessary for its accuracy is not fulfilled (there should be no more than 20% of cells with values less than 5). Ninety percent of the cells in the table for constructing a chi-square test do not satisfy this condition. At the moment, thus, there is no way to argue that the hypothesis is not confirmed. For subsequent verification, a correlation analysis is used.

Correlations			REACTION	Lack
Spearman's rho	REACTION	Correlation Coefficient	1,000	,195
		Sig. (2-tailed)	.	,256
		N	37	36
	Lack	Correlation Coefficient	,195	1,000
		Sig. (2-tailed)	,256	.
		N	36	36

Table 5.12: The correlation analysis for testing hypothesis 4. Source: author's own elaboration.

The correlation analysis does not show that there are no significant correlations, so there is no reason to argue that the sustainability of the supply chain depends on the timely delivery of the necessary resources and an immediate response to deviations in business processes, or that respondents predicting an untimely supply of resources and responding immediately to deviations are reliable partners. At the same time, the opposite cannot be said.

Hypothesis 5, that “Managerial periodic control of sequence, timing and dependence suggests that existing business rules do not cover all possible scenarios and options, or interfere with unnecessary coordination / steps, when considering factors contributing to the appearance of bottlenecks,” was tested by using multinomial regression. To test this hypothesis, a dependent variable containing multiple answers was recoded. The input independent variables were checked for the presence of multicollinearity, which was not detected ($p = 0.206$ and $p = 0.871$). For all indicators, the regression was not significant (model significance = 1.000, pseudo R Square Nagelkerke = 0.231, significance of all factors > 0.05). The information criteria AIC and BIC showed lower values before the predictor variables were included in the model, which means that the predictors do not influence the dependent variable. The hypothesis was not confirmed.

Testing details: To test this hypothesis, the variable Res_Transmit (“In what ways is the sequence, timeline and dependency controlled during transfer of responsibility?”), containing multiple answers, is represented as a modified variable calculated by a special transforming function, resulting in a unique combination of multiple values corresponding to each unique value of the new variable responses from respondents. A variable in this form can be used in the selected analysis method - multinomial regression. This type of regression was selected because Res_Transmit was chosen as the dependent variable, which is nominal, but not ordinal; i.e., its values are not ordered in any way. Input independent variables to test the hypotheses are BR_Covering, Interference and Factor.

It is necessary to check for multicollinearity between independent variables.

Correlations			FACTOR	Interference	BR_covering
Spearman's rho	FACTOR	Correlation Coefficient	1,000	-,216	,028
		Sig. (2-tailed)	.	,206	,871
		N	37	36	36
	Interference	Correlation Coefficient	-,216	1,000	,229
		Sig. (2-tailed)	,206	.	,180
		N	36	36	36
	BR_covering	Correlation Coefficient	,028	,229	1,000
		Sig. (2-tailed)	,871	,180	.
		N	36	36	36

Table 5.13: The correlation analysis for testing hypothesis 5. Source: author's own elaboration.

There is no significant correlation ($p\text{-value} > 0,05$), which means an absence of multicollinearity, and that all of the variables are valid for regression analysis. The results for the regression analysis are shown below.

Model Fitting Information				
Model	Model Fitting	Likelihood Ratio Tests		
	Criteria			
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	118,320			
Final	109,127	9,193	130	1,000

Table 5.14: Model fitting information for testing hypothesis 5. Source: author's own elaboration.

Pseudo R-Square	
Cox and Snell	,225
Nagelkerke	,231
McFadden	,068

Table 5.15: Pseudo r-square for testing hypothesis 5. Source: author's own elaboration.

Likelihood Ratio Tests

Effect	Model Fitting	Likelihood Ratio Tests		
	Criteria			
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	1,091E2	,000	0	.
FACTOR	73,216	.	80	.
BR_covering	1,163E2	7,160	20	,996
Interference	1,082E2	.	30	.

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

b. Unexpected singularities in the Hessian matrix are encountered. This indicates that either some predictor variables should be excluded, or some categories should be merged.

Table 5.16: Likelihood ratio tests for testing hypothesis 5. Source: author's own elaboration.

Parameter Estimates

RES_TRANSMIT ^a	B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
							Lower Bound	Upper Bound
,06 Intercept	-5,713	2348,578	,000	1	,998	.	.	.
[FACTOR=4,00]	7,942	2349,683	,000	1	,997	2812,000	,000 ^b	.
[FACTOR=30,00]	6,950	2348,568	,000	1	,998	1043,163	,000 ^b	.
[FACTOR=200,00]	7,124	2348,721	,000	1	,998	1240,932	,000 ^b	.
[FACTOR=230,00]	-35,858	,000	.	1	.	2,675E-16	2,675E-16	2,675E-16
[FACTOR=1000,00]	1,544	2348,538	,000	1	,999	4,683	,000 ^b	.
[FACTOR=1004,00]	9,977	2348,722	,000	1	,997	21524,030	,000 ^b	.
[FACTOR=1030,00]	3,432	,000	.	1	.	30,946	30,946	30,946
[FACTOR=1200,00]	-,142	2348,628	,000	1	1,000	,867	,000 ^b	.
[FACTOR=1230,00]	0 ^c	.	.	0	.	.	.	.
[BR_covering=2]	-3,290	16,436	,040	1	,841	,037	3,812E-16	3,642E12
[BR_covering=3]	,285	12,866	,000	1	,982	1,330	1,488E-11	1,189E11
[BR_covering=4]	0 ^c	.	.	0	.	.	.	.
[Interference=1]	-2,018	49,058	,002	1	,967	,133	2,321E-43	7,618E40
[Interference=2]	5,571	17,036	,107	1	,744	262,608	8,283E-13	8,326E16

	[Interference=3]	-,974	14,227	,005	1	,945	,378	2,931E-13	4,864E11
	[Interference=4]	0 ^c	.	.	0	.	.	.	.
,50	Intercept	1,207	1863,842	,000	1	,999			
	[FACTOR=4,00]	1,953	1864,725	,000	1	,999	7,052	,000 ^b	
	[FACTOR=30,00]	,578	1863,837	,000	1	1,000	1,783	,000 ^b	
	[FACTOR=200,00]	-1,459	1864,047	,000	1	,999	,232	,000 ^b	
	[FACTOR=230,00]	-35,649	,000	.	1	.	3,294E-16	3,294E-16	3,294E-16
	[FACTOR=1000,00]	,316	1863,794	,000	1	1,000	1,372	,000 ^b	
	[FACTOR=1004,00]	-2,797	1863,972	,000	1	,999	,061	,000 ^b	
	[FACTOR=1030,00]	-1,538	,000	.	1	.	,215	,215	,215
	[FACTOR=1200,00]	-,351	1863,862	,000	1	1,000	,704	,000 ^b	
	[FACTOR=1230,00]	0 ^c	.	.	0	.	.	.	.
	[BR_covering=2]	1,889	14,766	,016	1	,898	6,611	1,783E-12	2,452E13
	[BR_covering=3]	,701	11,644	,004	1	,952	2,017	2,475E-10	1,643E10
	[BR_covering=4]	0 ^c	.	.	0	.	.	.	.
	[Interference=1]	-1,788	37,310	,002	1	,962	,167	2,918E-33	9,583E30
	[Interference=2]	-,172	16,643	,000	1	,992	,842	5,738E-15	1,236E14
	[Interference=3]	1,087	12,674	,007	1	,932	2,964	4,825E-11	1,821E11
	[Interference=4]	0 ^c	.	.	0	.	.	.	.
4,00	Intercept	3,063	1792,167	,000	1	,999			
	[FACTOR=4,00]	-,960	1792,921	,000	1	1,000	,383	,000 ^b	
	[FACTOR=30,00]	-,718	1792,166	,000	1	1,000	,487	,000 ^b	
	[FACTOR=200,00]	-,974	1792,331	,000	1	1,000	,378	,000 ^b	
	[FACTOR=230,00]	-35,642	,000	.	1	.	3,317E-16	3,317E-16	3,317E-16
	[FACTOR=1000,00]	2,260	1792,122	,000	1	,999	9,587	,000 ^b	
	[FACTOR=1004,00]	-1,172	1792,296	,000	1	,999	,310	,000 ^b	
	[FACTOR=1030,00]	-,661	,000	.	1	.	,517	,517	,517
	[FACTOR=1200,00]	-,358	1792,186	,000	1	1,000	,699	,000 ^b	
	[FACTOR=1230,00]	0 ^c	.	.	0	.	.	.	.
	[BR_covering=2]	1,018	14,407	,005	1	,944	2,769	1,510E-12	5,075E12
	[BR_covering=3]	,715	11,418	,004	1	,950	2,045	3,906E-10	1,071E10
	[BR_covering=4]	0 ^c	.	.	0	.	.	.	.
	[Interference=1]	3,640	31,375	,013	1	,908	38,105	7,489E-26	1,939E28
	[Interference=2]	-1,341	16,153	,007	1	,934	,261	4,655E-15	1,469E13
	[Interference=3]	-,830	12,614	,004	1	,948	,436	7,999E-12	2,379E10
	[Interference=4]	0 ^c	.	.	0	.	.	.	.
30,00	Intercept	-2,442	2300,634	,000	1	,999			
	[FACTOR=4,00]	4,591	2301,357	,000	1	,998	98,634	,000 ^b	
	[FACTOR=30,00]	4,356	2300,627	,000	1	,998	77,908	,000 ^b	
	[FACTOR=200,00]	6,588	2300,750	,000	1	,998	726,296	,000 ^b	

[FACTOR=230,00]	-37,172	,000	.	1	.	7,183E-17	7,183E-17	7,183E-17
[FACTOR=1000,00]	2,360	2300,595	,000	1	,999	10,594	,000 ^b	.
[FACTOR=1004,00]	5,078	2300,738	,000	1	,998	160,522	,000 ^b	.
[FACTOR=1030,00]	2,028	,000	.	1	.	7,601	7,601	7,601
[FACTOR=1200,00]	1,172	2300,650	,000	1	1,000	3,229	,000 ^b	.
[FACTOR=1230,00]	0 ^c	.	.	0	.	.	.	.
[BR_covering=2]	-3,201	14,628	,048	1	,827	,041	1,442E-14	1,151E11
[BR_covering=3]	-2,344	11,382	,042	1	,837	,096	1,966E-11	4,679E8
[BR_covering=4]	0 ^c	.	.	0	.	.	.	.
[Interference=1]	1,700	35,221	,002	1	,962	5,472	5,729E-30	5,227E30
[Interference=2]	5,001	16,798	,089	1	,766	148,552	7,471E-13	2,954E16
[Interference=3]	1,951	13,102	,022	1	,882	7,034	4,956E-11	9,984E11
[Interference=4]	0 ^c	.	.	0	.	.	.	.
30,56 Intercept	-2,279	2739,196	,000	1	,999	.	.	.
[FACTOR=4,00]	2,578	2740,367	,000	1	,999	13,168	,000 ^b	.
[FACTOR=30,00]	3,953	2739,189	,000	1	,999	52,078	,000 ^b	.
[FACTOR=200,00]	2,743	2739,330	,000	1	,999	15,538	,000 ^b	.
[FACTOR=230,00]	-36,435	,000	.	1	.	1,501E-16	1,501E-16	1,501E-16
[FACTOR=1000,00]	-,663	2739,164	,000	1	1,000	,515	,000 ^b	.
[FACTOR=1004,00]	,242	2739,326	,000	1	1,000	1,274	,000 ^b	.
[FACTOR=1030,00]	-3,549	,000	.	1	.	,029	,029	,029
[FACTOR=1200,00]	,435	2739,238	,000	1	1,000	1,545	,000 ^b	.
[FACTOR=1230,00]	0 ^c	.	.	0	.	.	.	.
[BR_covering=2]	3,114	16,817	,034	1	,853	22,509	1,090E-13	4,647E15
[BR_covering=3]	-,870	13,915	,004	1	,950	,419	5,996E-13	2,928E11
[BR_covering=4]	0 ^c	.	.	0	.	.	.	.
[Interference=1]	-,116	38,264	,000	1	,998	,890	2,392E-33	3,312E32
[Interference=2]	2,714	18,099	,022	1	,881	15,089	5,931E-15	3,839E16
[Interference=3]	-1,077	15,190	,005	1	,943	,341	4,003E-14	2,898E12
[Interference=4]	0 ^c	.	.	0	.	.	.	.
34,00 Intercept	-1,089	2207,553	,000	1	1,000	.	.	.
[FACTOR=4,00]	15,305	2208,543	,000	1	,994	4434851,102	,000 ^b	.
[FACTOR=30,00]	1,108	2207,540	,000	1	1,000	3,027	,000 ^b	.
[FACTOR=200,00]	,515	2207,871	,000	1	1,000	1,673	,000 ^b	.
[FACTOR=230,00]	-35,568	,000	.	1	.	3,572E-16	3,572E-16	3,572E-16
[FACTOR=1000,00]	,763	2207,490	,000	1	1,000	2,144	,000 ^b	.
[FACTOR=1004,00]	2,448	2207,803	,000	1	,999	11,567	,000 ^b	.
[FACTOR=1030,00]	2,756	,000	.	1	.	15,733	15,733	15,733
[FACTOR=1200,00]	-,432	2207,585	,000	1	1,000	,649	,000 ^b	.
[FACTOR=1230,00]	0 ^c	.	.	0	.	.	.	.

	[BR_covering=2]	-2,324	26,926	,007	1	,931	,098	1,178E-24	8,132E21
	[BR_covering=3]	,864	13,617	,004	1	,949	2,372	6,083E-12	9,250E11
	[BR_covering=4]	0 ^c	.	.	0	.	.	.	.
	[Interference=1]	-7,981	52,456	,023	1	,879	,000	7,638E-49	1,530E41
	[Interference=2]	,657	19,571	,001	1	,973	1,929	4,236E-17	8,788E16
	[Interference=3]	,965	14,626	,004	1	,947	2,624	9,313E-13	7,394E12
	[Interference=4]	0 ^c	.	.	0	.	.	.	.
200,0	Intercept	5,574	1732,108	,000	1	,997			
0	[FACTOR=4,00]	-2,241	1732,977	,000	1	,999	,106	,000 ^b	
	[FACTOR=30,00]	-,835	1732,104	,000	1	1,000	,434	,000 ^b	
	[FACTOR=200,00]	-1,306	1732,261	,000	1	,999	,271	,000 ^b	
	[FACTOR=230,00]	-37,188	,000	.	1	.	7,073E-17	7,073E-17	7,073E-17
	[FACTOR=1000,00]	-1,146	1732,061	,000	1	,999	,318	,000 ^b	
	[FACTOR=1004,00]	,151	1732,232	,000	1	1,000	1,163	,000 ^b	
	[FACTOR=1030,00]	-1,632	,000	.	1	.	,196	,196	,196
	[FACTOR=1200,00]	1,188	1732,119	,000	1	,999	3,279	,000 ^b	
	[FACTOR=1230,00]	0 ^c	.	.	0	.	.	.	.
	[BR_covering=2]	,444	14,405	,001	1	,975	1,560	8,545E-13	2,847E12
	[BR_covering=3]	,394	11,244	,001	1	,972	1,483	3,984E-10	5,519E9
	[BR_covering=4]	0 ^c	.	.	0	.	.	.	.
	[Interference=1]	-1,865	31,788	,003	1	,953	,155	1,355E-28	1,771E26
	[Interference=2]	-1,821	16,049	,013	1	,910	,162	3,536E-15	7,405E12
	[Interference=3]	-,835	12,247	,005	1	,946	,434	1,633E-11	1,152E10
	[Interference=4]	0 ^c	.	.	0	.	.	.	.
234,0	Intercept	,000	2430,409	,000	1	1,000			
0	[FACTOR=4,00]	,000	2431,517	,000	1	1,000	1,000	,000 ^b	
	[FACTOR=30,00]	,000	2430,404	,000	1	1,000	1,000	,000 ^b	
	[FACTOR=200,00]	,000	2430,625	,000	1	1,000	1,000	,000 ^b	
	[FACTOR=230,00]	-36,000	,000	.	1	.	2,320E-16	2,320E-16	2,320E-16
	[FACTOR=1000,00]	,000	2430,344	,000	1	1,000	1,000	,000 ^b	
	[FACTOR=1004,00]	,000	2430,582	,000	1	1,000	1,000	,000 ^b	
	[FACTOR=1030,00]	36,000	,000	.	1	.	4,311E15	4,311E15	4,311E15
	[FACTOR=1200,00]	,000	2430,426	,000	1	1,000	1,000	,000 ^b	
	[FACTOR=1230,00]	0 ^c	.	.	0	.	.	.	.
	[BR_covering=2]	,000	20,047	,000	1	1,000	1,000	8,634E-18	1,158E17
	[BR_covering=3]	,000	15,748	,000	1	1,000	1,000	3,934E-14	2,542E13
	[BR_covering=4]	0 ^c	.	.	0	.	.	.	.
	[Interference=1]	,000	44,197	,000	1	1,000	1,000	2,396E-38	4,174E37
	[Interference=2]	,000	22,446	,000	1	1,000	1,000	7,827E-20	1,278E19
	[Interference=3]	,000	17,214	,000	1	1,000	1,000	2,224E-15	4,497E14

	[Interference=4]	0 ^c	.	.	0	.	.	.	.
234,5	Intercept	16,757	1718,595	,000	1	,992	.	.	.
0	[FACTOR=4,00]	-14,470	1720,113	,000	1	,993	5,196E-7	,000 ^b	.
	[FACTOR=30,00]	-15,043	1718,594	,000	1	,993	2,931E-7	,000 ^b	.
	[FACTOR=200,00]	-14,862	1718,774	,000	1	,993	3,511E-7	,000 ^b	.
	[FACTOR=230,00]	-57,100	,000	.	1	.	1,592E-25	1,592E-25	1,592E-25
	[FACTOR=1000,00]	-15,879	1718,527	,000	1	,993	1,270E-7	,000 ^b	.
	[FACTOR=1004,00]	-14,616	1718,827	,000	1	,993	4,492E-7	,000 ^b	.
	[FACTOR=1030,00]	-15,478	,000	.	1	.	1,897E-7	1,897E-7	1,897E-7
	[FACTOR=1200,00]	-14,900	1718,638	,000	1	,993	3,379E-7	,000 ^b	.
	[FACTOR=1230,00]	0 ^c	.	.	0	.	.	.	.
	[BR_covering=2]	-5,622	17,212	,107	1	,744	,004	8,085E-18	1,619E12
	[BR_covering=3]	-6,199	13,202	,221	1	,639	,002	1,176E-14	3,507E8
	[BR_covering=4]	0 ^c	.	.	0	.	.	.	.
	[Interference=1]	4,199	46,696	,008	1	,928	66,628	1,192E-38	3,726E41
	[Interference=2]	4,343	18,596	,055	1	,815	76,936	1,141E-14	5,188E17
	[Interference=3]	3,481	13,345	,068	1	,794	32,488	1,421E-10	7,429E12
	[Interference=4]	0 ^c	.	.	0	.	.	.	.
1000,	Intercept	-2,632	2061,907	,000	1	,999	.	.	.
00	[FACTOR=4,00]	-,710	2063,300	,000	1	1,000	,491	,000 ^b	.
	[FACTOR=30,00]	-,103	2061,879	,000	1	1,000	,903	,000 ^b	.
	[FACTOR=200,00]	8,736	2062,032	,000	1	,997	6220,039	,000 ^b	.
	[FACTOR=230,00]	-35,176	,000	.	1	.	5,287E-16	5,287E-16	5,287E-16
	[FACTOR=1000,00]	,348	2061,799	,000	1	1,000	1,416	,000 ^b	.
	[FACTOR=1004,00]	,240	2062,066	,000	1	1,000	1,271	,000 ^b	.
	[FACTOR=1030,00]	1,380	,000	.	1	.	3,976	3,976	3,976
	[FACTOR=1200,00]	-,824	2061,901	,000	1	1,000	,439	,000 ^b	.
	[FACTOR=1230,00]	0 ^c	.	.	0	.	.	.	.
	[BR_covering=2]	-,556	20,340	,001	1	,978	,573	2,786E-18	1,180E17
	[BR_covering=3]	1,648	16,470	,010	1	,920	5,196	4,974E-14	5,428E14
	[BR_covering=4]	0 ^c	.	.	0	.	.	.	.
	[Interference=1]	1,390	42,584	,001	1	,974	4,015	2,269E-36	7,106E36
	[Interference=2]	1,808	25,594	,005	1	,944	6,096	9,978E-22	3,724E22
	[Interference=3]	2,948	18,650	,025	1	,874	19,070	2,545E-15	1,429E17
	[Interference=4]	0 ^c	.	.	0	.	.	.	.

Table 5.17: Parameter estimates for testing hypothesis 5. Source: author's own elaboration.

Based on the results obtained, the regression was not significant. In this connection, the hypothesis is not confirmed.

Next, a multinomial regression was again suggested to test **Hypothesis 6.0**, that “The lack of logic gaps, ambiguities or contradictions is achieved by determining the compliance of business rules with the goals of the company”. Checking the presence of multicollinearity between the independent variables showed that the independent variables are related, so only one of them was taken in the analysis, i.e., one that was more suitable on a scale (nominal). The results of the multinomial regression showed a relatively good fit of the model at a significance level of 10%. The model was able to explain 30.6% of the target variable, owing to the influence of the independent variable. In this model, the second category was significantly affected by the second category of the “Compliance” variable ($p = 0.000$). Thus, it can be concluded that the stated hypothesis is confirmed, the correspondence affects the absence of discontinuities, and does so in a positive way ($\beta = 19,307$).

Testing details:

To test this hypothesis, a multinomial regression method was chosen. This type of regression was selected, since Gaps was selected as the dependent variable, which is nominal, but not ordinal, i.e., its values are not ordered in any way. The hypothesis input variables are BR_Covering and Compliance, which are categorical variables. It is necessary to check for multicollinearity between the independent variables.

Correlations			Compliance	BR_covering
Spearman's rho	Compliance	Correlation Coefficient	1,000	,363*
		Sig. (2-tailed)		,030
		N	36	36
	BR_covering	Correlation Coefficient	,363*	1,000
		Sig. (2-tailed)	,030	
		N	36	36

*. Correlation is significant at the 0.05 level (2-tailed).

Table 5.18: The correlation analysis for testing hypothesis 6. Source: author's own elaboration.

Correlations show the high significance of the relationship between the tested input variables, so only one of them can be used in the analysis. Since the BR_covering scale is less suitable (ordinal), there is a need to leave the Compliance variable for analysis. The multinomial regression results are presented below.

Model Fitting Information				
Model	Model Fitting	Likelihood Ratio Tests		
	Criteria			
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	25,237			
Final	13,873	11,364	6	,078

Table 5.19: Model fitting information for testing hypothesis 6. Source: author's own elaboration.

The significance of the model is not very high. It can, however, be accepted as a working model with the caveat that the significance level is assumed to be at least 10% (instead of the standard 5%), i.e., a large error in the results is allowed.

Pseudo R-Square

Cox and Snell	,271
Nagelkerke	,306
McFadden	,146

Table 5.20: Pseudo r-square for testing hypothesis 6. Source: author's own elaboration.

The model was able to explain 30.6% of the values of the target variable, owing to the influence of the independent variable.

Likelihood Ratio Tests				
Effect	Model Fitting	Likelihood Ratio Tests		
	Criteria			
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	13,873 ^a	,000	0	.
Compliance	25,237	11,364	6	,078

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

Table 5.21: Likelihood ratio tests for testing hypothesis 6. Source: author's own elaboration.

The likelihood test (model fitting quality) indicates that the independent variable has a significant effect at a significance level of 10% ($p = 0.078 < 0.1$).

Parameter Estimates								
		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)
								Lower Bound Upper Bound
Gaps ^a								
No breaks in logic, ambiguities or contradictions, all business rules correctly cover all processes	Intercept	-18,747	1,118	281,164	1	,000		
	[Compliance=1]	37,631	6301,916	,000	1	,995	2,202E16	,000 ^b
	[Compliance=2]	19,307	1,282	226,892	1	,000	2,426E8	1,967E7 2,991E9
	[Compliance=3]	17,361	,000	.	1	.	3,465E7	3,465E7 3,465E7
	[Compliance=4]	0 ^c	.	.	0	.	.	.
Yes, business rules are formalized, but require revision / updating	Intercept	,000	1,414	,000	1	1,000		
	[Compliance=1]	18,884	6301,916	,000	1	,998	1,589E8	,000 ^b
	[Compliance=2]	,811	1,537	,279	1	,598	2,250	,111 45,723
	[Compliance=3]	-1,386	1,803	,591	1	,442	,250	,007 8,560
	[Compliance=4]	0 ^c	.	.	0	.	.	.

a. The reference category is: Yes, while business rules are not formalized (historically).

b. Floating point overflow occurred while computing this statistic. Its value is, therefore, set to system missing.

c. This parameter is set to zero because it is redundant.

Table 5.22: Parameter estimates for testing hypothesis 6. Source: author's own elaboration.

In this model, the Gaps dependent variable is significantly affected by category 2 of the Compliance variable ($p = 0,000 < 0.05$). A positive coefficient B means that answer 2 ("I agree") to the question about the compliance of business rules with the goals of the company positively affects the answer "There are no gaps in logic, ambiguities or contradictions, all business rules correctly cover all processes" in the question about the availability gaps in the logic of processes. Thus, we can conclude that the hypothesis is confirmed; the compliance of business rules with the goals of the company affects the absence of gaps.

The next step was to calculate a logistic regression to verify **Hypothesis 7**, that the company's performance operations may depend on a number of factors yet to be identified. The performance indicator is the target variable and, at the same time, the nominal variable. This variable was transformed into a dichotomous variable. Independent variables were chosen, given the requirement for the absence of multicollinearity. The first version of logistic regression was calculated, and then significant predictors were tested for multicollinearity. Correlated predictors were not detected; the next step was to eliminate insignificant predictors. The remaining categorical variables as input were then converted to dummy variables. The constructed regression gave a satisfactory quality result (-2 Log likelihood = 32,185, Nagelkerke R Square = 0,478). Since all of the variables turned out to

be insignificant, however, the model was further improved by alternately eliminating the predictors in order of increasing importance. As a result, a well-working model was obtained, whose explanatory capacity is slightly lower (Nagelkerke R Square = 0.355), but the set of variables is significant ($p = 0.022$ and $p = 0.049$). A negative dependence of efficiency on the presence of a low level of process automation (with an exponential ratio of -2.25) and a negative dependence (with an exponential ratio of -1.799) on which processes are most costly for the company were, therefore, established.

Testing details:

The performance indicator is the target variable in the study of this hypothesis problem i.e. the nominal variable expressed in the ordinal scale. To test this, it is necessary to convert it into a dichotomous variable, where there will only be two values “1” - Yes, the company is effective (values 1 and 2 of the original variable Performance) and “0” - “No”, ineffective (values 3, 4, 5 and 6). Answers 3 and 6 must be included in the answer “No”, as the answers of the respondents in these categories are uncertain, i.e., there is no clear certainty that the efficiency of the company's processes is high.

Logistic regression is used as an analysis tool. The target variable is the modified Performance variable (Performance_1_0). Selectable independent variables should not have multicollinearity among themselves. For this, it is necessary to use logistic regression, to identify variables that can have a significant impact. Testing for multicollinearity will eliminate interfering variables. The next step is to categorize the input variables into dummy variables in order to be able to take them into account in logistic regression.

The results of the first launch of the regression with all possible influence factors are presented below:

Variables in the Equation						
	B	S.E.	Wald	df	Sig.	Exp(B)
Step 0 Constant	1,153	,468	6,059	1	,014	3,167

Table 5.23: Variables in the equation for testing hypothesis 7. Source: author's own elaboration.

The significance of the model is high (0.014), which means take this out that the constant in the regression equation is highly significant. Variables are not yet included in the model but are contenders.

Variables not in the Equation ^a			
	Score	df	Sig.

Step 0	Variables	Constraints	1,383	3	,709
		Constraints (1)	,013	1	,910
		Constraints (2)	,806	1	,369
		Constraints (3)	,006	1	,936
		Misunderstanding	1,243	3	,743
		Misunderstanding (1)	,163	1	,687
		Misunderstanding (2)	,672	1	,412
		Misunderstanding (3)	,680	1	,409
		Removal	1,974	3	,578
		Removal (1)	1,077	1	,299
		Removal (2)	,329	1	,566
		Removal (3)	,329	1	,566
		Benchmarking	5,263	3	,154
		Benchmarking (1)	4,441	1	,035
		Benchmarking (2)	,329	1	,566
		Benchmarking (3)	2,339	1	,126
		IMPROVEMENT	2,757	3	,431
		IMPROVEMENT (1)	,055	1	,815
		IMPROVEMENT (2)	2,339	1	,126
		IMPROVEMENT (3)	,503	1	,478
		Excellence	4,441	2	,109
		Excellence (1)	3,222	1	,073
		Excellence (2)	,377	1	,539
		LY_costs	3,413	2	,182
		LY_costs (1)	,672	1	,412
		LY_costs (2)	,006	1	,936
		Budget	1,471	3	,689
		Budget (1)	,853	1	,356
		Budget (2)	,013	1	,910
		Budget (3)	,806	1	,369
		Integration	5,903	4	,207
		Integration (1)	1,765	1	,184
		Integration (2)	,233	1	,629
		Integration (3)	1,791	1	,181
		Integration (4)	,003	1	,959
		Requirements (1)	,680	1	,409
		REACTION	1,383	4	,847
		REACTION (1)	,329	1	,566
		REACTION (2)	,329	1	,566
		REACTION (3)	,672	1	,412

REACTION (4)	,013	1	,910
FACTOR	8,588	6	,198
FACTOR (1)	,686	1	,407
FACTOR (2)	,365	1	,546
FACTOR (3)	,806	1	,369
FACTOR (4)	,503	1	,478
FACTOR (5)	,329	1	,566
FACTOR (6)	3,299	1	,069
BOTTLENECKS	8,553	5	,128
BOTTLENECKS (1)	1,077	1	,299
BOTTLENECKS (2)	,686	1	,407
BOTTLENECKS (3)	6,790	1	,009
BOTTLENECKS (4)	1,077	1	,299
BOTTLENECKS (5)	,013	1	,910
RESPONSIBILITY	7,378	5	,194
RESPONSIBILITY (1)	,686	1	,407
RESPONSIBILITY (2)	2,493	1	,114
RESPONSIBILITY (3)	,006	1	,936
RESPONSIBILITY (4)	,329	1	,566
RESPONSIBILITY (5)	1,895	1	,169
RES_TRANSMIT	5,537	6	,477
RES_TRANSMIT (1)	1,504	1	,220
RES_TRANSMIT (2)	,055	1	,815
RES_TRANSMIT (3)	,003	1	,959
RES_TRANSMIT (4)	,329	1	,566
RES_TRANSMIT (5)	,329	1	,566
RES_TRANSMIT (6)	,672	1	,412
Control	3,558	3	,313
Control (1)	,111	1	,739
Control (2)	,055	1	,815
Control (3)	3,299	1	,069
BR_covering	,525	2	,769
BR_covering (1)	,503	1	,478
BR_covering (2)	,365	1	,546
Gaps	4,576	2	,101
Gaps (1)	1,281	1	,258
Gaps (2)	,365	1	,546
Compliance	8,944	3	,030
Compliance (1)	,055	1	,815
Compliance (2)	4,957	1	,026

Compliance (3)	4,441	1	,035
Interference	2,203	3	,531
Interference (1)	,329	1	,566
Interference (2)	,680	1	,409
Interference (3)	1,281	1	,258
Increase	1,357	2	,507
Increase (1)	,672	1	,412
Increase (2)	1,176	1	,278
Decrease	1,767	2	,413
Decrease (1)	1,102	1	,294
Decrease (2)	1,646	1	,199
Lack	3,801	3	,284
Lack (1)	,329	1	,566
Lack (2)	,877	1	,349
Lack (3)	,163	1	,687
Respondent_type	4,985	3	,173
Respondent_type (1)	3,222	1	,073
Respondent_type (2)	3,070	1	,080
Respondent_type (3)	,111	1	,739
Impact (1)	,055	1	,815
Risks	6,725	2	,035
Risks (1)	5,263	1	,022
Risks (2)	3,402	1	,065
Performance	25,000	2	,000
Performance (1)	1,077	1	,299
Performance (2)	14,035	1	,000
Monitoring	4,715	2	,095
Monitoring (1)	4,441	1	,035
Monitoring (2)	1,895	1	,169
Priority	4,032	3	,258
Priority (1)	,163	1	,687
Priority (2)	3,299	1	,069
Priority (3)	,377	1	,539

a. Residual Chi-Squares are not computed because of redundancies.

Table 5.24: Variables not in the equation for testing hypothesis 7. Source: author's own elaboration.

The most suitable variables according to table 5.24 are: Benchmarking (1) (Yes), BOTTLENECKS (3) (4.0), Compliance (disagree), Compliance (2) (I agree), Compliance

(3) (In the middle), Risks (external and internal), Risks (1) (external risks Monitoring (1) (the most costly) have a significant impact to the target variable (Performance).

The multicollinearity checks on this set of variables is carried out by narrowing it to one category from each variable:

- Benchmarking (1) (Yes);
- BOTTLENECKS (3) (4.0);
- Compliance (2) (I agree);
- Risks (1) (external risks);
- Monitoring (1) (the most expensive).

Correlations			BM1	BN3	CP2	R1	MN1
Spearman's rho	BM1	Correlation Coefficient	1,000	-,193	,038	,219	-,113
		Sig. (2-tailed)	.	,251	,821	,193	,504
		N	37	37	37	37	37
	BN3	Correlation Coefficient	-,193	1,000	-,306	-,274	,161
		Sig. (2-tailed)	,251	.	,065	,100	,340
		N	37	37	37	37	37
	CP2	Correlation Coefficient	,038	-,306	1,000	,272	-,109
		Sig. (2-tailed)	,821	,065	.	,103	,520
		N	37	37	37	37	37
	R1	Correlation Coefficient	,219	-,274	,272	1,000	-,183
		Sig. (2-tailed)	,193	,100	,103	.	,280
		N	37	37	37	37	37
	MN1	Correlation Coefficient	-,113	,161	-,109	-,183	1,000
		Sig. (2-tailed)	,504	,340	,520	,280	.
		N	37	37	37	37	37

Table 5.25: The correlation analysis for testing hypothesis 7. Source: author's own elaboration.

No significant correlations were found, multicollinearity was not found, the variables are suitable for constructing a regression. Regression based only on these variables gives the following result:

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	32,185 ^a	,347	,478

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Table 5.26: Model summary for testing hypothesis 7. Source: author's own elaboration.

Forty-seven and eight tenths percent of the values of the explained variable are described by the selected model. This is an average.

Moreover, all variables turned out to be insignificant:

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a						
BM1	1,151	,930	1,531	1	,216	3,162
BN3	-1,475	1,033	2,040	1	,153	,229
CP2	1,187	,930	1,631	1	,202	3,278
R1	,943	1,010	,872	1	,350	2,568
MN1	-1,626	,990	2,699	1	,100	,197
Constant	,121	,879	,019	1	,891	1,129

a. Variable(s) entered on step 1: BM1, BN3, CP2, R1, MN1.

Table 5.27: Variables in the equation for testing hypothesis 7. Source: author's own elaboration.

Excluding the variables in turn, the following model is formed:

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	36,927 ^a	,258	,355

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.

Table 5.28: Model summary for testing hypothesis 7. Source: author's own elaboration.

Its explanatory ability is slightly lower, while the set of variables is significant:

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a						
BN3	-2,250	,984	5,225	1	,022	,105
MN1	-1,799	,913	3,881	1	,049	,165
Constant	1,635	,550	8,839	1	,003	5,127

a. Variable(s) entered on step 1: BN3, MN1.

Table 5.29: Variables in the equation for testing hypothesis 7. Source: author's own elaboration.

The final dependence can be formulated as follows: efficiency depends negatively (with an exponential coefficient of -2.25) on the answer to the question Bottlenecks = "4", i.e., "Low level of automation, so much has to be done manually" and also negatively (with an exponential coefficient of -1.799) from the answer to the question Monitoring = "The costliest processes."

Conclusion: whether the company always reaches the target levels of efficiency depends on what causes the appearance of bottlenecks, as well as what processes are regularly monitored. A company is more likely to be effective if it has a high level of automation, and if more than just the costliest processes are monitored. Automation and monitoring are key to increasing efficiency. If only costly processes are monitored, and the level of automation is low, then the company will most likely be ineffective.

Hypothesis 8.0, that the achievement of the company's target levels of efficiency depends on the measurement of all types of costs / the costliest processes was then verified using correlations. The significance of the correlation coefficient was $p = 0.01$ and, as a result, the null hypothesis of the absence of a linear relationship between the variables was rejected. The connection existed and was measured by a correlation coefficient, which is equal to -0.429, and which shows a negative average power. It can be argued that there was a medium strength connection.

Testing details:

The significance of the correlation coefficient is $p = 0.01$, which is less than the default significance level of 5% (0.05). Consequently, the null hypothesis is rejected, as is the lack of a linear relationship between the variables Performance and Monitoring. There is a connection. The strength of this relationship is measured by a correlation coefficient that is -0.429, that is 42.9% and is the average level of correlation. It is also worth paying attention to the coefficient. The correlation is negative. This means a negative linear relationship. It can be argued that the more thoroughly the measurement of processes is carried out, the greater the achievement of the company's efficiency target levels will be; and vice versa, the more efficient the company's work, the more measured its processes will be.

Correlations			Performance	Monitoring
Spearman's rho	Performance	Correlation Coefficient	1,000	-,429*
		Sig. (2-tailed)	.	,010
		N	35	35
	Monitoring	Correlation Coefficient	-,429*	1,000
		Sig. (2-tailed)	,010	.
		N	35	37

*. Correlation is significant at the 0.05 level (2-tailed).

Table 5.30: The correlation analysis for testing hypothesis 8. Source: author's own elaboration.

Hypothesis 9.0 was then tested on the ability of processes to scale upwards, depending on the absence of logic discontinuities, ambiguities or contradictions in them. For this, a correlation analysis was performed, which showed the presence of a significant correlation ($p = 0.013$). The null hypothesis regarding the absence of a linear relationship between the variables was rejected; there is a medium power positive relationship ($r = 0.406$).

Testing details:

For this pair of Gaps and Increase variables, the significance of the correlation coefficient is $p = 0.013$, which is less than the significance level of 5% (0.05). Consequently, the null hypothesis that there is no linear relationship between the Gaps and Increase variables is also rejected. There is a connection. The strength of this relationship is measured by the correlation coefficient, which is 0.406. 40.6%, and is the average level of correlation. It can be argued that there is a medium-strength positive relationship. It can also be argued that the more logic gaps there are in business processes, the worse they scale, and that the more scalable the processes, the fewer logic gaps, ambiguities or contradictions they have.

Correlations			Gaps	Increase
Spearman's rho	Gaps	Correlation Coefficient	1,000	,406*
		Sig. (2-tailed)	.	,013
		N	37	37
	Increase	Correlation Coefficient	,406*	1,000
		Sig. (2-tailed)	,013	.
		N	37	37

*. Correlation is significant at the 0.05 level (2-tailed).

Table 5.31: The correlation analysis for testing hypothesis 9. Source: author's own elaboration.

It was found (**Hypothesis 10.0**) that the combination of priorities of cost, time and quality is not critical for the supply chain. In order to come to this conclusion, a correlation analysis and a Chi-square test were performed. The Chi-square test did not show reliable results, so a correlation analysis was performed, which revealed the lack of a relationship between the tested variables ($p = 0.877$) and, therefore, the hypothesis regarding the existence of the relationship of priorities and criticality was not confirmed.

Testing details:

This hypothesis can be checked by two methods that are suitable in this case - the chi-square test, as well as the Spearman correlation. Such a choice of tests is due to the type of variables being checked for a connection as they are nominal.

The Chi-square test results are presented below.

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1,615 ^a	4	,806
Likelihood Ratio	2,136	4	,711
Linear-by-Linear Association	,315	1	,575
N of Valid Cases	36		

a. Eight cells (80,0%) have an expected count of less than 5. The minimum expected count is ,31.

Table 5.32: Chi-square tests for testing hypothesis 10. Source: author's own elaboration.

The results of this test are not convincing, since the condition necessary for its accuracy is not fulfilled (there should be no more than 20% of cells with a value less than 5). Thus, there is no way to assert that there is or is there not a connection between the answers to the question "What is priority: cost, time or quality?" and the question "What effect does the activity of your unit / company have on the value chain within the supply chain?"

The hypothesis needed to be checked by using a correlation analysis of a given pair of variables (Priority and Impact).

Correlations			Impact	Priority
Spearman's rho	Impact	Correlation Coefficient	1,000	-,027
		Sig. (2-tailed)		,877
		N	36	36
	Priority	Correlation Coefficient	-,027	1,000
		Sig. (2-tailed)	,877	
		N	36	37

Table 5.33: The correlation analysis for testing hypothesis 10. Source: author's own elaboration.

This test demonstrated that the correlation coefficient between Priority and Impact is insignificant, because the p-value = 0.877, which is more than 0.05 (set significance level). A correlation coefficient of -0.27, therefore, cannot be trusted. The conclusion is that Priority and Impact are not related. In other words, the answers to the questions “What is priority: cost, time or quality?” and “What effect does the activity of your unit / company have on the value chain within the supply chain?” do not depend on each other. It can be argued that the priorities of the company do not affect the impact that the company has on the value chain within the supply chain, and vice versa, the influence of the company on the supply chain does not determine its priorities.

The following is a summary table of hypothesis testing results:

№	Construct	Hypothesis Description	Test Results
H1	SC Integration	The imperfection of business processes, business rules and logic contribute to the emergence of bottlenecks, limiting the speed of the implementation of business processes.	Not supported
H2	SC Integration	The multiple transfer of responsibility is most often the cause of inefficient communication between departments / supply chain partners.	Not supported
H3	SC Integration	Compliance of the business rules with the goals of the company contributes to reduced costs by running projects on operational excellence.	Supported
H4	SC Resilience	The Resilience of the supply chain depends on the timeliness of the supply of the necessary resources and the immediate response to deviations in the business processes of supply chain partners.	Not supported

H5	SC Resilience	Managerial periodic control of sequence, timing and dependence suggests that existing business rules do not cover all possible scenarios and options, interfere with unnecessary coordination / steps, when considering factors contributing to the appearance of bottlenecks.	Not supported
H6	SC Resilience	The lack of logic gaps, ambiguities or contradictions is achieved by determining the compliance of business rules with the goals of the company.	Supported
H7	SC Performance	Supply chain performance depends on a number of factors that should be identified.	Supported
H8	SC Performance	Measurement of all types of costs or the costliest processes contributes to achieving a company's performance targets.	Supported
H9	SC Performance	The upward scalability of business processes is possible without discontinuities, logic ambiguities or inconsistencies therein.	Supported
H10	Service Level Priorities	The combination of cost, time and quality is critical to an international FMCG supply chain.	Not supported

Table 5.34: Summary of hypothesis testing result. Source: compiled by the author.

5.4. Summary of key empirical findings

The primary purpose of a supply chain is to satisfy a customer's demand and, therefore, the availability of resources and the functionality of supply chain processes need to be guaranteed (Heckmann, Comes & Nickel, 2015). One of the factors that contributes to this and requires increased attention is supply chain resilience that focuses on the system's adaptive capability to cope with temporary disruptive events (Jain *et al.*, 2017). Countering negative events requires the timely detection of deviations and predetermined options for their elimination, which should have previously been tested in practice. There is a need to implement performance measurement: the ratio of resources used against the results derived and the extent to which customer-related objectives have been met (Gligor, Esmark & Holcomb, 2015). Consumers and suppliers usually set service level agreements that meet the requirements and capabilities of both parties. In this way, once the current level of delivery performance has been evaluated, the next natural step is to find ways to improve delivery performance (Bushuev, 2018). The present study offers some clarification of the extant literature. The integration of the supply chain is quite a difficult process to manage, since it requires serious research at both the academic and business levels.

5.4.1. Business rules' significance (Integration)

Considering the supply chain integration process from a resource-based view, in order to take advantage of the capabilities of all of the participants and partners in a supply chain means that the business processes of all of the participants should neither contradict each

other nor create bottlenecks. Empirically, it was proven that bottlenecks are not a significant limitation which reduce the speed of the implementation of business processes. It is likely that a more detailed examination of this statement can reveal additional factors that impose restrictions and reduce the efficiency of business processes. This means that emerging bottlenecks in the supply chain are the result of inefficient business rules that should be managed constantly. Informational gaps and the non-transfer of responsibility in the end-to-end business processes of an integrated supply chain should certainly be considered as a limiting factor. Based on the respondents' answers, however, it was concluded that this statement does not correlate with the reason for the loss of effectiveness. To interpret the results obtained and define the main cause of inefficiency there is a need to reveal more important factors that should be found in further studies. At the same time, the results of the study confirmed that business rules governing business processes should be consistent with the objectives of the company and, at the same time, should be aimed at continually improving efficiency by initiating operational excellence projects.

5.4.2. Constraints elimination at the system level (Resilience)

An immediate response to deviations in supply chains is not a significant factor affecting their supply chain resilience. Business rules should determine the possible scenarios and options for the implementation of processes, so an immediate response to the identified deviation may conflict with the established order. This indicates that deviations are permissible, and that the business processes of supply chain partners are largely adapted to their occurrence. One of the tasks resulting from testing the hypothesis is to determine the limit of the supply chain flexibility which, in some cases, could be considered as the appearance of a force majeure. In addition, a manager's periodic control of sequence and timing is not significant for supply chain resilience, neither is excessive alignment or steps of business processes. The readiness of the supply chain to eliminate temporary disruptive events, in this case, can be interpreted as carrying out systems work and establishing control points for the continuous monitoring of deviations, as well as the formation of predefined response methods. This means that supply chain resilience directly depends on the business logic that manages the elimination of constraints at the systems level, i.e. a manager does not have to show creativity in each individual case and decipher how to deal with temporary disruptive events. It was largely confirmed that well-formed business rules that do not have contradictions should be consistent with the company's objectives with regard to managing both the efficiency of processes and the elimination of deviations in these processes at the systems level.

5.4.3. Business processes manageability and automation (Performance)

It was revealed that there is a dependence on the performance of the supply chain to automate the costliest business processes, which can significantly increase their manageability and, at the same time, achieve a reliable tool that helps to reduce costs. The performance of business processes, in terms of their ability to scale upwards, depends on the intelligible business rules that govern them. This study did not define the determination of the allowable limit of supply chain flexibility, beyond which it may be a negative impact on scalability.

5.4.4. Critical priority for the supply chain (Service level)

Finally, it should be noted that the study did not confirm the hypothesis that cost and quality are a critical priority for the supply chain. These priorities determine the ability of the supply chain to be effective and meet customer requirements. If logistics performance leads to more revenue from satisfied customers, then top management might view logistics as a way to achieve competitive differentiation (Leuschner & Lambert, 2016). To do this, a refinement should be made in a qualitative study of what may differentiate a supply chain from its closest competitors.

5.5. Qualitative research, analysis and findings

All of the theoretical approaches that were considered in this study are the basis for improving the efficiency of the supply chain, which is also the aim of this study. When integrating the business processes of supply chain partners, it is necessary to share resources and advantages in order to strengthen competitive advantages. All of the theoretical aspects considered are aimed at achieving the company's strategic goals, creating conditions for achieving resilience in the supply chain and ultimately creating value for customers and shareholders.

Based on the considered priorities of the supply chain, as well as its problems and challenges, questions were formed for conducting a semi-structured interview. The tasks of semi-structured interviews are to build understanding on the basis of real practice, i.e., which goals are set by the supply chain manager and partners for themselves, as well as which problems and challenges they experience, and how they see themselves resolving the problems and managing the constraints that they face in real life.

The efficiency of the supply chain is a key condition which creates value for customers and other stakeholders. The results of the quantitative study in this research showed that the effectiveness of the supply chain determines the quality of established business rules for the processes of partners in the supply chain, which should be consistent with the goals of the company and be aimed at constantly improving efficiency by initiating projects to reduce

costs. Moreover, supply chain resilience depends directly on the business logic that controls the elimination of restrictions at the systems level and determines the ability to move towards increased workloads. At the same time, it should be noted that the effectiveness of the supply chain does not depend on the presence of bottlenecks and information gaps.

5.5.1. Propositions for qualitative research

A quantitative study revealed the need for taking a deeper look at the established dependencies; the results of a quantitative study should be clarified by conducting a qualitative study consisting of semi-structured interviews.

Construct	Quantitative study findings	The need for further clarification by conducting a qualitative study
SC Integration	1. Bottlenecks do not reduce supply chain efficiency. 2. Multiple transfer of responsibility does not form inefficient communications. 3. Cost reduction is achieved through the implementation of projects on operational efficiency, which indicates the compliance of business rules with the goals of the company.	1. It should be understood why bottlenecks do not reduce the efficiency of the supply chain, and also why multiple transfers of responsibility do not form inefficient communications 2. For the supply chain partners, are there objectives to reduce costs and increase efficiency, and to what extent is this consistent with company goals.
SC Resilience	1. Timely response to emerging deviations does not contribute to supply chain resilience. 2. Periodic monitoring by business process managers does not mean the inefficiency of business rules. 3. Compliance of business rules with the goals of the company helps to eliminate logical gaps and contradictions.	1. How timely response to deviation has an impact on supply chain sustainability. 2. Is there a dependence on the control of business processes and the effectiveness of the supply chain.
SC Performance	1. Factors in supply chain efficiency are business process automation and cost monitoring. 2. Achieving company goals depends on monitoring the costliest processes. 3. The scalability of business processes is possible only in the absence of gaps in logic and contradictions.	1. How automation and cost monitoring help improve supply chain efficiency. 2. How cost control affects the achievement of company goals. 3. To what extent the discontinuity of the volumes passing through the supply chain can reduce the reaction rate.
Service Level Priorities	Time, cost and quality are not a priority for the supply chain.	It is necessary to clarify what is the priority of the supply chain, which creates value for customers in the long run.

Table 5.35: Propositions for qualitative research. Source: author's own elaboration.

The conclusions of the quantitative research will be clarified based on the respondents' responses. Considering that the main tasks of a semi-structured interview are to highlight problems, priorities and improvements from real practice, the clarification of the above findings is fully consistent with the objectives of a qualitative study.

5.5.2. Semi-structured interview questions

Conducting a semi-structured interview is important with regard to learning about real practice. First of all, real practice should be broken down into several dimensions: priorities, problems, improvement. The priorities include what managers are guided by, which goals they set for themselves and what determines their activities, while the problems are those challenges that the supply chain faces when trying to understand the main causes of inefficiency and how to solve or eliminate those constraints that directly affect underperformance and create difficulties for the supply chain. The improvements demonstrate how the focus company and its partners are trying to improve operational performance, and reflection indicates what lessons should be learned for the future. The questions formulated for conducting semi-structured interviews are listed in the following table:

Key topic	Focus company Top managers	Focus company middle management	Partners
Priorities	Goals / strategy of the focus company.	The goals and objectives of your unit Scope of current projects / tasks and their focus. Vision for development areas.	The goals and objectives of your company. Is there a formulated strategy and mission which you can specify as an example?
Problems	Supply chain structure: brief description of activities (planning, procurement, logistics, and so on.), regional presence.	Current situation / analysis of operational activities: costs / focuses, difficulties and limitations.	The practice of working with the focus company, difficulties and limitations in working. If possible, please indicate the root causes of difficulties and limitations when working with the focus company.
	Description of current problems / supply chain constraints (As-Is): resource, temporary, internal / external.		
Improvements	Current understanding of the future state of the supply chain (To-Be): what the future supply chain is capable of and which characteristics it should have supply chain transformation: how the transition from As-Is to To-Be (To-Do) is carried out.	Mitigation strategy to cope with difficulties and limitations.	Ongoing tasks to improve activities / business processes (if any) How do you work with limitations? What would you like to change in order to increase the effectiveness of partnerships?
Reflection	A generalized opinion on what was said, what happened / what didn't work out, which lessons should be learned (lessons learned) to capitalize "capabilities".	What was planned - with what quality and result, what failed and which lessons need to be learned for the future - capitalization of opportunities.	What do you think is the ideal partnership model for a focus company? Does it match the real model?

Table 5.36: Questions for semi-structured interviews for various group of respondents. Source: author's own elaboration.

5.5.3. Interviewing the Director of supply chain management

Conducting a qualitative study begins with an interview with the Director of supply chain management using previously formulated questions. Based on the results of the interview, rather complex answers were received that determined the main direction of further analysis. All of the judgments obtained from the results of this interview gave a basis to ideas about priorities, problems and improvements in the supply chain, which in turn greatly strengthened and facilitated understanding of the real practice in which the supply chain is located. The full transcript of the interview is given at Appendix F.

5.5.4. Supplement and verification of the quantitative study's findings

Conducting semi-structured interviews made it possible to supplement the verification of the quantitative study's findings. For this purpose, all of the respondents' statements were examined with a view to their compliance with the conclusions drawn from the results of testing the hypotheses. Obtaining additional information allows the creation of a deeper understanding of the factors that contribute to the effective integration of business processes between partners in the supply chain. The semi-structured interview transcripts are given at Appendix G.

5.5.4.1.1. Supply chain integration

It is necessary to understand why performance bottlenecks do not reduce the efficiency of the supply chain, as well as why the multiple transfer of responsibility does not generate ineffective communication.

Based on the responses of the respondents, supply chain partners are primarily focused on providing a good quality service. Emerging bottlenecks are, thus, relatively quickly evened out, despite the multiple transfer of responsibility. This is explained by the fact that the supply chain partners are interested in fulfilling their contractual obligations and receiving full payment for their services.

Confirmation of this is quoted by respondent No. 11:

'We are a responsible supplier, we will not spoil relations, but nevertheless this can be a rather big problem for us. A significant area is forecasting and compliance with the fact of delivery, in the first quarter we see a lag of 15% -18% from the forecast, a difference of 50% in April, the stock was not delivered on time, we do not see that the volume of production that we predicted for the year will be provided'.

Moreover, respondent No. 18 indicated that:

'We try to comply with the agreements, it is difficult to build our own process as we would like - forecasting raw materials. We try to integrate ourselves and close the risks with our own efforts. Joint result - all customer needs - high season, we could pass without any problems. Market changes, volatility of consumption - more accurate forecasting is required. We would like the client to analyse their own processes in this zone, so that there would be a result in this direction. Frequent rotation of personnel - people change, it's not always qualitatively able to convey the entire history of interaction with the supplier. Openness to a joint dialogue on both sides. We try to cover risks as much as possible, have spare suppliers, we have stocks in warehouses, when the market changes, our company is well adapted with an increase in the volume of work. When volumes fall, we are poorly adapted, as there are financial obligations for operating equipment. For a full-fledged information exchange, it would be possible to improve the integration of systems - what the client wants, what he plans, how the situation is changing - in order to flexibly integrate into these changes.'

Based on these answers, it can be concluded that the focus company has influence on partners in the supply chain, which indicates that potential bottlenecks and multiple transfers of responsibility are not factors that contribute to a decrease in supply efficiency.

Do supply chain partners have goals to reduce costs and increase efficiency, and how much does this correspond with the goals of companies?

Most partners have business growth goals. The vast majority of respondents carry out activities to control costs, to achieve waste-free production, to automate business processes, to reduce losses, to eliminate places where money is lost and certainly to reduce costs.

It is necessary to specify those respondents from the company who noted the objectives of business growth while reducing costs. These are respondents 11, 15, 18, 23, 24, 38, 14, 20, 21, 22, 29, and so on. As an example, there is a quote from respondent number 18:

'Automation of processes, the current market situation makes it more flexible, provide faster information to customers and partners. Also work on technological processes, cost reduction, staff training to meet top-level goals. We focus on the production of quality products that meet customer requirements and the required level of margin and the required level of costs.'

5.5.4.1.2. Supply chain resilience

Why does a timely response to deviation not affect supply chain resilience?

The inconsistency of this conclusion of the quantitative study can be explained as follows: the accuracy of planning directly forms deviations which, in fact, are difficult to eliminate. It should be mentioned that when plans containing certain volumes are sent by the partner, and these volumes are either higher or lower than estimated, it is no longer possible to respond to this in a timely manner.

This is a fairly simple, logical explanation since partners encounter difficulties scaling up their processes owing to previously unaccounted for circumstances, and these circumstances leave a serious imprint on their activities.

Confirmation of this is given by the direct citation of respondent number 27:

'The speed of change in IT in the focus company is not fast. All key personnel were relocated to Moscow; managers in the region do not have authority. Planning allows us to plan a resource. We see problems in planning the balance of goods, overstocking our warehouse, we are a buffer for storing goods. Any partner earns on sales. We could sell this place to another value-added customer. We bear these costs. 3000 pallet places would be enough, and we keep 5000. This creates costs for us. It would be great for us that we did not have shipping peaks. We ship 50-70 tons, at some point we need to ship 200-300-400 tons, these days we completely switch to the manual control.'

Is there a relationship between business process control and supply chain performance?

The resilience and performance of supply chain business processes depend on many factors. Monitoring business processes is one of them, but certainly not the only one. Based on the respondents' responses, a great deal of evidence was received which indicated that the effectiveness of business processes is tied to many factors.

This is confirmed by the statements of all of the respondents, starting from the representatives of the focus company and ending with all of the partners' categories. Almost all of the respondents noted that effectiveness is based on many factors. Among them, it should be noted, are automation, quality budgeting, efficiency management, prioritization of tasks, rotation and recruitment of new employees, cost management, loss reduction, fulfilment of obligations by all partners in the supply chain and improving planning accuracy.

As an example, presented below is a quote from respondent number 6:

'Focus on efficiency: establishing cost control processes and automation is a problem with the timing of the provision of information and integration between systems, a problem with master data, the constant transfer of responsibilities from hand to hand in the IT department - leapfrog, a lot of time is wasted. The impact of IT restrictions on operational activities: discipline, entering data, entering correct data in IT systems. Analysis of transportation costs — the systematization of information management is not regulated due to the many IT systems: from 10 different sources — this can be halved, I would like to reduce to 4 sources: international transport, small-tonnage transport, long-distance transport, groupage cargo. This will reduce the time for analysing information and checking its quality, quickly find inconsistencies, and quickly get the final result. The leapfrog begins - who has made it and where. Analysis of warehouse costs of factories - a report template has been drawn up, again in Excel - automation is required. The share of storage costs is 20%. It requires the formation of a single reporting structure in QCD with the registration of all sources of information and an understanding of visualization. There are time limits - reporting appears after the 25th of the month following the reporting one - it's too late to do anything. The sooner reporting the faster the reaction. The creation of optimal stocks is detached from the results, an understanding of corrective actions is a multiple transfer of responsibility: planning warehouse operations, delivery.'

5.5.4.1.3. Supply chain performance

How do automation and costs' monitoring help to improve the efficiency of the supply chain?'

Cost control through automation is carried out by most supply chain partners. The availability of accurate and timely data allows partners to make high-quality management decisions in a timely manner, which in turn helps to increase the efficiency not only of their companies, but also of the supply chain as a whole.

Respondent number 13 noted that:

'Automation of business processes, interaction with automation partners, simplification and cost reduction of processes. Automatic data exchange, to exclude the human factor - from receiving an application from a client, bidding, transferring data to a driver, ending with electronic documents, accounting documents, documents for payment. We are forced to transfer data to our systems manually, look with our eyes, auto-exchanges are not configured. This would reduce our labour and

transportation costs. It takes us a lot of time to interrupt the same data. Integration by IT system - we need a platform that automatically exchanges data, leave for half an hour to close one order. We need to establish info exchange through the API.'

Regarding the relationship with cost monitoring, it should be noted that respondent 6 stated the following:

'When IT resources are released, we will be able to achieve operational success, there are many bottlenecks. The goal is to build information flows - automation - understanding what the problem is: control of the arrival of information, its quality, its filling, establishing restrictions on entering information. The complexity of automation - there is no culture of data maintenance, restrictions on data entry. Effective cost management - understanding of the factors that affect the final costs, all the relationships are built and quick response. Large drains, excess tariffs. The difficulty is that everyone is used to working with different types of information.'

How does cost control affect the achievement of company goals?

The implementation of the company's strategy involves the carrying out of periodic monitoring of the achievement of its target values. Based on this, the cost control of the company makes it possible for management to have an idea of the current efficiency levels so that they can make high-quality management decisions in response to unsatisfactory results. Making adjustments to the strategy is also part of the management's decision-making process in case inefficiencies in the internal environment or significant changes in market parameters are identified. The company's costs are a significant indicator that characterizes the effectiveness of the company, its ability to improve and to meet market realities.

This should be confirmed by the comments of respondent number 6:

'Where regular monitoring and analysis of the current situation over the past period is required, comparing plans with the budget and financial indicators, analysing the factors that caused the deviations, and building an information chain in order to track budget indicators.'

How do discontinuities in volumes flowing through the supply chain reduce reaction rates?

The unpredictability of the volumes that go through the supply chain certainly reduces its effectiveness. In addition, the reaction rate decreases, since it is quite difficult to process the volumes that suddenly appear. The readiness of the supply chain and its partners for such phenomena equally depends on the quality of planning and on the capabilities of the partners

themselves. How quickly partners can adapt to volumes that deviate from plans depends on their ability to manage their reserve capacities and resources.

Confirmation of this should be provided by the quote from respondent number 11:

'Last year we received plans from a Focal company, distributed the received volumes to equipment and resources. Deliveries were lower by 15%, for us it was significant. We purchased investment equipment for these volumes, where the return on investment is calculated based on the volume of products shipped. If the forecast is inaccurate, this significantly affects our budget indicators and the performance of the entire group of companies. An accurate forecast of the main layer with which we need to work, we may not include investments in the contract, but we need guarantees that the purchase of our products will be carried out within 2 years.'

5.5.4.1.4. Service level priorities

It is necessary to clarify what the priority of the supply chain is, which creates value for customers.

Creating value for the client is a strategic priority for all companies because customers pay only for what is valuable and necessary for them. The priorities discussed above, i.e., time, cost and quality, are a prerequisite for creating value, but not a key priority. Based on the responses of the respondents, it should be noted that most respondents see continuous improvement as a tool to meet the requirements of market realities. Continuous improvement should be understood as flexibility and constant changes, the search for new solutions, and the creation of conditions for business growth through the management of its complete advantages. The changing requirements and preferences of customers make companies constantly improve their activities and find new, innovative and creative solutions that allow them to differentiate themselves from their closest competitors and, at the same time, to ensure the growth of the company, which increases the stability of the business. To confirm this, see the short quotes of the respondents below:

Respondent number 19 noted: *'We do not sell the product that is mass produced; we sell the solution.'* Respondent number 14 stated that: *'The use of advanced and technology in the field of logistics will make it possible to become the largest logistics company in Eastern Europe.'* Respondent number 27 said: *'To be modern, able to quickly change their logistic model to the requirements of the partner, while maintaining cost, quality and time.'* Respondent number 11 remarked that: *'Entering new markets for innovative packaging, creating new types of goods.'* Respondent number 21 stated that: *'Efficiency is not only costs*

per unit of production, but also compliance with the goals of our customers.’ Respondent number 15 said: *‘Our strategy is to work ahead of the curve, a team of professionals has been assembled for this.’* Respondent number 18 stated: *‘Enhancing caring for people, creating environmentally friendly and reliable packaging, focusing on continuous development, rational use of materials, caring for the convenience of the product.’*

5.5.5. Coding

Conducting a qualitative study is aimed at extracting, from real practice, the priorities, problems and improvements from the point of view of the respondents interviewed. For this purpose, the primary analytical concepts were identified directly from the interview transcripts, which were divided into three areas: priorities, problems and improvements. Primary coding was used to analyse the text and understand how the respondent builds their judgments, in order to further build logical relationships between the statements of all respondents and the presence of patterns in them. It is important to understand that inaccurately formulated problems can lead to the creation of an incorrect model for business processes, where serious errors can be made that will subsequently entail incorrect actions and negative consequences.

Interview questions spaced across the dimensions (problems, priorities and improvements) set the logic for generating codes. Within each dimension, codes were generated based on the judgments of the respondents. The results of the interview were used to understand what guides supply chain managers and, at the same time, if necessary, supplement their judgments with a more valid and balanced position provided by the Director of supply chain management, who determines priorities and ensures the development of the supply chain. This step ensures the verification of the identified problems and, at the same time, establishes the impact that the problems might have on each other. All of the materials covering the results of the interview were provided for discussion in an anonymous form. The data was presented in an anonymous form without indicating the identify of any of the respondents or their companies. Several meetings were held, the results of which established the relationships between the identified priorities to form the most complete picture by building dependencies and the influence of priorities on each other.

All of the materials, i.e., audio recordings, interview transcripts and codebooks are available on request.

The semi-structured interview coding samples are given at Appendix H.

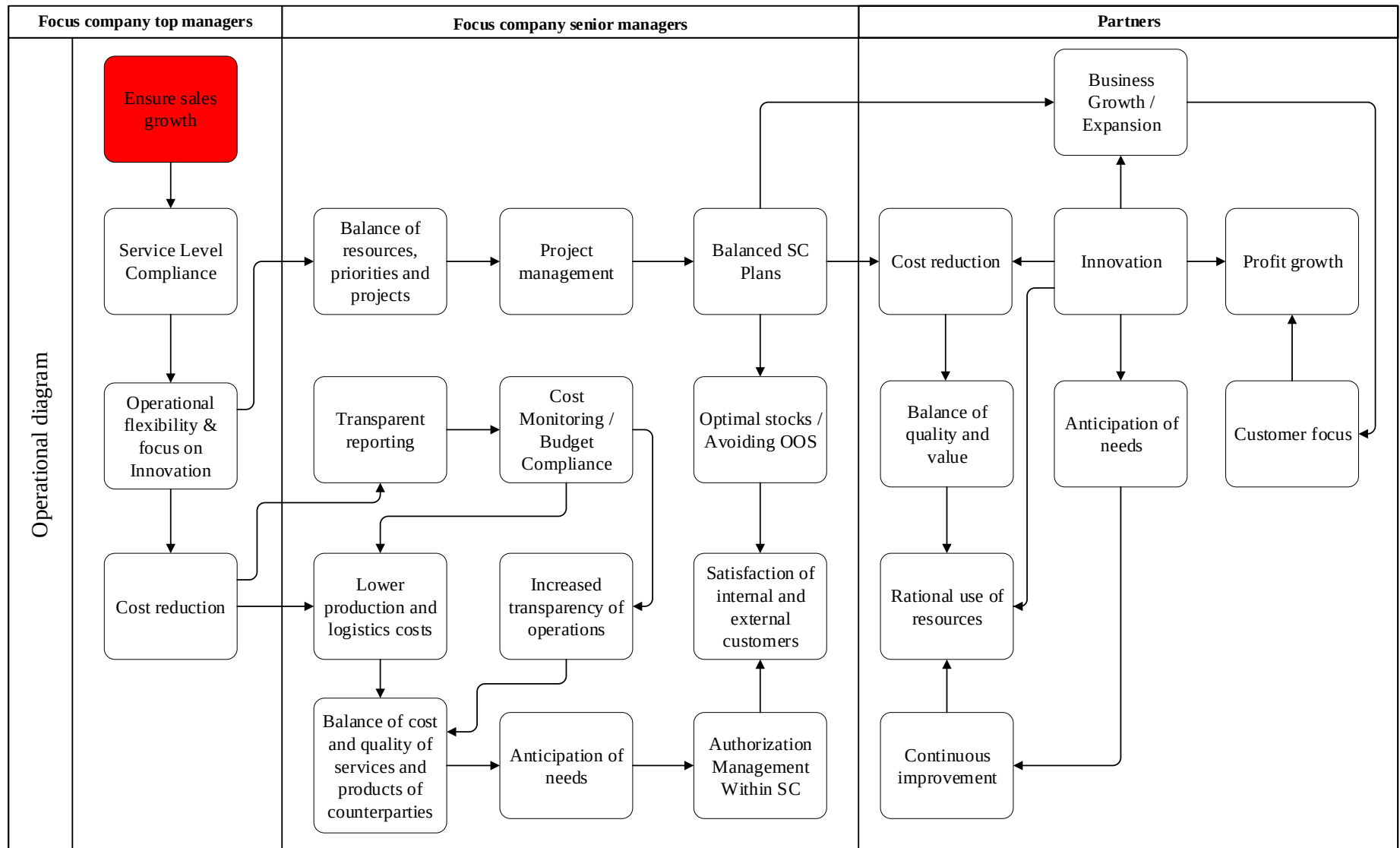


Figure 5.1: Supply chain priorities. Source: author's own elaboration.

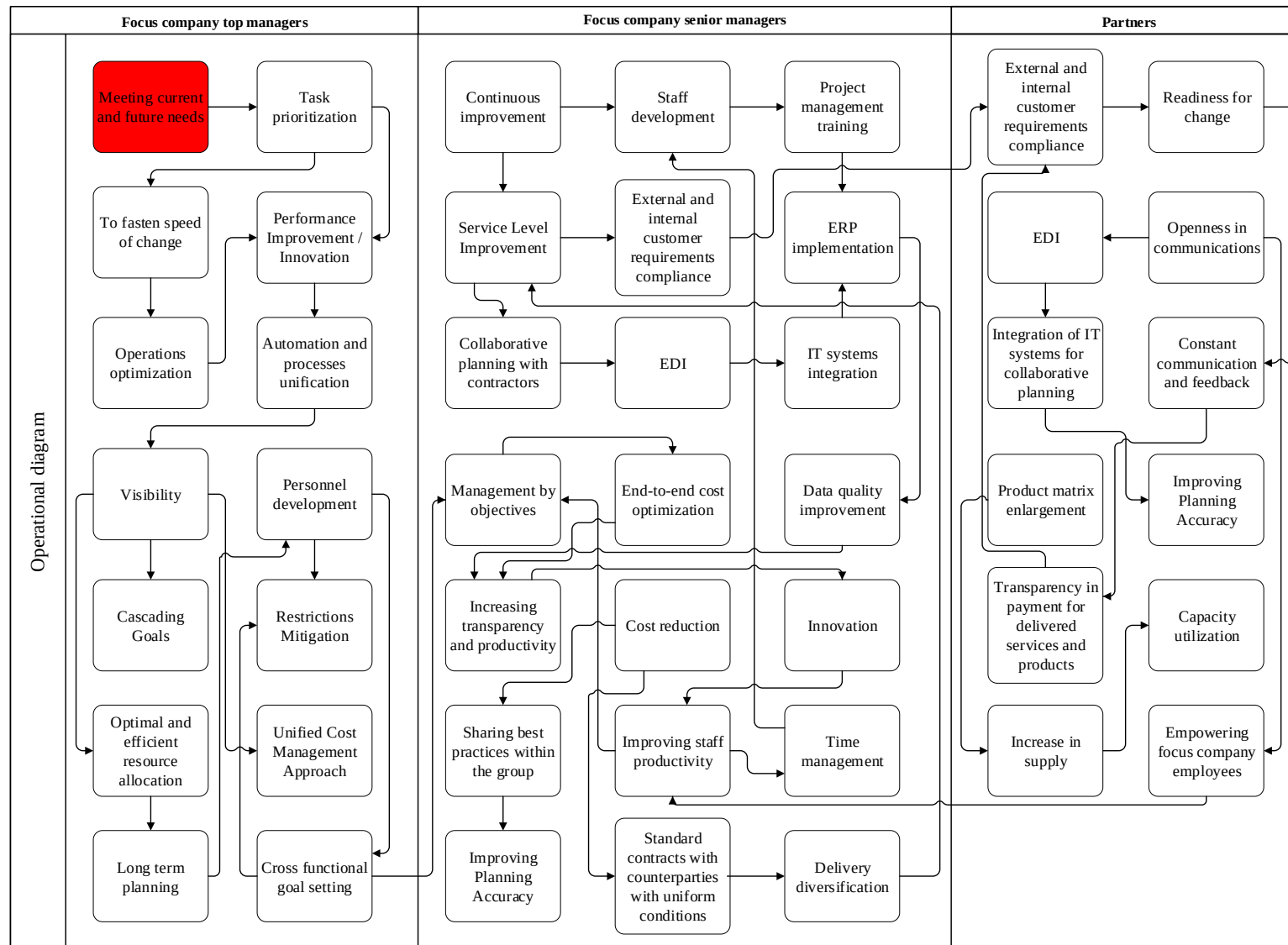


Figure 5.2: Supply chain problems. Source: author's own elaboration.

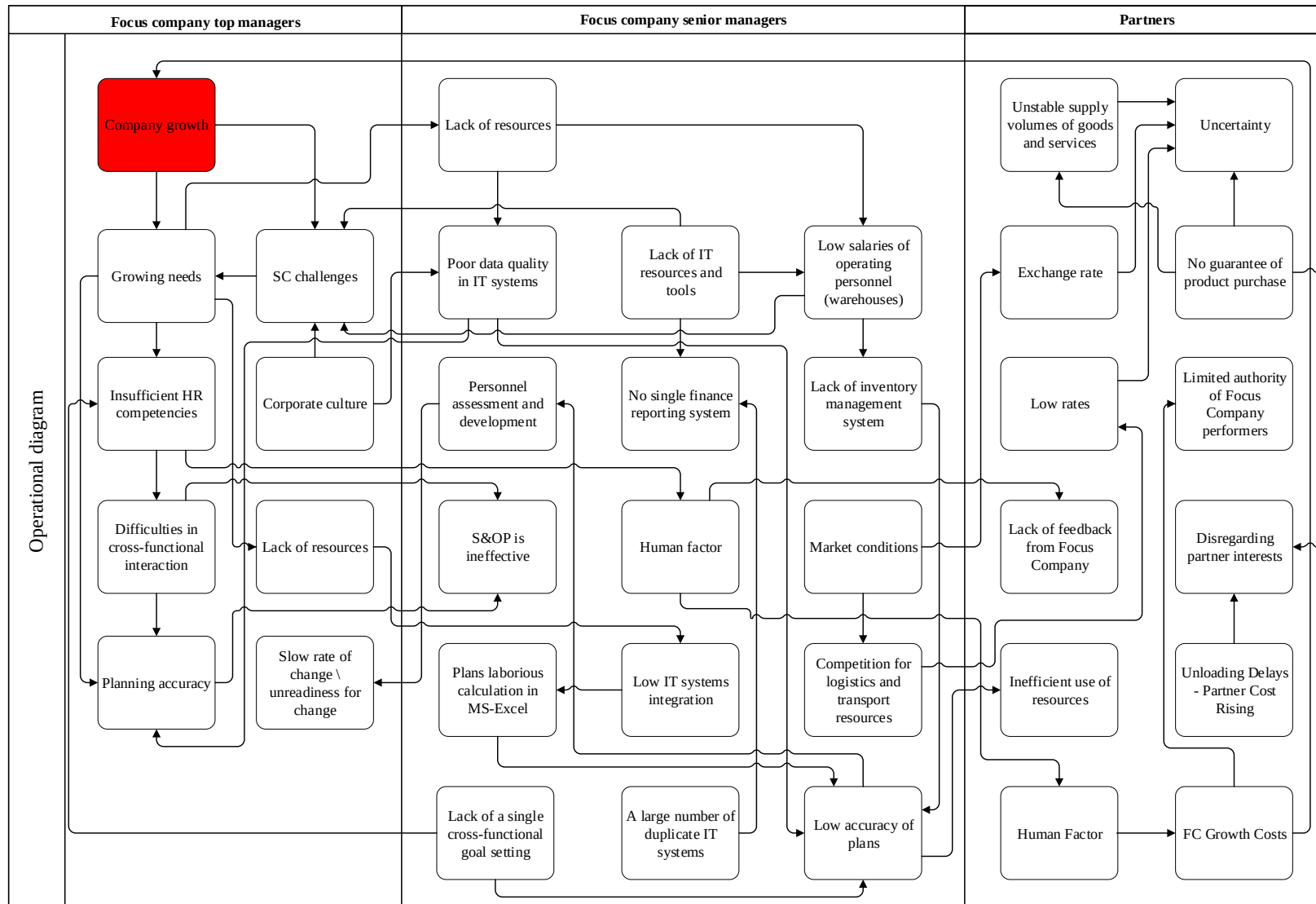


Figure 5.3: Supply chain improvements. Source: author's own elaboration.

5.5.6. Searching for themes, reviewing and naming

The resulting codes were analysed in order to identify themes. They were grouped by their common features. The following is a description of the first four topics in each dimension, since it contains 80% of the codes based on the Pareto principle.

Priorities:

The respondents' statements regarding the growth of the company were the basis for the formation of themes according to priorities. Thus, the following themes were formed:

- Company growth: increase in profits, business development, conducting projects aimed at company growth, providing a high level of service at minimum cost, expansion into new markets;
- Improvement of activities: the provision of services, reduction of labour intensity, satisfaction of external and internal clients, high-quality execution of operations, innovations, improvement of quality, search for new solutions, customer focus, continuous improvement;
- Cost control: operational flexibility, not exceeding costs, cost reduction, cost monitoring and analysis, not exceeding the budget, transparent reporting, impact on financial results, reducing logistics' costs, using the minimum amount of resources and losses, rational use of resources, quality at an optimal cost;
- Balanced plans: balance of resources, priorities and projects, balance of quality and cost of purchased services, manufacture of products in accordance with the plan, prevention of production shortages, balance of quality and value, formation of balanced supply chain plans.

Problems:

The respondents' statements regarding the main problems of the company were the basis for the formation of the themes on problems. Thus, the following themes were formed:

- Manageability: difficulty in setting priorities, difficulties in conducting project activities, lack of a unified reporting system, late reporting periods, S&OP inefficiency, inefficiency of the logistics structure, lack of uniform budgeting rules, default on partners in the supply chain, failure to meet deadlines, difficulties in cross-functional interaction, lack of performance assessment, increased consumption of materials, high loss of materials and high costs, a large number of readjustments of production equipment, unplanned shutdowns of equipment, delays in unloading

products, limited powers of the focus company's executor, disregard for the partner's interests, lack of feedback from the focus company;

- Planning: mismatch of plans, mismatch of resources to needs, high amount of time spent on planning, laborious calculations and plans, poor quality of planning, procurement planning, overstocking of warehouses, low accuracy of plans, lack of guarantees for the re-purchase of manufactured products, incorrect planning of resources;
- Personnel and competencies: low rate of change, lack of readiness for change, inefficient cross-functional interaction, low wages, lack of flexibility, human factors, staff motivation, time management;
- Automation: lack of IT resources, a large number of IT systems, lack of information exchange between IT systems and partners in the supply chain, imperfection of IT architecture, low systems integration, low speed of IT change.

Improvements:

The respondents' statements regarding improvements were the basis for the formation of the themes on improvements. Thus, the following themes were formed:

- Staff and competencies: staff development, competency building, implementation of a project approach, training in new knowledge, improving cross-functional interaction, increasing staff motivation, monitoring operations, time management, unifying the competencies of production personnel, introducing project managers, increasing staff productivity;
- Integration of supply chain partners and cross-functional interaction within the focus company: adherence to agreements, joint planning, focus on mutual compliance, stimulating partners, monitoring partners, integrating IT systems for joint planning, establishing information exchange, improving planning accuracy, constant communication: receipt of feedback, openness, payment transparency, providing the greater powers of an executive focus company, willingness to change;
- Increasing the accuracy of planning: increasing the accuracy of production planning, increasing the accuracy of planning, the receipt of information on changes in demand in advance, uniform production loading;
- Automation: automation of business processes unification, synergy between users and the system, improving the quality of data in systems, IT outsourcing, elimination of duplicate IT systems, automation of planning processes, implementation of ERP.

Each theme was reviewed, an additional clarification was provided by the Director of supply chain management, and a name was given based on the common meanings by which the codes are grouped.

The table below shows the topics distributed by measurement (problems, priorities and improvements), indicating the number of codes that form them, according to the categories of respondents.

№	Themes	Number of codes	%	Cumulative % of codes	Including companies				
					Focus company	Partner - Supplier	Partner - Transport Company	Partner - Co-Packer	Partner - 3PL
	Priorities								
1	Company growth	27	33%	33%	7	5	13	1	1
2	Performance improvement	24	29%	61%	7	7	5	2	3
3	Cost control	20	24%	86%	16	4			
4	Balanced plans	7	8%	94%	6	1			
5	Controllability	3	4%	98%	3				
6	Overcoming the resource limit	1	1%	99%	1				
7	Personnel competency development	1	1%	100%	1				
	Total	83							
	Problems								
1	Manageability	21	28%	28%	17		1	1	2
2	Planning	18	24%	51%	6	7	3		2
3	Personnel and competencies	14	18%	70%	14				
4	Automation	10	13%	83%	8	1			1
5	Market restrictions	5	7%	89%	5				
6	Resources	4	5%	95%	4				
7	Company growth	4	5%	100%	3				1
	Total	76							
	Improvements								
1	Personnel and competencies	20	28%	28%	20				
2	Integration	18	25%	54%	8	1	6	1	2
3	Planning	13	18%	72%	2	5	3	1	2
4	Automation	12	17%	89%	11	1			
5	Cost control	6	8%	97%	6				
6	Provision of resources	2	3%	100%	2				
	Total	71							

Table 5.37. Themes extracted from semi-structured interviews. Source: author's own elaboration. Analysis and implications

5.5.6.1. Priorities

The growth of the company, which is reflected in increased sales, is the strategic goal of the focus company and its partners. To achieve this goal, it is necessary to ensure the improvement of activities in order to control costs, as well as to have balanced plans for operations that will take into account the optimal number of manufactured products for delivery to the right place, at the right time and in the right amount.

Ensuring sales growth primarily depends on achieving the established level of customer service. For this purpose, the company, in the first instance, needs to achieve operational flexibility, which in turn must consider the required resources, which must be provided on time; these are predetermined priorities for development. Since high service level implies high costs for the company, it is necessary to carefully analyse and control the efficiency of operations first, while reducing their cost. Of course, the key to achieving cost-effectiveness is transparent and timely reporting, which allows the swift monitoring of costs. These goals of the focus company need to achieve balanced sales and operations plans that should be as accurate as possible, because balanced plans have a direct impact on creating optimal stocks and avoiding shortages. From the point of view of the partners of the focus company, the highest priority is the growth of business and profit. Partners achieve this goal by conducting various development projects, introducing innovations, conducting projects for continuous improvement, increasing the level of customer focus and anticipating needs.

Thus, to ensure the growth of supply chain sales, it is necessary to have balanced operation plans that will ensure optimal stocks of products in warehouses and prevent the formation of out-of-stocks, as well as reducing production and logistics' costs. Since partners in the supply chain have a material interest in the focus company, their priority is certainly the growth of their business and the expansion in the region

At the same time, with great attention being paid to reducing costs, the service level should not be reduced. Thus, an optimal ratio of the size of insurance stocks is required, as well as the volume of output, lead-time supply of raw materials, the receipt of actual customer orders, as well as the coordination of their execution time to determine the current operational priorities of the supply chain.

5.5.6.2. Problems

When analysing the problems and challenges faced by the supply chain, key elements should be highlighted: the quality of planning of all of the tools used based on Microsoft Excel, the lack of resources, including IT and financial resources for conducting development projects, significant difficulties in cross-functional interaction within the focus company where a large

amount of time is spent on resources for target setting, which does not always result in end-to-end goals being realized with fewer resources. When arguing that the company is actively developing the existing stage of development of the internal environment and attempting to meet the requirements of the external environment, it should be noted that many areas for improvement are identified, but they must be interconnected. As previously noted, there is a great need for the development of a planning system in terms of increasing forecast accuracy, the development of an IT System that will significantly reduce manual labour and, at the same time, will improve the efficiency of the operation, creating a single contour of personnel competence management and its development. From the partners' point of view, the identified problems are primarily caused by uncertainty, which entails unstable volumes of supplies of both raw materials and services. This indicates an inefficient use of resources and a decrease in the quality of integration of processes between partners. In addition, the entire supply chain is confronted with external factors, such as exchange rate differences, competition for resources on the market, and the need to improve the efficiency of operations while reducing costs.

When defining the causes of problems, it should be noted that sales growth, however strange it may sound, is the main source of supply chain problems. Of course, the very fact that the company is developing, demonstrates that sales growth is a value for both management and shareholders. At the same time, in order to overcome the competition and ensure sales growth, the company must effectively plan and manage its operations, provide the necessary resources to fulfil its obligations in a timely fashion, and carry out effective communications with partners, providing them with the necessary feedback. It is also equally important to build effective cross-functional relationships within the focus company.

5.5.6.3.Improvement

When further developing the discussion about the need for improvements and discovering how they can be carried out from the point of view of the manager in the supply chain, it should be noted that the scalability of processes should primarily be aimed at meeting the future needs of the supply chain. For this purpose, it is necessary to increase the speed of change, to prioritize tasks depending on the degree of influence of the business result, to increase supply chain visibility, and to decide on whether to invest significant resources in end-to-end process automation throughout the company based on one information system. There is a need to increase cross-functional interaction, which can be achieved most efficiently by integrating cross functions into a single information space based on one IT system. All participants in the supply chain are required to be ready to make changes, to

have open communications, to integrate information systems, as this will ultimately improve the quality of planning so that all of the participants in the supply chain can prepare for operations in advance, investing less time and fewer financial resources. Collaborative planning will significantly improve the efficiency of the operation to ensure sales of the company's products.

The tasks of increasing the efficiency of supply chain operations are relevant for most companies. The interviews allowed the creation of a holistic picture of priorities that guide supply chain managers. Key issues and supply chain improvements were also identified. The main priority that defines all of the operational indicators of the supply chain is to ensure the growth of company sales, since the supply chain is the link between marketing, which determines the market demand for the company's products, its promotion methods and end consumers, which in turn makes demands on the quality of products and consumer properties, cost and delivery times. The establishment of information exchange between partners in the supply chain, the integration of IT systems, as well as the automation of business processes is certainly a priority for all partners in the supply chain since this will significantly increase the speed of operations and the timely adoption of correct management decisions, as well as significantly reducing the complexity of manual labour.

Supply chain management constantly determines how to most efficiently carry out logistics operations and select the most competitive producers of raw materials that provide decent quality and optimal price; it also determines where and in which regions to produce products to reduce logistics costs. The current approved level of service is 98.5%, which is a fairly high level of customer service. On this basis, the company is focused on maximizing customer satisfaction and, at the same time, has a significant focus on cost reduction. This means that the focus company needs to have efficient logistics operations and an optimal level of stocks that will maintain the company's working capital to ensure development of and investment in new technologies. Given that the growth in the volume of supply of products is growing from year to year, the tasks of the company are primarily to manage production and logistics operations so that they are carried out in the least costly way. Under these conditions, the company is forced to work closely with counterparties and, owing to an increase in volume, reduce the cost of transportation or manufacture of a unit of production, by continuously monitoring costs, analysing market conditions, as well as by comparing actual performance with what was indicated in the business plan.

Optimization activity is considered by the management of the focus company as a priority in the implementation of daily operations. For this, all possible cost-cutting options are accepted, such as: the optimal batch size - the delivery quantum, the delivery of products to

the client directly from the place of production, if appropriate full track load, the production of a specific Stock keeping units in a large volume to reduce changeovers, the selection of the most optimal delivery schemes, and the construction or rental of warehouses that are closest to a major consumption centre or intermediate storage space for long-distance delivery.

5.6. Defining requirements for an optimal business process model

5.6.1. Criteria and parameters for optimizing business processes

The growth of the global economy and increasing competition is forcing many companies to look for options to optimize their supply chains. Globalization has opened up more markets to manufacturers and generated a great deal of pressure on them (Gunasekaran, Lai & Edwin Cheng, 2008). International supply chains are always striving to conquer new markets in different regions of the world and to solve the problem of ensuring the continuous supply of products. When optimizing and designing the supply chain, there is always the possibility of underestimating or overestimating the risks that could lead to a negative effect. For these purposes, the current problems should be most carefully formulated and the most optimal solutions found. Optimization is most often understood by the optimal movement of products along the supply chain from one region to another, in the right amount, at the right time and at the optimal cost. In this regard, the design of the supply chain is important because its competitiveness and the value-creating parameters that are necessary for the consumer depend on it: quality, time and cost. The main points of integration between partners are processes related to the planning of sales and operations, as well as the management and processing of orders related to the movement of goods and services throughout the supply chain.

5.6.2. Business rules' directions

Based on the results of the study, it was determined that, in order to increase the efficiency of business processes between partners for supply, it is necessary to develop business rules that will determine the logic of relationships. It should be noted that the development of business rules was not a priority for the research. In order to conduct the study most fully, however, it was necessary to adjust the research programme and develop the directions in which business rules would be developed outside of the framework of this study.

For this purpose, it is necessary to determine not only the areas in which business rules should be developed, but also the tolerance corridor, within which, when deviations occur, the supply chain partners will understand which deviations are permissible, and no

adjustments are required on the part of supply chain managers under previously agreed Service level. Moreover, if the boundaries of tolerance corridors are exceeded, these deviations are critical and urgent decisions are required to eliminate them. Based on the results of the quantitative and qualitative research, the directions of developing business rules that should cover the processes of interaction between partners in the supply chain were determined. The direct development of business rules is not part of this study and should be brought to the focus company level.

The developed direction for the formation of business rules primarily refers to optimization activities, in which it is planned to create optimal inventories and prevent product shortages, as well as to optimize costs and minimize movement between warehouses in order to create insurance stocks. By itself, increasing the effectiveness of interaction between partners in the supply chain is usually based on timely and accurate information regarding the plans of partners and, accordingly, timely and complete delivery of the ordered materials and services to create products, and their subsequent movement by the focus company's client. For these purposes, it is necessary to establish a fully-fledged information exchange between the partners' information systems, as well as the availability of high-quality data for transmission.

Below are suggestions generated for improving the activities that should be reflected in the business rules, including improvement of the quality of integration between partners in the supply chain.

5.6.3. Combining capabilities

Summing up the discussion and the analysis of qualitative and quantitative research, it is necessary to formulate the main directions of increasing the efficiency of business processes in the supply chain:

- The formation of business rules. The business process model should take into account the possible scenarios and options for the implementation of processes, with the inherent logic of adapting to various deviations to achieve supply chain sustainability;
- Processes must provide a high service level and, at the same time, they must be cost-effective;
- The establishment of information exchange and communication between partners in the supply chain. Implementation of vendor managed inventory (VMI) and collaborative planning, forecasting and replenishment (CPFR) processes with supply

chain partners. This also requires supply chain visibility and data quality in information systems;

- The formation of optimal sales and operations plans. Business processes must be optimal to ensure the rhythmic work of the supply chain, from the supply of materials to the delivery of products to the final consumer. This requirement can be achieved through the implementation of the integrated sales and operations planning System.

Continuous monitoring of the effectiveness of interaction between partners in the supply chain should be based on fixing deviations from target values. The company should track suppliers up to level 2 for strategic materials: raw materials, dyes and additives, as well as equipment with which the products are manufactured. As for suppliers of production equipment, it is necessary to know who the manufacturer of components, important components and assemblies of production lines is. There is a need to evaluate transport service providers to level 2 if the first provider is not the only one at this level. At the same time, it is not necessary to evaluate which fuel is used, as well as car brands. If other companies fulfil the order on a contractual basis, however, they should track who the final service provider is, since this requirement affects the reliability of supplies.

As a rule, companies try to have several alternative distribution channels. This phenomenon is most often determined by a strategy where financial costs and necessary resources are estimated in advance to ensure the continuous operation of all elements of the supply chain. It is likely that risk in relationships with strategic suppliers is more important for supply chain performance (Trkman & McCormack, 2009). In a conversation with the Director of supply chain management, the following ratios were indicated: if the supplier is a monopoly, it is necessary to establish a single supplier's share of not more than 40%, and also to establish a share of orders in its total supply of not more than 40%. This requirement allows the balancing of supplies and increasing their reliability, in order to eliminate dependence on strategic suppliers.

The need for stakeholder relationship management is determined by the company's need for implementing strategic goals. When actively interacting with various groups of company stakeholders, it is necessary to have support for implementing the strategy and achieving long-term competitive advantages.

The closer a supplier's production is to a focus company's production, the higher the service level agreement of that supplier is expected to be. When working with suppliers, one should adhere to the principle of maintaining the level of the minimum balance of raw materials, which in turn depends on the delivery time. Evaluation is also based on the availability of

raw materials in the market. The optimal order size should be calculated based on the optimal utilization of transport, as well as the availability of storage space in the warehouse. For each item of strategic materials, it is necessary to determine the optimal order sizes, and to develop matrices of alternative materials and suppliers.

Of course, there is a need to consider the possible deviations of supply chain planning when working with suppliers. It is required to jointly plan the supply of strategic materials. Collaborative planning should also be carried out with transport companies since less time passes from the moment of demand to the satisfaction of needs than with suppliers of strategic materials. Service level agreement should also consider patchiness in demand, seasonality and planning quality. Tolerance to these deviations should be determined at the service level agreement. In each contract with a partner, a certain framework of tolerance is required, both on the part of the supplier and the client, which all parties must comply with and not go beyond. Financial performance is important to many of a firm's stakeholders, but it is not the only aspect of value that is important to stakeholders (Harrison & Wicks, 2013).

5.7. Analysis implications

This study has suggested some useful implications for supply chain managers. Firstly, the results of the study have demonstrated that bottlenecks and possible informational gaps do not provide the grounds for assuming that integration between partners is ineffective. Of course, they can be considered as areas for improvement, but the effectiveness of integration is more determined by the quality of the established business rules for supply chain partner processes. This means that bottlenecks and informational gaps are only a consequence of poor-quality business rules, which should be designed initially when forming requirements for business processes, in order to create an effective supply chain.

Secondly, an important result is that supply chain resilience depends on the ability of business processes to adapt to various deviations. Managers should focus more on building business processes that are adaptable to various kinds of deviations. This means that deviations that somehow arise during daily operations should not require increased attention and could be eliminated by the most effective standard method.

Thirdly, understanding the formation of key priorities, problems and improving the supply chain helped to form an idea of the causes of problems, the sources of priority setting and the current improvement aimed at improving the activity of maintaining sales growth. Thus, the extraction of priorities, problems and improvements from real practice allows the formulation of optimal requirements for a business process model.

The feedback to the partners on the study results is attached at Appendix J.

5.8. Analysis limitations

This study is limited to a relatively small sample of respondents, the number of which is 37 managers. More representatives of supply chain partners could certainly have been included in the sample, but the resulting conclusions would not have met the initial requirements. This category of partners is not interested in identifying the main difficulties, contradictions and patterns, owing to their relatively small volume of supplies of materials and services. A limited sample determined the minimum statistical toolkit that was used to test the hypotheses.

5.9. Summary of the chapter

In this chapter, an analysis of quantitative and qualitative research was carried out, where attention was paid mainly to identifying those factors that contribute to increasing the efficiency of interaction between partners in the supply chain. The quantitative research was aimed at analysing the results of the survey in order to find interconnections and dependencies between the respondents' answers. The qualitative research was aimed at strengthening the conclusions of the quantitative research and extracting priorities from real practice, a problem or an improvement that contributed to a better understanding of the current situation and the formation of optimal requirements for developing business process models. The main findings indicate that, on the basis of statistically significant patterns, the need to carefully formulate business rules that govern the logic of the implementation of business processes was determined, as well as the relatively small effect of information gaps on the effectiveness of integration, the significant impact of immediate reactions to deviations, the impact of automation and monitoring of business processes including the cost of supply chain efficiency and the ability of the supply chain to scale up on the basis of a careful formulation of business rules. The results of the qualitative study made it possible to refine the conclusions of the quantitative study, as well as to identify problems, priorities and improvements, to understand their relationship and, by summarizing, to take into account the results of the quantitative study and formulate the requirements for modelling business processes.

CHAPTER 6. CONCLUSIONS AND IMPLICATIONS

6.1. Introduction

The literature review identified a wide range of issues and tasks for this study. Here the main priorities of the supply chain were identified, the issue of relations with different types of stakeholders was considered, and the creation of competitive advantage, based on the Resource-Based View, was discussed, as well as the main challenges and problems of the supply chain. In addition, the operational attributes of the supply chain were analysed, the best practices reviewed and the priorities and common problems that supply chains experience were examined.

The results of the quantitative and qualitative studies made it possible to formulate the main supply problems based on the interviews, i.e. hypotheses were tested that made it possible to formulate proposals for improving the supply chain business processes. Moreover, useful and meaningful feedback was received from partners for improving the supply chain management.

This chapter provides the key findings of the study, and discusses how it was conducted and which results were obtained. It describes the main findings and explains how such contributions have been introduced into theory and practice. There is also a discussion about the limitations of the study and suggestions are made for future research.

At the same time, interaction is carried out with all of the interested parties; the companies are clearly aware of the interests of all of the participants in the external and internal environments for achieving the maximum results for the company by satisfying each other's needs. Of course, one should consider the fact that in the process of making a profit and creating value for customers and shareholders, it is likely that the interests of the various stakeholders are not considered.

6.2. Conceptual modelling stages and requirements

Conceptual modelling is a part of many approaches used in explaining, understanding and exploring different kinds of systems (Argent *et al.*, 2016). The purpose of conceptual modelling is to create a model of business processes that connects supply chain partners in such a way that their interaction, shared resources and opportunities create competitive advantages, that the interests of all of the partners and the focus company are considered, that they contribute to the stability of the supply chain and ensure continuous improvement in productivity. Conceptual modelling is a design discipline and conceptual models are

design artefacts used to actively construct the world rather than simply describe it (Moody, 2005). The business process model should eliminate previously identified problems at the systems level and be understandable and accessible to all who will implement it, as well as being guided by the results of its implementation in operational activities. It should be noted that there is no decided standard for conceptual modelling (Argent *et al.*, 2016).

A process model provides a technique to abstract the operations performed by a customer on a product during the conceptual design phase (Nagel *et al.*, 2011). The developed model should contain critical business processes that integrate partners, establish requirements for their implementation, and create the necessary relationships between partners at the level of information, material, and product flows in the supply chain. The process models are also used to teach people about the processes and tools to support the processes. (Krogstie, Sindre & Jørgensen, 2006). At the same time, it is very important to get the most complete and detailed feedback on the current state of business processes from managers and partners in the supply chain, with the subsequent establishment of the reasons for the loss of efficiency and the identification of areas for further improvement. Conceptual models are precise and complete representations that are coherent with scientifically accepted knowledge (Greca & Moreira, 2010). The use of this methodology is justified when the supply chain is experiencing problems and urgently needs to identify effective solutions. Conceptual modelling is the process of abstracting a model from the real world (Kotiadis & Robinson, 2008). An abstraction allows a problem to be extracted from its physical reality, providing a means for problem solvers to find solutions to those problems (Nagel *et al.*, 2011).

The conceptual model offers a unified approach to solving problems in such a way as to establish interaction between partners within the supply chain, for documenting a problem domain for the purpose of understanding and for communication between stakeholders (Moody, 2005). Conceptual modelling of processes is based on the results of quantitative and qualitative research, and developed proposals to improve efficiency and productivity. The modelling process is to identify only those salient elements of a system, and to evaluate, according to distinct rules (Greca & Moreira, 2010).

In the framework of this study, the requirements for improving the efficiency of the supply chain were formulated, which should be included in the conceptual model. At the same time, the main stages of conceptual modelling, i.e., setting a problem, formulating goals, defining the boundaries of conceptual modelling and its scope, and developing a conceptual model were devised.

After the main priorities and the problems that significantly limit performance have been identified, and feedback on improvements has been collected, it is necessary to proceed to the main stage of conceptual modelling. A block diagram provides details of the teams' actions during the design process and can include critical review points, programme approval goals and other design milestones (Nagel *et al.*, 2011).

In general, to avoid most problems, the developed model should be as simple as possible to understand, be based on the identified main problems, and be developed by taking into account the available theoretical and practical approaches presented in the academic literature. The benefits of simpler models are that they can be developed more quickly, they are more flexible, they require less data, they take very little time to implement, and the results are easier to interpret since the structure of the model is better understood (Kotiadis & Robinson, 2008). It should be borne in mind that if the model is too simple, then it is likely that the results obtained from it may not be entirely suitable for further use. The requirements provide a means for distinguishing better from worse (Robinson, 2008).

When forming a conceptual model, the requirements that the model should be recognizable as effective and necessary for solving business problems should be determined in advance. The process of conceptual modelling requires assumptions to be made concerning the real world and simplifications to be made to the model (Kotiadis & Robinson, 2008). For these purposes, the following criteria were selected, the justification for which is given below: validity, credibility, utility and feasibility (Robinson, 2008).

Model Validity is based on an earlier study that addresses the problem statement, an understanding of how this problem can be solved, as well as the hypothesis testing results, where the assumptions made about the efficiency of the supply chain are empirically confirmed or refuted. This can be explained by some failures of the conceptual modelling approach being over-complicated, resulting in an excess of knowledge gaps and unknowns that leave the process at a standstill and with a long research agenda that provides no relevant information to support current management decisions. (Argent *et al.*, 2016).

Model Credibility is an essential requirement that determines the applicability of the developed model to the real business environment. The first principle in conceptual model development is adoption of an open and transparent process throughout (Argent *et al.*, 2016). In this case, the model should consider the realities faced by the focus company and its partners, important details that can be critical, as well as taking into account the interests of all of the participants in the supply chain and does not contain conflicting elements. Conceptual modelling praxis provides procedures for modelling real-world phenomena

(Weber, 2003). It is necessary to adhere to the unity of goals, the interests of all of the participants and openness. Openness implies not only that stakeholders are able to participate, but also that the process is open to considering and accepting input from all stakeholders. (Argent *et al.*, 2016).

Model Utility determines the significance of the information contained in it, and how this utility will be implemented, as well as decision making and further operations to achieve the goals for which the model was conceived. The utility of the conceptual model is ‘a perception that the conceptual is useful as an aid to decision-making within the specified context’ (Robinson, 2008). The model should be understandable to supply chain management and their partners, and consider all of the parameters of the movement of information, product and material flows from the point of view of economic expediency and the complexity of operations. Process and event modelling is used to represent the transformation of input flows into desired output flows (Nagel *et al.*, 2011).

Model feasibility is most often perceived as a reproduction of a set of model algorithms in computer systems. Conceptual modelling is an activity undertaken during information systems development and maintenance work to build a representation of selected semantics about a number of real-world domains (Weber, 2003). At this stage, it should be borne in mind that tasks which are somehow related to automation can attract significant amounts of time and costs and require the involvement of qualified personnel so that the supply chain is as automated as possible in terms of reducing unproductive manual labour, shifting most of the operations onto computing power. The conceptual model that results is used as a basis for the design and programming tasks that must be undertaken to build or modify an information system (Weber, 2003). Since the objectives of this study are limited to the development of a methodology for managing business processes between partners in the supply chain, the tasks of translating the model into an automated control system are outside the scope of this study. At the same time, this model should be understandable to IT developers. Conceptual modelling occurs early during information systems development and maintenance work (Weber, 2003).

The methodology determines the number of tiers in the supply chain, i.e., the number of suppliers and customers, and the types of business processes, which are most often expressed in the form of planning and execution of operations, as well as indicating the types of relationships between partners. The conceptual modelling framework described above provides a series of iterative activities for helping a modeller to design a simulation conceptual model for a specific problem situation (Robinson, 2008).

The right balance between the reliability of the model and the necessary level of simplicity should also be found. The goal for the model should be for it to be simple enough to be usable but complicated enough to be useful (Argent *et al.*, 2016). The methodology should include an understanding of how the integration between partners occurs, how the relationships between partners are formed, how the material and information flow is carried out, how operations are carried out on the basis of previously made planning and how the decision-making process takes place.

6.3. Definition ‘As-Is’ business processes

The basis for conceptual modelling is the definition of the business processes of the supply chain of the focus company that determines the order of relations with partners, the processes of supply chain planning and the translation of sales plans and operations by the partner, the order processing processes, as well as the flow of material and information flows throughout the supply chain.

The definition of the boundaries of business processes in the framework of this work is not required, since the description of business processes “as is” was carried out until the moment of conceptual modelling. This description defines the list of all business processes of the supply chain, the process owners, the inputs that are necessary for the implementation of these processes, and the procedure for transforming inputs into outputs. For each business process, the amount of time required for its implementation was indicated. In addition, the description defines the information systems by which business processes are implemented.

At the beginning of the conceptual modelling, the focus company defined the business processes of the supply chain according to the APQC model: business processes of planning, procurement of logistics services, raw materials, logistics processes, including warehouse and transport; customer relationship processes: customer service, cost control, cost analysis and standardization. During 2018-2019, the focus company implemented projects to formalize the supply chain business processes.

The business processes definition “as-is” is based on interviewing process owners, collecting information on how business processes are implemented, which resources are used, how much time it takes to implement the steps of each business process, the need to work in information systems, and the current understanding of the process owner regarding the possibility of improvement. At this stage, the process owner gives an understanding of how to execute the process in detail. This activity requires a significant amount of time and management resources. Not all process owners had any idea of how their business process

is involved in creating company value. Moreover, some business process owners did not understand how changes in their business processes could lead to changes in the business processes of other owners. These phenomena can be called critical, since before the beginning of the description of business processes “as is,” there was no whole and unified picture of the implementation of business processes along the supply chain of the focus company.

The business processes definition “as-is” was not a document development in the form of which a business process is implemented. This means that to formulate the procedures, the most effective way of implementing the business process with small changes that did not require a large investment of time or money was chosen. The described business processes were procedures that contained all of the necessary instructions for implementing a business process, metrics for the effectiveness of evaluating the implementation of business processes, a matrix of responsibility distribution, and graphical diagrams of business processes in BPMN 2.0 notation, as well as tables for any types of calculation or data conversion in Microsoft Excel models.

It should be noted that the development of procedures with the process owners took a great deal of time, since the process owners first needed to structure the main stages of the business process for themselves, highlight the inputs that are transformed into outputs, and identify the consumers of the outputs, as well as the suppliers of the inputs. This does not mean that process owners do not know how their business processes are implemented. In everyday activities, many of them simply do not think about it and many things happen instinctively. The business processes definition “as-is” allowed the focus company to reconsider its attitude to business processes, to understand the bottlenecks that impede the efficient implementation of the business processes, to identify areas for development, to structure information in order to accumulate knowledge and to ensure the repeatability of the business processes in the most efficient way.

In general, the defined business processes and the procedures based on them meet efficiency requirements that the company sets for itself. At the same time, business processes do not impose entry requirements on partners in the supply chain, since we are only talking about the implementation of business processes within the focus company and, accordingly, increasing the efficiency of operations. Improving the efficiency of interaction between supply chain divisions in the company was the priority when first defining the business processes definition. As more and more business processes were described, it was understood that there is a great need not only to increase cross-functional interaction within the focus company, but also between partners in the supply chain.

Interaction with partners is framed in the form of a contractual relationship, which indicates all of the necessary requirements and delimitation of powers and defines the procedure for interaction with the focus company. At the same time, as the quantitative study demonstrated, this was not enough because it was identified that there is a great need for the formation and establishment of business rules that should regulate the procedure for working with emerging deviations without allocating significant resources.

A certain part of the business rules was formed and specified in the procedures, while the rest required development in consultation with partners. As an example, we can cite the main areas where the development of business rules is required, for example, determining the optimal size of a customer's order, the optimal levels of insurance stocks, the procedure for creating insurance stocks, determining the priority matrix for customers to secure orders, writing off products, and much more.

Since the managers of the focus company spent significant resources on working with emerging deviations, formalized procedures significantly reduced these labour costs. Effective interaction routes between business functions and departments were identified, and the required levels of achieving results and providing process exits for their consumers were determined. In addition, key performance indicators were generated for formalized business processes, which significantly increased the efficiency of their implementation.

Based on the results of the business processes definition "as-is", enough basis was formed for conceptual modelling. The feedback received from the managers of the focus company and supply chain partners during the semi-structured interviews allowed us to get the most complete picture of the current problems and their solutions, as well as the priorities that different business functions of the focus company and partners set for themselves. Based on the theory of stakeholders, it should be noted that considering the interests and opinions of all of the interested parties should be considered as one of the basic conditions for creating competitive advantages for supply chains.

The business processes definition "as-is" made it possible to establish interconnections between processes and form an understanding of how the value chain is formed within the supply chain, from the moment of forming plans, purchasing raw materials, manufacturing products, storage and transportation to the client. All of these stages of creating value have been defined and integrated with each other at the level of inputs and outputs with fixing as the desired result. The description of the APQC business process at the stage of conceptual modelling is subject to conversion into a SCOR model which contains the same business processes but describes them at different levels with the definition of performance metrics,

the suggestion of best and standard practices, as well as personnel competency requirements. Interaction with the owners of business processes allowed to get real practice, based on which, in the future, we will carry out a comparison with the SCOR model and determine areas for increasing efficiency and eliminating process steps that do not create value.

The movement of material and product flows in the supply chain is carried out by road and rail. The supply chain of the focus company covers several countries, which determines its international status. The use of different types of transport and the presence of many warehouses that are used as intermediate storage places determines the complexity of supply chain management and requires effective tools for managing material flows. Given the fact that the company seeks to increase its market share, a high service level and low costs are priority areas. It should be noted that the combination of these two factors can be contradictory and, therefore, it is necessary to determine their acceptable ratio, that is, finding the balance point. It should be noted here that delivery quant, lead time, and the need for working capital for the formation of insurance stocks affect service level. The focus company is primarily interested in holding optimal stock size and the highest possible service level.

The supply chain business process repository and the business process conversion matrix APQC - SCOR are available on request. Below is an as-is diagram of the movement of information, product and material flows based on an SCOR model.

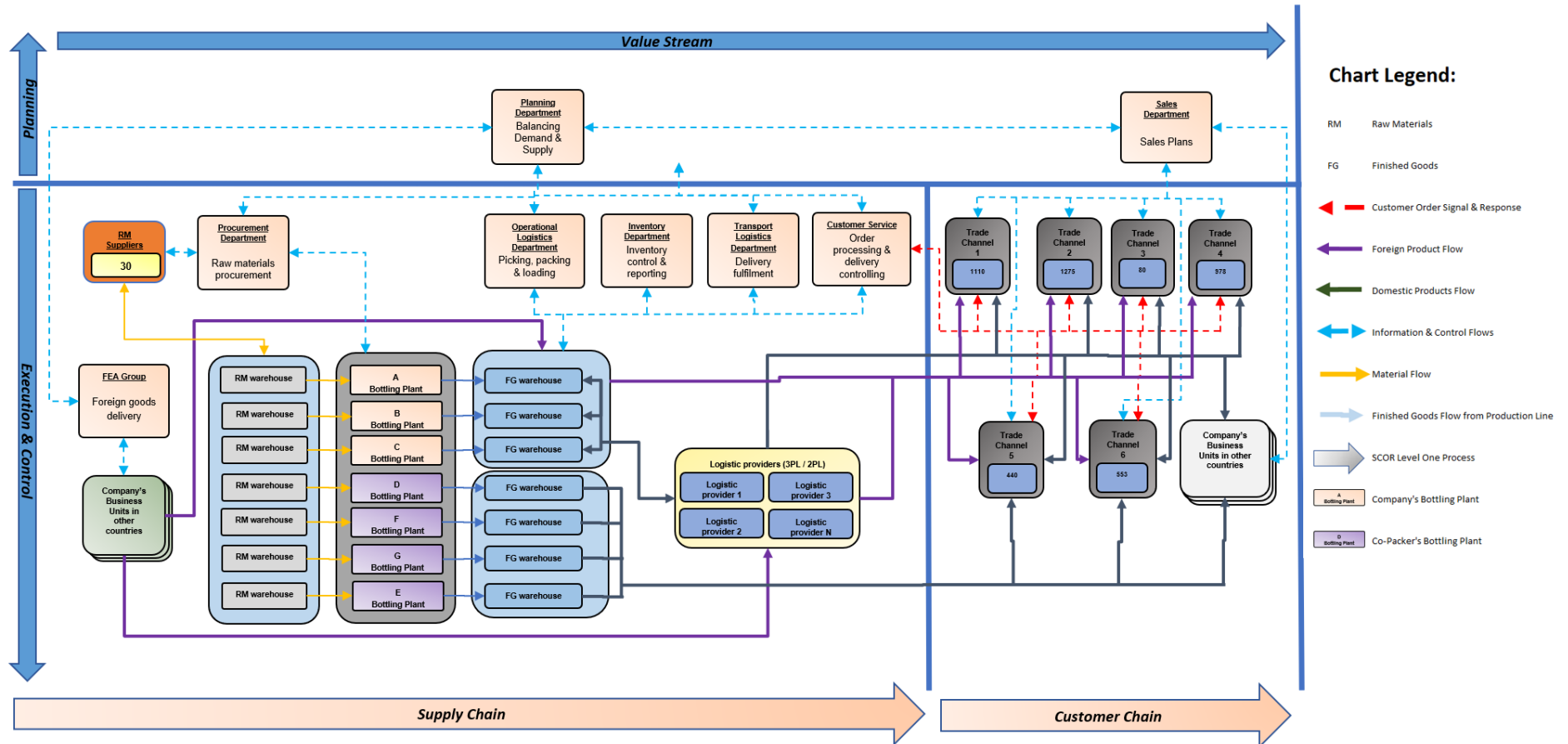


Figure 6.1: As-is products flow chart. Source: authors own elaboration.

6.4. Defining the supply chain configuration. Conceptual modelling.⁶

Based on the previously conducted quantitative and qualitative studies, the goal of integrating partners in the supply chain can be formulated as follows: maintaining a minimum number of stocks of finished products to ensure uninterrupted supply of products to customers at the highest possible speed without allowing a shortage of products.

Using the SCOR model can significantly accelerate the development of an optimal model of business processes, since it contains all of the necessary elements and practices for establishing relationships between partners. The SCOR is a source of knowledge and best practices that have been tested in many companies around the world. This model of business processes is developed up to level 3 and takes into account the current features of the focus company and its partners. Source relates to order and receipt of materials and products; make means to schedule, manufacture, repair, remanufacture or recycle materials and products, while deliver includes the picking, packing and shipping of orders (Sellitto *et al.*, 2015).

6.4.1. SCOR process ID sP Plan

Process description:

This group of processes is a top-level planning process designed to form a balance of supply and demand, determining the sequence of actions that will most suitably meet market requirements, taking into account the capabilities of suppliers, the production and the logistics chain.

Requirements for business processes and the formation of business rules:

The formation of product flows in the supply chain begins with forecasting sales. This step is a calculation for assessing the future demand for the company's products. The prediction of sales is the initial stage in the formation of plans for operations, the management decisions for the formation of inventories, the determination of the required production volumes, the supply of raw materials and materials, as well as the level of capacity utilization of logistics operators and transport companies.

The basis for generating a sales forecast is the accumulated data array of sales history for the previous 3 years, as well as pre-orders for different customers in different sales channels. The detailed forecast of sales depends on the specifics of the market, which in turn determines the necessary level, i.e., the category, product group and SKU. At this stage, the

⁶ The present model does not take into account the SCOR Enable (support) group of processes owing to their small significance to the present study. The study focuses on primary and basic processes.

sales forecast is calculated by clearing historical data, applying various forecasting algorithms taking into account seasonality and promotional activities, as well as verification and subsequent approval of the sales forecast with the sales department.

The importance of careful work with the sales forecast is due to the need for quality management of company costs. Excess products form the excess costs of storage, production and transportation. The shortage of products in turn creates lost sales, loss of market share and customer satisfaction. An oversupply or lack of products, therefore, is a serious problem for the company. An accurate sales forecast forms the optimal volume of production, storage and delivery of products, and contributes to the efficient utilization of warehouse areas, product turnover, increased return on financial assets and subsequent cost reduction. Given that the sales forecast affects all of the partners in the supply chain, its best quality calculation helps to reduce costs throughout.

The generated sales forecast is the basis for the development of plans for operations, i.e., supply of materials, production of goods, and the storage and plans for the delivery of products to consumers. At this stage, deviations are formed, i.e., the “whip effect”, which is broadcast to partners. In this regard, the most preferred tools to minimize the bullwhip effect are VMI and CPFR technology. The data concept is part of an integrated supply chain planning technology. For these purposes, business rules should be worked out that will distribute orders between partners, evaluate their technological capabilities and the speed of delivery of materials for production. Thus, joint planning and performance forecasting allows suppliers to manage not only their capacities to understand their workload in the short-term planning horizon, but also to manage the effectiveness of the entire supply chain. VMI, thus, allows guaranteed access to stocks of materials to ensure timely and quick production needs. The consequence of this is a reduction in inventory costs, since the storage of excess insurance stocks generates additional costs; as a result, the flexibility of the supply chain is significantly reduced, as well as its effectiveness.

Below is a conceptual diagram of the To-Be movement of information, product and material flows based on the SCOR model.

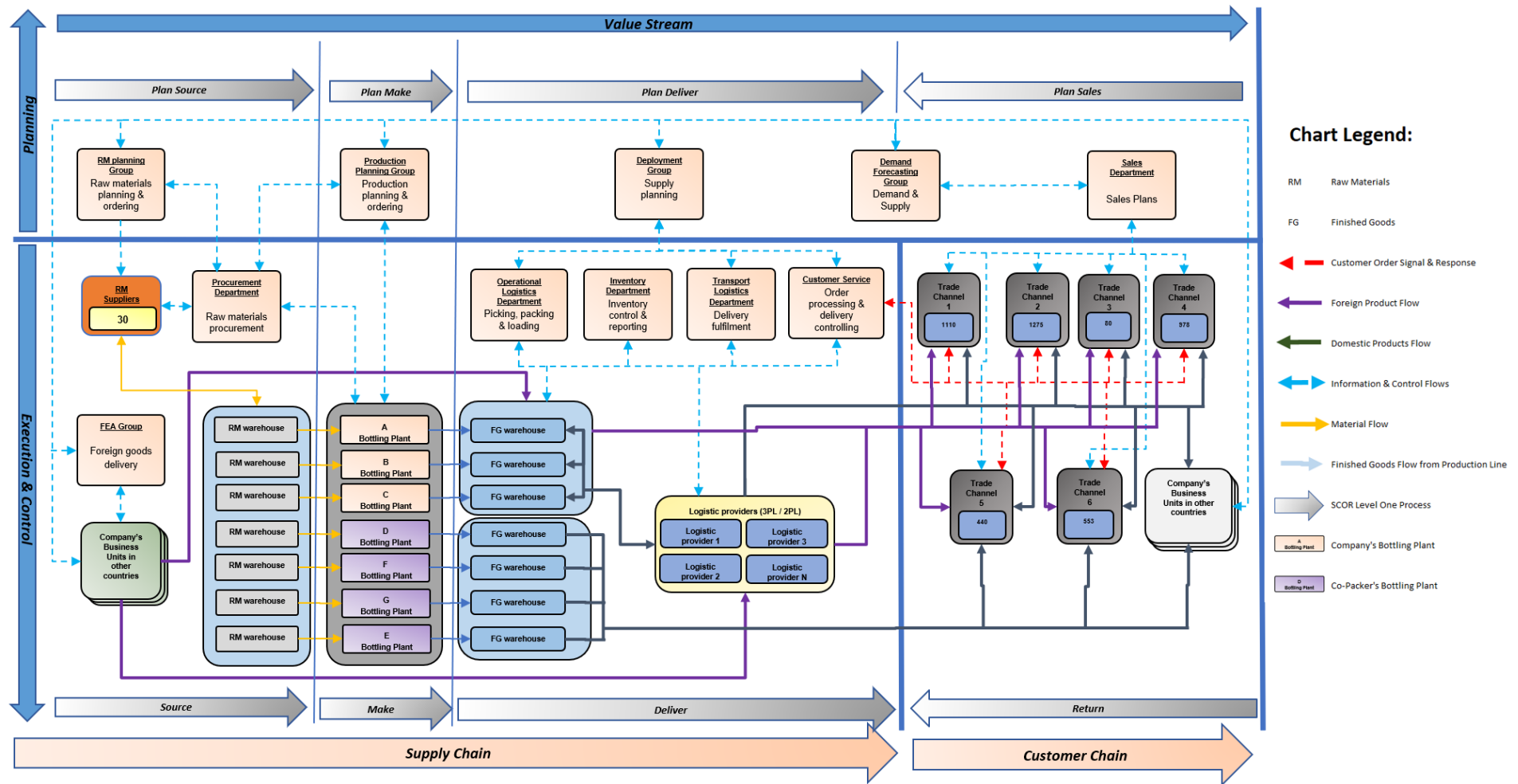


Figure 6.2: SCOR-based To-be products flow chart. Source: authors own elaboration.

This model takes into account the movement of information, material and product flows along the supply chain, taking into account the functions of the focus company and partners. The formed plans for operations should ensure the timely delivery of materials, of products subject to customs clearance, of production, of storage and transportation and of delivery to consumers. The model of movement of material and product flows is distributed across SCOR dimensions, i.e., supply chain planning, supply of raw materials and finished products, production of goods and delivery through various types of trade channels. This model takes into account the best practices of integrated planning, such as joint planning and replenishment.

It should be noted that the main objective of supply chain planning is to maximize the satisfaction of demand, taking into account the capabilities of suppliers, production and logistics facilities, in order to deliver products in the right quantity, at the right time, to the right place and to avoid lost sales, which in turn can negatively affect strategic company goals.

6.4.2. SCOR process ID sS Source

Process description:

This group of processes provides the supply of materials for the timely production of products in order to meet market demand.

Requirements for business processes and the formation of business rules:

Given the low speed of the information flow through a large number of participants and supplier links to ensure guaranteed supplies of materials for production, it is necessary to establish controlled types of relationships between suppliers up to the third level. This step will allow the formation of production schedules based on actual needs, and not forecasts and sales plans, which are calculated on the basis of needs for more than one month.

To increase the speed of information flows, it should be borne in mind that in the process of receiving an order from a client, this information should be immediately transmitted to the procurement planning process, with direct provision for replenishment of materials from third-level suppliers. That is, suppliers of level 3 in real time should receive high-quality and reliable information about the required volume of materials. It should be noted that this step is not a panacea and improving the accuracy of long and medium-term planning is a priority. A supply chain partner needs to have high-quality and reliable plans, on which they will build their activities and form performance indicators.

6.4.3. SCOR process ID sM Make

Process description:

This group of processes ensures the production of products of the right quality and quantity, in order to meet the needs of the market in a timely fashion.

Requirements for business processes and the formation of business rules:

Thus, using various forecasting and planning algorithms for supply chain operations, and the quality of information flows, which are the basis for calculating sales and operations plans, should be taken into account. Improving the quality of these information systems is an important part of improving the supply chain since incorrect information leads to erroneous decisions. To do this, it is necessary to ensure the consistency of information flows in the supply chain to create a consistent database that will be used to calculate plans and, accordingly, reduce the so-called bullwhip effect. Achievement of this task depends primarily on the coordination of actions between partners in the supply chain, when suppliers, having an accurate forecast and the ability to supply resources on time and in the required quantity, ship materials at exactly the specified time to meet production needs. This step allows significant savings on storage costs, ensuring that the minimum required stocks of materials go almost immediately to production. Moreover, given the possibility of various deviations, as well as changes in plans, suppliers can, on a daily basis, adjust their tasks to the level of daily requests that are carried out through EDI. The timely availability of information on the status of production of finished products, of order fulfilment, of expected shipments and of possible deviations allows supply chain partners to have good quality information for managing their operations and coordinating the regulation of information, material and product flows within the supply chain.

6.4.4. SCOR process ID sD Deliver

Process description:

This group of processes takes into account the requirements of the consumer and ensures the timely delivery of products to them, in the right amount, to the right place and at the right time.

Requirements for business processes and the formation of business rules:

Based on the goals of integrating partners in the supply chain, namely increasing efficiency and overall cost reduction, maintaining the lowest possible inventory level is one of the priorities. Based on this, the key areas of cost management are formed, i.e., minimizing

insurance stocks that free up the supply chain resource and costs associated with the optimal provision of order fulfilment. The first group of costs is formed on the basis of various planning algorithms, where timely delivery of products to customers on the basis of forecasting and joint planning allows companies to predict the receipt of customer orders for the supply of products more accurately. The second group of costs is associated with optimizing the delivery process to the client that can be achieved by choosing the optimal type of transport along with the optimal delivery routes.

6.5. Business process model validation and visualization

This model takes into account the key findings of the literature review regarding the formation of the principles by which the supply chain operates, the conclusions of the quantitative research supported by the qualitative research, and how the maximum compliance of the priorities, problems and improvements that have been extracted and analysed from real practice is achieved. These requirements are basic and determine the effectiveness of the integration of supply chain partners. It should be understood that achieving the synergy effect of using the results of modelling business processes will take a long time.

Model Validity: the correctness of the model is confirmed by the conclusions drawn, the validation by the Director of supply chain management, the wishes of the supply chain partners, who during the semi-structured interviews explained the causes of the problems and proposed methods for solving them, using best practices - SCOR modelling, as well as integrating the theoretical approach that was learned from the academic literature.

Model Credibility: the credibility of the model determines its practical significance and applicability. For these purposes, early problems, priorities and improvements extracted from real practice were analysed and integrated into the model to achieve the most complete correspondence to the realities in which the focus company and its partners are located.

Model Utility: The usefulness of the models is confirmed by the results of the quantitative and qualitative research that were based on a scientific approach, the identification of statistically significant phenomena and their interpretation. In this way, the patterns and understanding of excellence in the supply chain greatly helped to improve its quality and increase resilience in the long term.

Model feasibility: Given that the purpose of this study is not the development and implementation of an automated supply chain management system, the developed conceptual model takes into account the movement of information, material and product

flows within the supply chain, but the model should be understood not only by all of the partners, but also by IT developers who will establish the exchange of information between partners, carry out the integration of information systems and improve the data quality. Thus, the feasibility of this model can be confirmed by the fact that a clear understanding of the flow of information flows within the supply chain significantly enhances the automation of routine business processes, and ensures the timely transmission of information on orders, current status, and emerging deviations to all partners in the supply chain.

To increase the effectiveness of information interaction between partners, it is necessary to initially determine how the information on the real need for materials and demand for finished products will be implemented, who the recipient of this information is, who the supplier of this information is, and how this information will be taken into account by partners in the supply chain for planning joint activities. Of course, these requirements should include business rules that define the logic for implementing joint actions within the supply chain.

In order to maintain and ensure the introduction of the SCOR model in the focus company, workshops for top and senior management have been launched, where detailed modelling of each business process is carried out with the establishment of process links between partners. After a detailed study of the model in the focus company, it is expected that partners will discuss and make adjustments, if necessary, and then put the business process model into practice.

The diagram below is a graphical description of the SCOR model, showing the sequence of business processes with the responsibility of each function of the focus company and supply chain partners.

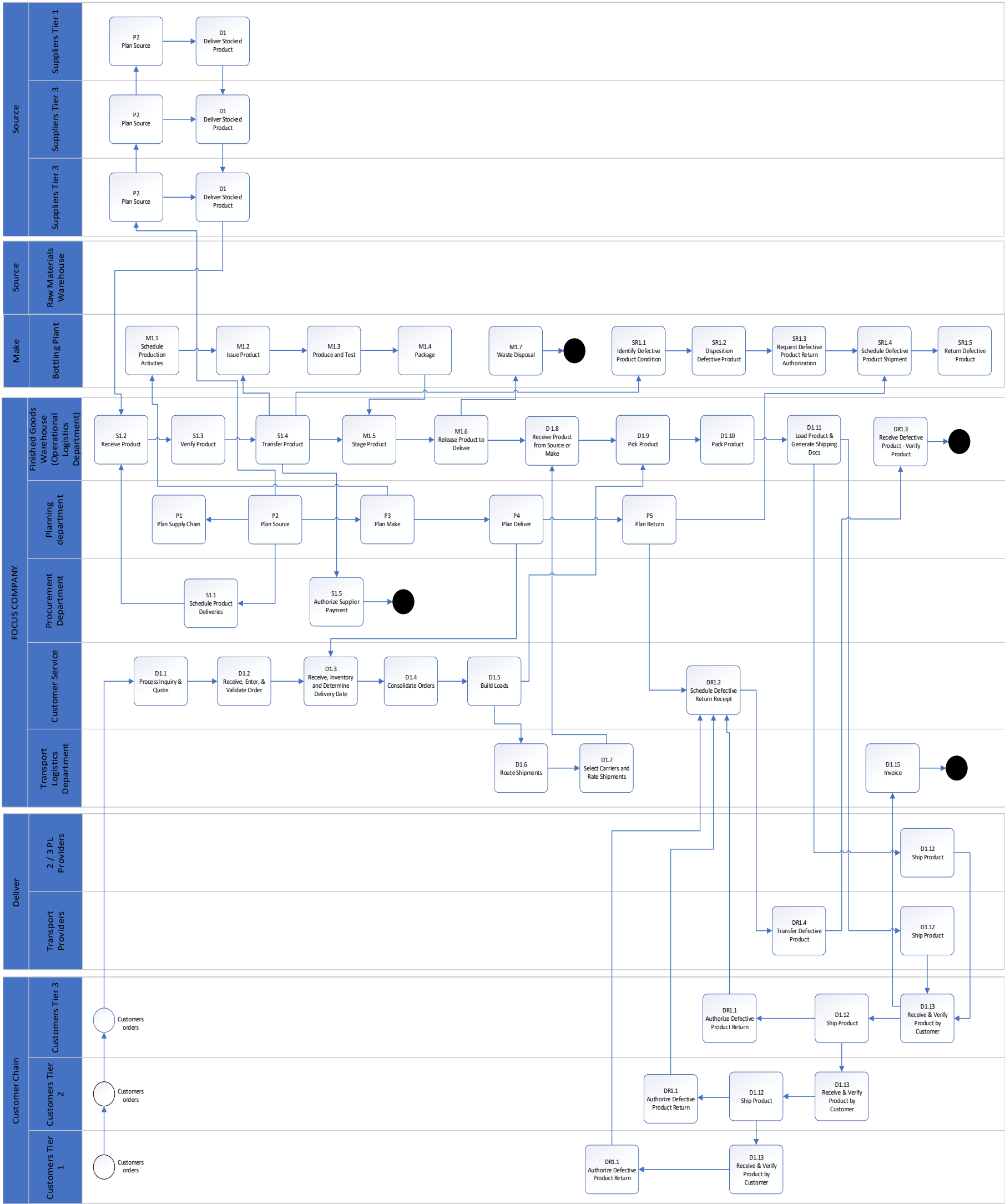


Figure 6.3: Business process model based on SCOR. Source: author's own elaboration.

6.6. Outcomes of the research

This study focuses on the integration of the business processes of supply chain partners to achieve resilience, increase productivity and ultimately to create value for the customer. Together, this creates a competitive advantage for the supply chain. At the same time, the constant search for new solutions to improve the efficiency of the supply chain makes it more sustainable, in the long term, to meet the requirements of a dynamic, competitive environment.

6.6.1. Theoretical outcomes

The preliminary stage of the study was the secondary research, the purpose of which was to consider the theoretical foundations and the formation of the prerequisites for conducting the primary research. The presence of a large number of academic sources devoted to the study of factors and features of integration of partners in the supply chain facilitates the formation of a fairly clear and understandable idea. The academic literature encourages researchers to identify more and more gaps in the body of knowledge, in order to constantly supplement and improve it. Understanding the interests of all stakeholders allows the supply chain to manage relationships and purposefully allocate and distribute the necessary resources. At the same time, stakeholder interests are inseparably connected in a system of value creation (Harrison & Wicks, 2013). Based on this, studying the problems of the integration of partners in the supply chain provides very useful information for the academic sphere, as well as for companies trying to improve and increase their competitive advantages, on a daily basis, by achieving a synergistic effect as a result of using each other's potential and resources. Thus the strategic behaviour of an organization is subject to diverse groups in accordance with their respective importance (Mainardes, Alves & Raposo, 2011). The present study confirmed all of the theoretical approaches above and complemented them. The principles of the functioning of the supply chain and the most effective interaction between partners, is primarily based on the theory of stakeholders. The management of supply chains seeks to plan, monitor and control a network of interdependent organizations (Heckmann, Comes & Nickel, 2015). The need to take into account the interests of partners was confirmed, since the introduction of joint activities implies a certain responsibility not only within the focus company, but also the fulfilment of the obligations undertaken with respect to partners. Supply chain integration links intra-firm departments, buyers, suppliers, and other chain members to improve the efficiency and effectiveness of supply chains and their deliveries to end users (Ralston *et al.*, 2015). Understanding their interests and strategic goals aimed at business growth allows the focus company to manage this type of

relationship, which is aimed not only at making profit from joint activities, but also giving due attention to the needs and problems that partners experience. Thus, a supply chain is managed, link-by-link and relationship-by-relationship, and the organizations that manage these relationships best will gain the advantage (Lambert & Enz, 2017).

A resource approach was considered where sharing unique and hard-to-reproduce resources helps the supply chain to increase its efficiency. The need for resource sharing allows the company to respond quickly to market changes and, at the same time, improve activities in order to achieve the competitive advantage of interconnected firms (Lavie, 2006). The unique competencies of partners, which are difficult to reproduce, significantly increase the efficiency of the entire supply chain, since such know-how is becoming an integral part of its technological chain. Competences enable firms to extract rents from resources and create value (Castaldi, ten Kate & den Braber, 2011). Understanding the principles of the functioning of the supply chain from the point of view of managing the different links of partners, e.g., suppliers, consumers, logistics operators and transport companies, allows the focus company to minimize its risks, and ensure the reliability and flexibility of deliveries to end consumers, which certainly creates value for the end customer.

The supply chain faces problems that certainly limit its effectiveness. The literature review revealed a sufficient number of problems that should be continuously worked on, i.e., conflicts of interest, inopportune deliveries, a whip effect, data quality for IT systems and resource support. The value creation process in the supply chain is there to ensure that the right product is delivered in the right quantity, at the right time, in the right condition, to the right place, with the right documents and for the right cost (Okongwu *et al.*, 2016). A company that understands how to address these restrictions has a high chance of achieving efficient operations. The priorities, problems and challenges of the supply chain in a theoretical approach are quite well understood and represent the passage of a long, tedious and thorny path to achieving and gaining competitive advantages. A lack of resources and competition significantly deplete the supply chain which, in turn, stimulates them to create more and more new solutions that contribute to achieving strategic priorities. In this regard, the quality of management decisions and their timeliness is directly related to the quality of data that supply chain partners possess, as well as their current level of integration, as structured decision-making involves defining a complex problem with stakeholder input and breaking that into decision objectives (Taticchi *et al.*, 2015). The presence of a large number of data arrays requires tremendous effort in order not to drown in the vast ocean of information and find what is needed to solve specific problems that arise on a daily basis.

Thus, the supply chain visibility emerges from the shared information, offering value and advantages for supply chain management (Papert, Rimpler & Pflaum, 2016).

The advantages of integrated and collaborative planning with the supply chain partners for the focus company are considered. It has been confirmed that the unification and synchronization of information flows for planning sales and operations can significantly increase the accuracy of plans, increase reaction speed, balance the work of partners, eliminate a significant proportion of deviation, carry out joint planning, forecasting and the management of inventory balances, as well as providing the right to manage inventory suppliers to strengthen supply chain resilience to various deviations. Supply chain planning, thus, addresses the allocation of rules for resources, as well as usage rules that define production, distribution lead times, lot sizing and inventory policies (Okongwu *et al.*, 2016).

The best practices for developing models of business processes were studied, and their strengths and weaknesses were determined. The factors that contribute to the effective implementation of business processes, i.e., organizational culture and change management, were considered. The use of best practices for modelling business processes has significantly reduced the time it takes to identify the optimal structure of business processes, using proven practices that contribute to the effective interaction and integration of supply chain partners. The use of a standardised reference model in the supply chain allows for quicker model building and introduces understandable processes and metrics, already defined in the SCOR model (Persson, 2011). Establishing links between the business processes of partners involves a continuous exchange of information, e.g., the availability of data on deviations and the current execution of orders, in order to make high-quality managerial decisions in real time and, if necessary, to form a picture of possible system deviations that must be eliminated using various kinds of statistical toolkits. Information quality refers to information richness, rather than the amount; thus, it emphasizes the quality and nature of information shared between buyers and suppliers (Chavez *et al.*, 2015b). Difficulties in conducting change management were confirmed by the results of the study, while staff readiness plays a key role, since not taking this factor into account significantly reduces the speed of change. The problems relating to changes considered in the literature review are based primarily on staff competencies and their readiness for these changes. By violating the usual order, changes affect the interests of employees and raise concerns about wages and job stability (Crane & Ruebottom, 2011). The willingness of staff to introduce new processes is unconditionally based on the fear of the new and the unknown; managers should, therefore, make a considerable effort to motivate employees through leadership. Trying to

change employees' behaviour should include such matters as attitudes and motivation (Oakland & Tanner, 2007).

The above aspects are the theoretical basis for understanding the principles of the functioning of the supply chain. Developed on the basis of a detailed review of the literature, they were confirmed by the quantitative and qualitative studies:

- The optimal structure of relationships within the supply chain and types of relationships between partners is uncertain;
- The dependence of the quality of management decisions on the information that partners have and the speed of its movement has been established;
- The synergistic effect of supply chain integration is achieved when establishing an exchange of resources, information and technologies;
- They revealed how taking into account the interests of partners contribute to the achievement of supply chain resilience;
- The use of the SCOR model allowed choosing priorities and minimizing deviations at the systems level.

6.6.2. Managerial outcomes and implications

This study used a mixed methodology for collecting data. A quantitative study was based on completing a survey and the subsequent testing of hypotheses was formed on its basis. A quantitative study was also conducted to determine the current service level of the focus company with the development of proposals to increase its effectiveness. The qualitative research was based on semi-structured interviews with managers of the focus company and partner companies. Based on the results of the interview, the main priorities, problems and challenges were identified, as well as measures to increase productivity. Research questions were aimed at identifying best practices that were taken as the basis for developing a model of business processes. At the same time, the results of both the quantitative and qualitative research have become the basis for the development of requirements for the business process model of the international supply chain. It should be noted that the results of the quantitative study, after testing the hypotheses, revealed a significant need for the formation of business rules that determine the logic of business processes of the focus company and its partners.

Firstly, it has been empirically proven that effective business rules create effective business processes. This conclusion suggests that supply chain partners should initially determine the whole logic of integrating their business processes, and then how deviations might be eliminated. Business processes, in turn, should not consume a great deal of time, resources

and managers' attention, and should correspond with the strategic goals of partner companies, i.e., not to contradict or reduce the impact on value creation for customers and other stakeholders (Okongwu *et al.*, 2016). A one-sided advantage in favour of one of the partners will create significant discomfort for other participants, which will affect the creation of value for the end user. Considering the interests of all of the participants in the supply chain, there is a need to define the common logic of business rules within it. The common benefits of SC collaboration are identified as cost savings, inventory reduction, timely replenishment and forecast accuracy (Ramanathan & Gunasekaran, 2014). The responsibility of partners in relation to each other is the basis for trust and the establishment of long-term and useful relationships. This requires a good planning and close collaborative support of upstream suppliers and down- stream retailers (Ramanathan & Gunasekaran, 2014)

Secondly, achieving a targeted service level is important, but rather expensive for a focus company. Ensuring sales growth and, at the same time, maintaining a high level of service requires significant resources from the company, which in a competitive environment can be regarded as squandering. This in turn indicates that cost management and the constant search for solutions to reduce costs is also an equally important priority.

Maintaining a high service level with a simultaneous reduction in costs can, in some cases, be regarded as mutually exclusive and conflicting priorities. Setting these goals as basic in the course of the operation, however, forces the company to look for new and more effective ways regarding the productivity of operations and the implementation of its strategic priorities. These can most often be found in the fields of innovation and technological improvement which facilitate different types of flows to maximize profitability through efficiencies, as well as achieving customer satisfaction (Heckmann, Comes & Nickel, 2015).

Thirdly, the high speed of information exchange between partners contributes to the fastest search for the necessary resources for production and logistics, and at the same time reduces costs, because the company will have more time to make appropriate decisions and plan its own operations based on information received from the partner. In this case, there is a need to pay attention to the technologies used to plan the sales and operations of the focus company, where it is possible to consider many parameters, and to have high-quality initial data for making a decision; this also allows the generation of the necessary reports in real time. Exchange of information not only boosts the service level, but also reduces the cycle time of a supply chain (Khan, Hussain & Saber, 2016). Visibility in this case is an important property of information flows, based on which timely and high-quality management decisions will be made, and on which the competitiveness and profitability of the focus

company depends. Supply chain strategy specifies the goals of the supply chain; it determines the overall focus of the supply chain with respect to cost and responsiveness (Tarafdar & Qrunfleh, 2017).

Supply chains are one of the main elements of creating value for customers and other stakeholders. This fact makes many researchers and managers look for more and more new ways to improve work, and to take a fresh look at the usual course of things and phenomena. Consideration of the issue of creating value throughout the supply chain, from the focus company to its partners, reveals new priorities for work on improving the mechanism for managing the relationships and communications between participants in the supply chain. Supply chain integration indicates the necessity of shared activities to jointly improve products and service delivery (Wiengarten & Longoni, 2015). This indicates that an increase in efficiency should occur synchronously between all participants, since there is a high probability of losing the competitive advantages, owing to multidirectional actions and the appearance of bottlenecks that reduce efficiency. Turning to the main task of the supply chain i.e., the coordination of work to create value, for example, from choosing raw materials, converting them into finished products to delivering to customers, it should be noted that any uncoordinated action can cause serious malfunctions and lead to adverse consequences.

At the same time, the results of the qualitative study formed a relationship between the priorities of the improvement problem in such a way that it became most obvious that the supply chain was experiencing difficulties due to its weak ability to scale with increasing volumes of production and sales. Firstly, this suggests that the internal environment of the company was not ready and the accelerated development of the supply chain in many areas was required regarding automating business processes and developing staff competencies. It should be noted that operational performance (i.e., cost, quality, delivery and flexibility) is consistently impacted by supply chain integration rather than firm and/or financial performance (Wiengarten & Longoni, 2015). Equally important is investing in IT technologies that will facilitate the rapid execution of production and logistics operations. In order to narrow this gap and ensure sales, first of all, it is necessary to establish effective communication with supply chain partners in terms of collaborative planning and replenishment of stocks; this is necessary in order to establish the exchange of information to form optimal sales and operations plans, to establish visibility and improve data quality, as well as to carry out continuous monitoring of business process performance relative to target values. These requirements are integrated into a developed business process model.

6.6.3. Summary of the research

In summarizing the results of this study, key questions should be answered. The research question was formulated by reviewing the academic literature; the answer to this question should complement the existing body of knowledge. The table below presents the main findings of this study with a description of the results.

Research question	Outcome
Which mechanisms will facilitate the effective interaction of supply chain partners?	The mechanism of effective integration, according to the results of this study, is to establish a fully-fledged information exchange between the participants of the supply chain in order to broadcast to each other sales and operation plans, current restrictions and deviations, order fulfilment and delivery statuses, and compliance with contractual obligations. Moreover, the formation of a single end-to-end logic of the implementation of business processes in the form of business rules throughout the supply chain will eliminate systemic contradictions and create the conditions for a high-quality, timely, guaranteed and uninterrupted supply of products to end consumers.
Which targets, problems, challenges and improvement measures are currently in the supply chain?	Challenges and improvements, as well as the priorities of supply chain partners, are common to all. Companies primarily look at the growth of their business and to increase sales. The task of scaling a business, in turn, generates problems caused by the unwillingness of the internal environment to pump increasing volumes through it. Among these problems is a lack of understanding of the importance of integration between partners or the timely exchange of information. The automation of business processes has a positive effect on data exchange, cost control and continuous improvement. Under these conditions, all measures aimed at supporting the growth of the supply chain business, in turn, are faced with such constraints that make it necessary to find new and better solutions, using the minimum amount of resources and achieving optimal quality.
Which approaches can be considered as suitable for	The considered best practices and theoretical approaches have enabled the creation of a holistic picture for the development of a methodology for the forming of business process models. Theoretical approaches based on the interests of partners, improving data quality, integrated planning, change

developing a methodology for business processes modelling for an international FMCG supply chain?	management, as well as sharing resources and establishing various types of relationships between partners were integrated into the business process model for using these approaches to obtain a synergistic effect and to strengthen the competitive advantages of the chain supplies. Orientation towards the strategic goals of supply chain partners and their integration can significantly increase the speed of operations and their quality. Key criteria were identified according to which a conceptual model of business processes was developed and validated.
What kind of optimal business process model of an international – FMCG supply chain can be recommended for all of its participants and stakeholders?	The literature review examined the currently most used models of business processes, as well as their advantages and disadvantages. Based on the results of the comparative analysis, the SCOR methodology was proposed as the one most fully reflecting the needs of the supply chain. This model allows the increase of efficiency and the speed of information exchange, reducing costs in two ways, i.e., at the time of the formation of sales and operations plans that take into account the synchronized actions of all of the partners in the supply chain, as well as increasing the speed and quality of product delivery and reducing the cost of delivery to the final consumer. The business process model takes into account the movement of information, material and product flows within the supply chain between partners and allows the elimination, at the systems level, of many problems associated with the imperfection of information exchange between partners.

Table 6.1: Summary of the research. Source: compiled by the author.

6.7. Contribution to the theory

In order to provide a solution to the research problems; a large number of academic sources have been studied. Supply chain integration has been widely regarded as an important strategy for improving firm performance (Cao *et al.*, 2015). It was not clear, however, how process models based on best practices can be implemented. Most of the sources that contained recommendations for the implementation of these models did not include step-by-step instructions and gave understanding only in general terms. At the same time, there is a large amount of literature on the introduction of process frameworks, but they do not consider the particularities of supply chains at the growth stage, where it is necessary to focus on the scalability of processes, thereby ensuring sales growth. Partners, thus, set up their first integration initiatives and implicitly test goal compatibility, integrity and

performance of the other. (Vanpoucke, Vereecke & Boyer, 2014). In this work, an attempt was made to create a model of business processes, which is primarily focused on closer integration of partners in the supply chain and, at the same time, the formation of adaptive business processes to varying degrees of scalability with increasing sales. Moreover, firms have to deliver value to customers while remaining profitable (Ralston *et al.*, 2015).

Academic significance lies in the formation of a representation of the supply chain integration process through the study of the mechanism of the formation of interdependent competitive advantages from the point of view of the focus company, which determines the creation of value for the end consumer. Managers and scholars largely acknowledge the need to manage the supply chain as a system which is dynamic, complex, and difficult to predict and control (Carter, Rogers & Choi, 2015). This study has explained the positive effect of integrating supply chain partners with a particular company, as the collaborative use of each other's capabilities and resources creates synergies that enhance competitive advantages. The timely and coordinated work of partners allows not only the provision of scalability of business processes, but also the creation of value for the end customer. Such synchronization leads to the reduction of total costs, the improvement of quality, cycle time and a stronger competitive position (Vanpoucke, Vereecke & Boyer, 2014).

6.8. Practical implications

The practical significance of the research lies in the fact that by integrating business processes along the supply chain, companies achieve their competitive advantages and significantly increase the supply chain's efficiency. The results obtained in this work can be used as a textbook for students who study supply chain management, and for supply chain managers to create an effective and optimal model of business processes that will be competitive and capable of creating significantly greater value for all stakeholders. Researchers can take, as a basis, the results of this work for the further development and improvement of tools to increase the efficiency of supply chains.

Moreover, accurate plans and timely planned resources from suppliers, the willingness of logistics providers to accept and process customer orders, as well as the timely identification of the appropriate type of transport for product delivery, the higher the ability of the supply chain to scale in the direction of increasing volumes will be. Achieving the goals of scaling and maintaining sales, however, is a difficult task, since many factors need to be considered, i.e., the relationship management that stakeholder theory reveals, the sharing of resources and supply chain integration, an understanding of the nature of supply chain problems, as well as the challenges, knowledge and application of the most effective solutions to eliminate

them. All of this creates the stability of the supply chain and allows achieving sustainability in the long term.

6.9. Additional recommendations

When modelling the business processes of the supply chain, the main problems faced by the focus company and its partners should be clearly formulated. This stage is a rather time-consuming and complicated process because it is necessary to process a large amount of information by conducting a survey among the managers of the focus company and its partners, and analysing the collected data, grouping the identified problems on similar grounds in order to reflect not only all points of view, but also the formation of holistic pictures with the necessary details.

Certainly, it should not be included in the structure of all participants since their number can be quite large, which will greatly complicate the initial analysis and complicate the modelling of the business processes. The most acceptable option in this case would be to use the Pareto principle, where a small number of participants should be identified who make a significant contribution to the results of the supply chain.

6.10. Limitations of the research

The supply chain is a complex mechanism, since the management of partners and information flows have many variations and, therefore, the complexity of management increases sharply. This study was conducted on the example of an international supply chain, including a focus company and its partners. The results, therefore, are largely aimed at solving the problems of this supply chain. The data collection that was carried out based on the specifics of this supply chain takes into account the characteristics and current status of the relationship between partners. Certainly, the results of this study cannot incorporate unique and unified solutions for all international supply chains and take into account the individual characteristics of each of them. Thus, by taking into account the nature of other international supply chains, the difficulties in relations with partners, the level of maturity of the mechanisms and instruments of the interaction used, the results can vary quite widely, and the conclusions and recommendations can be completely different. It should be noted that this study is aimed at developing a business process model according to SCOR methodology, while it did not affect the development of key performance indicators. The development of key performance indicators is a rather time-consuming process, where it is necessary not only to take into account the company's current priorities, but also to analyse and predict the state of the supply chain in the long term. If necessary, this need can be

singled out in a separate study, which will be no less laborious, and then conducting this study.

At the same time, the business process model does not take into account the business processes of the entire company, but only those that create value for the consumer in terms of providing services. When using this model in other supply chains, the accuracy and comprehensiveness of the requirements should be clarified, which can vary significantly when the supply chain is in different competitive environments and have a direct impact on setting goals and parameters for achieving long-term sustainability.

6.11. Suggestions for future research

The results of this study confirmed the theoretical basis formed during the review of the literature. In addition, on the basis of real practice, refinements and additions to the theoretical foundations were obtained. Certainly, a deeper understanding of the problem of supply chain integration can be obtained on the basis of several studies, where each subsequent study will complement the previous one. There is also a need to identify and develop key performance indicators, and to establish their relationship with the long-term priorities of the company. This study has proved that a significant relationship exists between the information interaction of partners in the supply chain, taking into account a predetermined optimal logic for the implementation of business processes in the form of business rules.

Studying the patterns and identifying the features of other supply chains will allow the validation of results and create a common framework to increase the efficiency of interaction and reduce costs within the supply chain. Studying the maximum number of specifics and the difference between supply chains will help to form and supplement the understanding of factors that determine the quality of integration, reduce costs, increase customer satisfaction, and analyse and implement strategic priorities, taking into account a wide variety of problems, the competitive features of different markets and geographical locations.

In addition, studying the integration process from the perspective of the partner vis-a-vis the focus company can provide additional benefits and strengthen the conclusions of this study. A deeper understanding of the interaction between partners is certainly of considerable interest for future research. In addition, the developed model of business processes and the methodology for its formation can be the basis for future research in studying the characteristics of other supply chains, taking into account differences in geographical, market, technological and product characteristics.

6.12. Conclusion

When comparing the goals and objectives of this study with the results obtained, it should be noted that this research provides an understanding of how the effective integration of supply chain partners is carried out, as well as what needs to be done in order to increase the efficiency of interaction and expand the competitive advantages of the supply chain. It is assumed that the results obtained in the course of this study will encourage managers and academic researchers to work further and find new ways to increase the efficiency of the integration of supply chain partners, taking into account the peculiarities of international supply chains and their unique characteristics.

On the theoretical side of SCM, the outcomes expand the boundaries of supply chain integration processes through a detailed study of how interdependent competitive advantages are established that significantly affect value creation. On the practical level, the outcomes can be directly applicable to increasing the efficiency of the supply chain owing to its ability to scale up and maintain increased sales by taking into account the interests of stakeholders and the sharing of resources, establishing a fully-fledged information exchange where the speed of information, materials and product flows are significantly increased.

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APPENDIX A. Participant information sheet sample

Информационный лист участника

Меня зовут Игорь Никифоров, я являюсь докторантом Университета Уэльса Тринити Сент Дэвид (Великобритания), а также начальником отдела стандартизации и развития ООО «ИДС Боржоми». В настоящее время провожу диссертационное исследование на тему: «Оптимизация бизнес-процессов в международной FMCG цепи поставок».

Позвольте пригласить Вас поучаствовать в вышеуказанном диссертационном исследовании. Для того чтобы у Вас сложилось полное понимание для чего необходимо проведение исследования, порядок и условия проведения интервью, каким образом будут использованы результаты исследования предлагаю ознакомиться с информацией, приведенной ниже. Если какой-то раздел Вам покажется не понятным или Вы захотите получить больше информации, пожалуйста, задайте мне вопросы.

Цель проведения исследования:

Целями проведения исследования является создание оптимального функционирующего механизма бизнес-процессов в международной FMCG цепи поставок, способствующей достижению стратегических целей всех участников и стейкхолдеров.

Цель проведения интервью:

Цель проведения интервью – выявление узких мест бизнес-процессов на всем протяжении цепи поставок и определение потенциала для повышения эффективности. Основные вопросы, которые планируется обсудить во время проведения интервью – это «пробелы» и проблемы с прогнозированием спроса, поставок материалов, хранением и транспортировкой продукции. Для достижения целей настоящего исследования, предполагается проведение интервью с топ и старшими менеджерами компаний участников цепи поставок. Также в рамках проведения интервью будет предложено заполнить анкету.

Продолжительность интервью:

Интервью займет не более 30-40 минут.

Результаты проведения интервью:

Проведенные интервью станут основой для получения наиболее полного понимания текущей ситуации и выработке подходов к анализу имеющихся статистических данных.

Предоставление обобщенных выводов:

По результатам проведения исследования предоставление обратной связи в виде обобщенных выводов исследования будет возможно предоставить (*прошу подчеркнуть нужное*):

Participant Information Sheet

My name is Igor Nikiforov, I am a doctoral student at the University of Wales Trinity St. David (UK), and the head of standardization and development department of IDS Borjomi Russia. Currently, I conduct the thesis research on the following title: "Business Process Optimization for an International FMCG Supply chain".

Let me invite you to participate in the above thesis research. For you to have a full understanding of what the research is needed for, the procedure and conditions for conducting interviews, how the research results will be used, I suggest that you read the information below. If any section seems unclear to you or you want to get more information, please ask me any questions.

The aim of the study:

The aim of this study is to establish the optimal functioning mechanism of an International FMCG Supply chain, contributing to the achievement of the strategic goals of all its participants and stakeholders.

Purpose of the interview:

The purpose of the interviews is to clarify the bottlenecks in the business processes for identifying areas for increasing efficiency. The questions to be discussed during the interviews will be gaps in business processes, problems with demand forecasting, procurement, production, storage and transportation. To achieve the purpose of the research, it is supposed to conduct interviews with senior and top managers of the companies within the Supply chain. Also, it will be offered to fill the survey.

Duration (how long it will take) of the interview:

The interview will take about 30-40 minutes.

Results of the interview:

The interviews will be the basis for obtaining the most complete understanding of the current situation and developing approaches to the analysis of available statistical data.

Receiving generalized research findings:

- на адрес электронной почты;
- распечатанном виде.

Условия проведения интервью:

Для целей качественной обработки результатов интервью планируется проводить аудиозапись. Во время проведения интервью участник исследования вправе отвечать не на все вопросы, а также отказаться от дальнейшего проведения интервью в любое время его проведения. Также участник может анонимно отвечать на вопросы. Вся полученная информация будет использоваться только для целей исследования и не будет передана третьим лицам.

При необходимости Вам будет предоставлена возможность иметь доступ к информации, которую Вы предоставили на протяжении всего проведения исследования.

Порядок хранения, уничтожения и кодирования результатов интервью:

Вся полученная информация будет храниться в электронном виде в папках с установлением паролей.

Также вся полученная информация будет преобразована с помощью средств криптографии для целей информационной безопасности.

Настоящий информационный лист участника составлен на русском и английском языках, и оба текста имеют одинаковое содержание и смысл.

С условиями проведения исследования / интервью ознакомл-ен/-ана, соглас-ен/-на:

According to the results of the study, feedback in the form of generalized findings of the study will be provided to each participant (please specify):

- by e-mail;
- on paper.

Terms of the interview:

For the purposes of qualitative processing of the results of the interview, audio recording is planned. During the interview, the participant has the right not to answer all the questions and to refuse further interviewing at any time. Also, the participant can anonymously answer the questions. All data obtained will be used for the study and will not be available to the third parties.

If necessary, you can access the information given during the study.

How the information will be kept, erased and encrypted:

All data will be kept electronically in password protected folders on HDD, special cryptic software will be used. Also, all information received will be encrypted for information security purposes

This Participant Information Sheet is drawn in English and in Russian, and both texts have the same content and meaning.

I have read the conditions of the study / interview, I agree:

____/____/2019

____/____/2019

APPENDIX B. Business correspondence with partners regarding research

Письмо партнерам

From:

Sent: Monday, March 18, 2019 2:28 PM

Cc: Nikiforov Igor <Igor.Nikiforov@IDS-Borjomi.Ru>

Subject: Request for the opportunity to participate in a study on optimizing business processes

Importance: High

Dear partners!

IDS Borjomi LLC thanks you and your company for fruitful cooperation. With this request, I ask you to participate in a study to optimize business processes. In more detail, the purpose of the study is spelled out in a cover letter.

Your feedback is very important to us.

Based on the results of the study, we will be able to share systematic information with you.

We guarantee confidentiality on our part.

Thank you!

Best regards,

Maxim Zhuravlev

Head of Procurement Department

IDS BORJOMI RUSSIA

5, 1st Derbenevskiy lane, Moscow, 115114, Russia

Tel.: +7 (495) 660-73-11 ext.1812

Mobile: +7 (926) 640-93-63

www.ids-borjomi.ru

www.facebook.com/borjomi.ru

Cover letter from the Director of supply chain management



IDS BORJOMI
RUSSIA

От _____ № _____
На _____ № _____

Уважаемые господа!

В пределах цепи поставок IDS Borjomi Russia с начала марта 2019г. проводится диссертационное исследование по теме: «Оптимизация бизнес-процессов в международной FMCG цепи поставок». Предметом исследования являются бизнес-процессы цепи поставок: Компании и ее партнеров.

Проведение исследования осуществляется Никифоровым Игорем Антиповичем, докторантом Университета Уэльса Тринити Сент Дэвид (Великобритания) / University of Wales Trinity St. David (UK), который также является начальником отдела стандартизации и развития IDS Borjomi Russia.

Для достижения целей исследования планируется проведение интервью с топ и старшими менеджерами IDS Borjomi Russia и ее партнеров: поставщиков сырья и материалов, поставщиков транспортных и логистических услуг. Цель проведения интервью: выявление узких мест бизнес-процессов на всем протяжении цепи поставок и определение потенциала для повышения эффективности соответственно. При публикации результатов исследования в научных журналах, название Вашей Компании не будет указано в статьях, равно как и наименования брендов и продукции.

Ожидая, что результаты исследования и выработанные практические рекомендации помогут значительно повысить эффективность сквозных бизнес-процессов в пределах цепи поставок, усилить наши общие конкурентные преимущества и создать основу для устойчивого роста цепи поставок.

Прошу принять участие в вышеуказанном исследовании и сообщить о своем участии на адрес электронной почты: Igor.Nikiforov@IDS-Borjomi.Ru.

С искренним уважением,

Supply Chain Director
Александр Абдулаев

115114, Россия, Москва, БЦ "Дербеневская Плаза"
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APPENDIX C. Survey sample for quantitative research

№	Survey section	Question number	Questions
	2.1. Section "Business Context"	2.1.1.	What impact does your unit / company have on the value chain within the supply chain? 1. Critical impact (results of operations directly affect the results of the supply chain) 2. Moderate (performance results have little effect on supply chain performance) 3. No effect (performance is not reflected in supply chain performance)
	2.1. Section "Business Context"	2.1.2.	What are the main risks for your department / company (internal, external) and what is the probability of quickly adapting to maintain performance if they occur? 1. No risk 2. External risks, depends on the market / focus company (please specify) 3. Internal - depends on the internal environment of the Company. Please specify
	2.2. Section "Performance Metrics"	2.2.1.	Does the unit / company always reach the set target performance levels? 1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree
	2.2. Section "Performance Metrics"	2.2.2.	What processes or financial indicators are actually measured? 1. Nothing is measured 2. The costliest processes. Please specify 3. All types of costs for all processes. Please specify

			4. Other. Please specify
	2.2. Section "Performance Metrics"	2.2.4.	What is priority: cost, time or quality? 1. Cost 2. Time 3. Quality 4. Cost / time 5. Cost / time / quality 6. Other. Please specify
	2.2. Section "Performance Metrics"	2.2.5.	How is the monitoring of the effectiveness of business processes / activities organized? 1. In IT systems: 2 Manually (on paper) 3. In MS-Excel 4. In BI reports 5. Not organized 6. Other. Please specify
	2.2. Section "Performance Metrics"	2.2.6.	What is the reaction to identified deviations in business processes? 1 No reaction 2. Immediate response, analysis and change of processes online 3. No response, only monitoring and fixing deviations 4. In case of deviations, the root causes are analysed and corrective measures are taken at the unit / Company level. Duration of a cycle not less than 2 months 5. Other. Please specify

	2.2. Section "Performance Metrics"	2.2.7.	Are performance metrics monitored continuously and continuously? 1. Yes, always 2. Periodically, as needed 3. Not implemented 4. Other. Please specify
	2.3. Section "Transfer of responsibility"	2.3.1.	Does a multiple transfer of responsibility in your unit / Company delay the process? 1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree
	2.3. Section "Transfer of responsibility"	2.3.2.	What is most often associated with the appearance of bottlenecks that cause delays in the work flow? 1. Incompetence of performers and managers 2. Imperfect processes and business rules 3. Low level of formalization of business processes 4. Low automation, so much has to be done manually 5. No bottlenecks 6. Other. Please specify
	2.3. Section "Transfer of responsibility"	2.3.3.	What are the ways in which responsibility transfer controls sequence, timing, and dependency? 1. Uncontrolled, response occurs only when deviations are detected

			2. Supervised by the manager periodically, if he has free time for this activity 3. At the level of IT systems (end-to-end automation with installed control points) 4. The supervisor monitors all stages of the process constantly 5. The contractor constantly monitors all stages of the process 6. Other. Please specify
	2.4. Section "Business Rules"	2.4.1.	Do existing business rules cover all possible scenarios and all solution options that may arise during the process? 1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree
	2.4. Section "Business Rules"	2.4.2.	Are there any breaks in logic, ambiguity or contradiction in existing business rules (throughout the supply chain)? 1. There are no logic gaps, ambiguities or contradictions; all business rules correctly cover all processes 2. Yes, business rules are formalized, but require revision / updating 3. Yes, while business rules are not formalized (historically) 4. Other. Please specify
	2.4. Section "Business Rules"	2.4.3.	Are existing business rules consistent with the objectives of the division / company? 1. Strongly disagree 2. Disagree

			3. Neither agree nor disagree 4. Agree 5. Strongly agree
	2.4. Section "Business Rules"	2.4.4.	Are the existing rules creating interference in the form of unnecessary approvals or steps that should be addressed? 1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree
	2.5. Performance Section	2.5.1.	Are your department / company processes scalable upwards? At what point will the processes fail with increasing workload? 1. The processes are well adapted to changing workloads. With an increase in work volumes of more than 50%, additional resources are attracted relatively quickly 2. Processes respond poorly to changes in workloads. With an increase in the volume of work by more than 50%, it is extremely difficult or impossible to attract additional resources 3. Other. Please specify
	2.5. Performance Section	2.5.2.	How well do your department / company processes scale down? What are the costs of the process if it is idling? 1. The processes are well adapted to changing workloads. With a decrease in the volume of work by more than 30%, a proportional / substantial increase in costs does not occur 2. Processes poorly adapted to changing workloads. With a decrease in the volume of work by more than 30%, a proportional / substantial increase in costs occurs

			3. Other. Please specify
	2.5. Performance Section	2.5.3.	What happens to the processes of your department / company when the required materials or resources necessary to perform basic functions are delayed or inaccessible? 1. Work stops completely awaiting the arrival of relevant resources 2. Continuously predicts the occurrence of such risks. When identifying, the search for alternatives is immediately carried out, as a rule, there are always alternatives to eliminate such risks 3. Spare options not provided; alternatives are only searched for when risks occur 4. Other. Please specify
	2.6. Bottleneck Section	2.6.1.	What factors lead to a bottleneck? 1. Human factor (incompetence, mistakes, miscalculations, and so on.) 2. Systemic problems (ineffective business rules and logic that determine the course of business process implementation) 3. Organizational factors (inefficient cross-functional interaction, sudden changes at the supply chain level, and so on.) 4. Other. Please specify
	2.6. Bottleneck Section	2.6.2.	What most severely limits the effectiveness of your unit / company? 1. Availability of various resources 2. Existing Business Rules 3. Dependence on non-transfer of responsibility from other divisions / focus Company (IDS) 4. Other. Please specify
	2.6. Bottleneck Section	2.6.3.	Do “problematic” communications cause bottlenecks within the supply chain?

			1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree
	2.6. Bottleneck Section	2.6.4.	Is it possible to eliminate the main bottlenecks (including “generating” significant costs) without significant investments / costs or changes in infrastructure? 1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree
	2.7. Section "Costs"	2.7.1.	Does the cost level comply with the best industry / international standards per unit of product / service (rub / kg)? 1. Yes 2. No 3. I don't know, such benchmarking has never been done 4. Other. Please specify
	2.7. Section "Costs"	2.7.2.	Is it possible to significantly reduce costs through automation or technological improvements? 1. Strongly disagree 2. Disagree

			3. Neither agree nor disagree 4. Agree 5. Strongly agree
	2.7. Section "Costs"	2.7.3.	Have projects on operational efficiency (resource optimization) been launched in your unit / Company? What types of costs are subject to optimization in the first place? 1. Yes, launched. The following types of costs are subject to optimization 2. No, not running 3. Other. Please specify
	2.7. Section "Costs"	2.7.4.	In comparison with the same period last year, how much did unit costs increase / decrease? What contributed to this? 1. Costs increased per unit of output due to (please specify) 2. Cost decreased per unit due to (please specify) 3. Other. Please specify
	2.7. Section "Costs"	2.7.5.	What types of costs are most likely to exceed the budget? Is the reason for this inefficiency of business processes? 1. No budget overrun by cost type 2. For processes with the highest share of costs (please specify) 3. For processes with the lowest unit cost (please specify) 4. Both that and others equally (please specify) Please specify: If the reason for this is the inefficiency of business processes, what should be eliminated in the first place?
	2.8. Section "Integration of Business Processes of	2.8.1.	Does the level of integration of information systems between supply chain partners meet the necessary requirements for a complete information exchange?

	Supply Chain Partners in IT systems”		1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree
	2.8. Section “Integration of Business Processes of Supply Chain Partners in IT systems”	2.8.2.	Are there formalized requirements for the business processes of supply chain partners? 1. The processes for establishing requirements are formalized and updated as necessary, an audit is carried out periodically to ensure compliance 2. Requirement processes are not formalized and execution occurs only within the framework of existing contractual relations with supply chain partners 3. The level of formalization of business processes is insufficient to establish requirements, contractual relations Please specify: If they exist, how is this fixed?

APPENDIX E. Descriptive statistics and intercorrelations

Variable s	Descriptive Statistics			Spearman's correlation coefficient																																								
	N	Mea n	Std. Dev iation	RESPONSIBILITY	Responsibility5	Responsibility4	Responsibility3	Responsibility2	Responsibility1	RES_TRANSMIT	Res_Transmit6	Res_Transmit5	Res_Transmit4	Res_Transmit3	Res_Transmit2	Res_Transmit1	FACTOR	Factor4	Factor3	Factor2	Factor1	BOTTLENECKS	Bottlenecks6	Bottlenecks5	Bottlenecks4	Bottlenecks3	Bottlenecks2	Bottlenecks1	Caps	Compliance	BR_covering	Misunderstanding	Interference	Benchmarking	Monitoring	Risks	Performance	Increase	Impact	Priority				
RESPONSIBILITY	37	89,0541	173,24384	1,000																																								
Responsibility5	37	0,27	1,146	-,410*	1,000																																							
Responsibility4	37	1,19	1,853	-,620**	-,155	1,000																																						
Responsibility3	37	1,22	1,493	,081	-,197	-,417*	1,000																																					
Responsibility2	37	0,49	0,87	,723**	-,136	-,369*	-,468**	1,000																																				
Responsibility1	37	0,03	0,164	,294	-,040	-,108	-,138	-,094	1,000																																			
RES_TRANSMIT	37	148,4086	250,59105	,315	-,208	-,351*	,298	,183	-,145	1,000																																		
Res_Transmit6	37	0,32	1,375	-,270	-,057	,368*	-,197	-,136	-,040	-,208	1,000																																	
Res_Transmit5	37	0,81	1,868	-,234	-,105	,356*	-,214	-,079	-,073	-,326*	,219	1,000																																
Res_Transmit4	37	1,3	1,898	-,136	,345*	-,198	,133	-,258	,241	-,273	-,166	-,148	1,000																															
Res_Transmit3	37	0,65	1,252	-,077	-,126	,233	,101	-,145	-,088	,140	,165	,125	,057	1,000																														
Res_Transmit2	37	0,86	1,004	,249	-,209	-,329*	,279	,141	-,145	,806**	-,209	-,236	-,372*	-,193	1,000																													
Res_Transmit1	37	0,05	0,229	,158	-,057	-,155	,046	,143	-,040	,404*	-,057	-,105	-,166	-,126	,033	1,000																												
FACTOR	37	489,8919	496,64384	,372*	-,012	-,463**	,366*	,080	,130	,233	-,209	-,132	,255	-,026	,228	,017	1,000																											
Factor4	37	0,43	1,259	-,290	-,083	,345*	-,110	-,197	-,058	-,130	-,083	,083	,131	,029	-,128	-,083	-,313	1,000																										
Factor3	37	1,38	1,516	-,104	,019	-,006	,012	-,017	-,154	,220	,259	,183	-,291	,174	,290	,019	-,343*	-,321	1,000																									
Factor2	37	0,43	0,835	,351*	-,126	-,198	-,166	,467**	-,088	,510**	-,126	-,053	-,224	,043	,337*	,455**	,325*	-,183	-,089	1,000																								
Factor1	37	0,43	0,502	,217	,033	-,329*	,390*	-,113	,191	-,053	-,209	-,088	,444**	-,061	,009	-,209	,891**	-,128	-,476**	-,061	1,000																							
BOTTLENECKS	37	95,4676	98,43793	,152	,210	-,150	-,102	,255	-,090	,226	-,128	-,319	-,375*	-,215	,258	,041	,096	-,259	,019	,115	-,053	1,000																						
Bottlenecks6	37	0,81	2,08	-,163	-,094	,262	-,165	-,040	-,066	-,176	-,094	,470**	,233	,176	-,185	-,094	-,326*	,626**	-,047	-,016	-,185	-,618**	1,000																					
Bottlenecks5	37	0,54	1,574	-,085	-,083	-,036	,244	-,197	-,058	-,046	-,083	-,153	,317	,240	-,128	-,083	,186	-,121	,028	-,183	,223	-,391*	-,138	1,000																				
Bottlenecks4	37	1,08	1,801	-,006	-,145	,004	,117	-,203	,274	,129	,393*	-,103	-,162	-,172	,206	,124	,118	-,016	,050	-,024	,083	-,053	-,241	-,212	1,000																			
Bottlenecks3	37	0,24	0,83	-,102	-,071	,023	,158	-,168	-,050	-,158	-,071	,138	,006	-,156	-,059	-,071	,067	-,103	-,075	-,156	,140	,000	-,117	-,103	-,181	1,000																		

Bottlenecks2	37	0,92	1,0 1	,168	,259	-,125	-,209	,362*	-,154	,204	-,220	-,258	-,291	-,089	,180	,019	-,008	-,146	,021	,174	-,148	,900**	-,364*	-,321	-,317	-,274	1,000																				
Bottlenecks1	37	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.																				
Gaps	37	1,89	0,7 74	,187	-,120	-,071	-,242	,416*	-,200	,408*	,191	-,029	,508**	-,171	,415*	,335*	-,272	-,296	,423**	,420**	,524**	,298	-,142	-,418*	,231	-,218	,282	.	1,000																		
Compliance	36	2,06	0,7 91	,376*	-,181	-,251	,067	,199	,235	,199	-,181	-,223	-,367*	,499**	,239	,388*	-,025	-,264	-,107	,228	-,180	,270	-,360*	-,264	,260	,139	,113	.	,430**	1,000																	
BR_cove ring	36	2,92	0,6 92	,146	-,148	-,006	,160	-,007	,027	,227	-,148	-,170	-,006	-,039	,184	,206	,028	-,215	,115	,258	-,066	-,073	,051	-,215	,071	,170	-,124	.	,267	,363*	1,000																
Misunderstandin g	36	2,58	0,8 74	,024	-,031	-,102	,079	-,052	,095	-,029	,093	-,172	,092	-,025	,098	-,198	-,011	-,027	,109	-,194	,000	-,186	-,027	,379*	,070	-,051	-,193	.	-,098	-,185	-,167	1,000															
Interference	36	2,44	0,7 73	,196	-,299	-,019	-,061	,248	-,109	,242	-,156	-,048	-,330*	-,129	,270	,039	-,216	,095	-,054	,136	-,320	,208	,034	-,227	,034	,205	,125	.	,257	,397*	,229	-,216	1,000														
Benchmarking	37	2,19	1,1 51	,006	-,042	-,003	-,091	,019	,117	,096	,066	,059	-,116	-,089	-,003	,066	-,136	,331*	-,016	-,026	-,098	,011	,147	-,214	,274	-,139	-,011	.	,183	-,003	-,083	-,086	,036	1,000													
Monitoring	37	2,86	0,5 85	-,052	,066	-,053	,113	,007	-,259	-,285	-,153	,236	,266	,146	-,272	-,153	,001	,367*	-,157	-,215	,112	-,201	,355*	,097	-,182	-,099	-,072	.	-,282	-,311	-,249	,024	-,212	-,059	1,000												
Risks	36	3,11	0,9 5	,245	-,284	-,206	,146	,068	,162	,426**	,090	-,135	-,201	,150	,438**	-,036	,067	-,038	,369*	,090	-,042	-,090	,043	,151	,191	-,139	-,107	.	,289	-,026	-,157	,254	,038	,224	-,120	1,000											
Performance	35	2,23	0,5 98	,423*	-,449**	-,169	,081	,209	,235	,543**	-,112	-,298	-,346*	-,098	,448**	,337*	,226	-,287	,026	,554**	-,027	,141	-,287	-,164	,448**	-,140	,026	.	,488**	,452**	,274	-,132	,217	,270	-,429*	,359*	1,000										
Increase	37	1,35	0,5 38	,009	,082	-,204	,152	,000	-,115	,257	-,165	-,152	-,358*	-,226	,451**	-,165	-,205	-,240	,261	-,090	-,225	,229	-,109	-,240	,084	,000	,187	.	,406*	,419*	,172	-,012	,158	,189	-,131	,298	,229	1,000									
Impact	36	1,31	0,4 67	-,173	-,161	,084	,213	-,244	-,112	-,012	,366*	-,092	,215	,284	-,071	-,161	,045	-,043	-,108	-,021	,051	-,395*	-,043	,341*	,262	-,200	-,386*	.	-,056	-,108	,010	,237	,083	-,022	-,140	-,071	,058	-,095	1,000								
Priority	37	4,59	1,3 63	-,120	,251	-,160	,188	-,064	-,280	,010	,251	,035	-,024	,047	,193	-,222	,220	-,470**	,413*	,047	,095	,238	-,270	,042	-,051	,036	,198	.	,179	-,094	,139	,202	-,206	-,317	,101	,130	-,226	,208	-,027	1,0 00							

APPENDIX F. Transcript of semi-structural interview with the Director of supply chain management

Researcher: What are the goals of SC Department?

Director of supply chain management: The goal of SC, within the framework of a specific company strategy in accordance with the approved business plan until 2025, is to provide an approved RTM strategy both as part of the service and in creating a distribution scheme necessary to provide RTM at given KPI costs - cost parameters. That is, there is an approved business model, which in turn contains distribution and schemes with specific channels, with regions, with a given profitability targets. And SC's mission is to support this distribution.

Researcher: If we are talking about sales assurance RTM model, which assumes maximum sales assurance, then what is also a priority? When ensuring sales, there are 3 main indicators: cost, time and quality. Which of these indicators is priority, which is less priority?

Director of supply chain management: for us, quality and time are almost the same indicators anyway, we are talking about two indicators. We operate with two indicators: these are bones and service. Slightly lower or slightly higher is flexibility, because under the conditions of an approved business plan, a company must provide growth of 20-25% annually. Plus, in the process of implementing this business plan, there are some additional opportunities to increase both in the regions of presence and sales volumes. Accordingly, with the given parameters of the service and costs, the so-called flexibility must still be ensured. Flexibility is not some kind of KPI; flexibility is the additional resources that SC needs to provide for responsiveness and sales. That is, our priority is primarily on costs, taking into account the necessary flexibility. The first objective indicator is service, the second objective indicator is costs— I mean by priorities.

Researcher: And a couple of words on the structure of SC, a brief description of what the structure is, what areas of activity are presented and regional presence.

Director of supply chain management: SC now looks like this, in principle, in the classic view, SC is all the structures that cover the contour: the functional contour is planning, this is procurement, this is logistics and of course support for these areas of function: standardization, analytics, foreign economic activity and the project office, which strengthens support for the implementation of projects by functions: planning, procurement, logistics, foreign economic activity.

Researcher: What problems are currently facing SC, what problems and limitations exist? As a rule, they can probably be divided into four types: resource, temporary, internal environment, that is, how perfect or imperfect is the internal mechanism of the company's implementation and, accordingly, the external environment — most often this is relations with partners or the market situation.

Director of supply chain management: Based on this classification, the question does not sound right and what kind of contention of these problems we have, if we talk about the resource. Well, of course, when a company is transformed annually / once every two years, our business has grown 5 times since 2013, accordingly there is a diverse resource shortage: from the personnel in terms of personnel, IT resource, partner resources, process resources that have not been created. If we talk about temporary resources, of course those changes that should occur in the structure, they occur more slowly than required by business. The implementation of each task can take from a month to a year, depending on the complexity of implementation: such as batch accounting, implementation of a new process. A year later, there was already a slightly different business, with new warehouses or new plants or some additional structures, an additional line of business, such as HOD, which appeared in the seventeenth year. Of course, a temporary resource exists. Internal problems - certainly not only SC, but the whole company is undergoing a transformation. Therefore, there is complexity with cross-functions, not in terms of collaboration, collaboration is ensured here and some flexibility exists. The question is that there are many tasks, priorities must be set, the resource is limited. The internal environment does not allow somewhere to quickly implement the intended tasks. Simple examples related to IT, now in the modern world everyone is focusing on digital transformation, a new buzzword, but in fact it is to provide basic tools for implementing the strategy mentioned above. And they are difficult to make, or at some point it is even impossible because there are not enough resources. Focus somewhere there may be IT competencies although we are talking about absolutely must tools, we are not talking about machine learning, but about some elementary things. About external competitors, the market is thrown up by some constant difficulties in various fields, be it transport, a warehouse, personnel which, where there is personnel shortage for some positions. Therefore, for all of them there is a problem. If you highlight the key - then certainly there are not enough resources. The human and internal resources associated with the low speed of changes that occur in the Company are transformation.

Researcher: What is the current understanding of the future state of the supply chain in the company, i.e. What is the supply chain capable of and what characteristics should it have?

Director of supply chain management: I believe in 2017 a target structure was already created that will be enough to provide RTM until 2025, consolidation in logistics has passed, the development plan has been approved for the planning function, where it fully covers all planning directions and stages: from sales planning to planning materials and stocks of raw materials suppliers and materials; and purchases that should cover all categories A with a given configuration, depending on priorities, visions such that the current structure will fully ensure the company's strategy until 2025. As for what characteristics, this is certainly a professional team with a focus, of course, on people, on those competencies that are approved in the framework of the competency model in the first phase and will be approved in the second. Here, each function has an understanding of what competencies should the structure as a whole have. But this is a highly efficient automated team with the necessary tools and well-built processes with IT support, because without IT transformation it is impossible to find support. Plus resources in the form of CAPEX where necessary: warehouses, of course, transport and equipment.

Researcher: We just talked about the future state, we also have an understanding of how SC looks now, taking into account the limitations, taking into account the capabilities, there is an understanding of future parameters. And how the transformation should take place, that is, we are talking about the transition from the “as is” model to the “as it should be” model through, respectively.

Director of supply chain management: There is a set of absolutely clear and understandable actions for each function; it has not yet been formulated - an understanding of strategy and development. The first thing we start with and what we do is to build business processes, in fact, what standardization does. As part of building this work, it is not yet fully understood even for the team. But in general, my vision should allow the right process to begin, because now people are set up to constantly solve these narrow necks, to embroider them, to constantly extinguish fires. But in fact, the main part of these problems should be removed when we build the process. Therefore, the first block is a big one - building business processes.

Researcher: Regarding business processes, the situation is more or less clear, enough has been said about that, and as for project activities?

Director of supply chain management: What we did there we created in 2017 in terms of transforming the structure that will implement the strategy, we created a project office, so of course throughout 2018 we pump up teams and prepare for the right activity for project

management, therefore, certainly based on project office and the creation of the so-called Casual project managers, we are certainly focused on the effective implementation of projects, in order to ensure the SC strategy we need to implement many projects, therefore, the body The implementation of project activities has a focus for us until 2025. Strategic projects, such as IBPs, are already being implemented, which serve as technological support for the S&OP process that we built in 2017 and developed in 2018 and we need to automate this process in the next development phase. A powerful project related to platforms for logistics processes, transport, for warehouses - all this is necessary and naturally linked with functions, cross-projects, so that some projects do not harm others: prioritize and focus on results. Also, from the point of view, to achieve this transformation, of course, we are building the analytics development process with the necessary detail and relevance of information, that is, moving away from the analysis of what happened 2 months ago to the ability to take any necessary analytics online and make forecasts in order to make management decisions , in fact, the creation of a large powerful analytical unit for process control. What analytics is focused on with the IT team. It's also important to talk about building cross-functional interaction inside, like inside SC, because we definitely need to work on it and work while we build business processes, define, clearly fix the responsibility for processes and process participants, and a very important cross- functional interaction between departments both within SC and company. Obviously, this is not enough, not enough, respectively, which is important to implement in terms of managing and cascading goals - setting the goal and goals of the company to a specialist at the lowest grade so that the strategic goal is cross-cutting and cascaded to the lowest level.

Researcher: In principle, it is quite clear how the transformation will occur. In conclusion, I would like you to give a certain reflection, share the experience that has been accumulated, tell about what you planned, what came out of the planned. It doesn't happen that everything turns out that it didn't work out and that it didn't work out which lessons should be learned in order to repeatedly strengthen the opportunities that exist at present.

Director of supply chain management: Are we talking about the previous period? Of course, a huge number of activities and projects were planned, a lot of things were done. But a lot of things could not be done, because a lot was planned. The first conclusion is that you need to focus on the main, important. The second thing that is important, that it's essential, is to correctly plan the resources of people, the resources of the cross functions involved, the temporary resources not only at the budget stage, but at the stage of approval and confirmation of activities that the team leads. Tight control is just over these initiatives that

the teams form, because each function has a huge need for development, the team is formed with a clear understanding of how to do this, which is priority - which is less priority. When teams are scattered and begin to implement their tasks, it turns out that the priority for SC and for the Company may be distorted based on the purpose of a particular function. Undoubtedly, the second one is the dragging out of resources, because for solving cross-functional tasks, resources from other departments are attracted, because of which, in turn, their own tasks begin to suffer. Resource management in our case is one of the most important points. The second is prioritization of those tasks that SC poses to each other. Well, something that probably could not be done, something that I wanted, just the root reason is long-term planning, not when there is a need here and now, you rush at it about what we are doing now with colleagues from the corporate centre. We formulate an optimization plan until 2025, that is, the activity of the optimization initiative until 2025 allows us to conditionally deviate with this unfocused look, get distracted from the existing deficits, priorities and everything else, make a more global assessment of these initiatives and go from the reverse to the resources that are needed for this necessary. This is what has not been done, namely the long-term planning of these changes. What has not been done in part: understanding of the SC strategy - they exist, just put it together and formulate them before 2025 - this is, unfortunately, still not possible. The strategy is not being formed in all companies, especially in regional ones, just for a tick - a beautiful word, but a specific set of actions until 2025 with specific tricks and challenges, problems, and so on. that can already be updated or confirmed by rolling, endorse annually and it is possible to make any some adjustments. This has not yet been done. Well, a number, of course, if you go down a number of things related to the personnel, of course, we did not manage to form teams to the end. This may be due to budgetary constraints, but you can still see that there are not enough resources for another little pace. Somewhere, people lack competencies because there is a budget constraint.

Researcher: And who or what currently represents SC capabilities, development potential: are these people, these are projects, these are initiatives?

Director of supply chain management: Opportunities for development in everything. If we talk about the current status, everything has a development potential: for people, both in terms of structures and in terms of optimization of these structures. We are now not talking about increasing the number of people, we are now talking about creating more effective teams, effective structures, with a clearer delineation of functionality, with additional functionality, starting with the structure if we talk about people and the creation and

development of competence of these people themselves. If we talk about processes, we have also talked about this several times, of course it is a huge potential, because most of the efficiency is just sewn up in that the processes are imperfect and this is a huge potential for developing the structure, for increasing efficiency, for improving service, and for reducing costs. It is the process stuff, that which requires a relatively small investment. And of course, those tools that SC now possesses have enormous potential for development, starting from accounting systems, TMS solutions, electronic platforms, project management, ERP systems that are planned to be implemented. We are talking not only about federal, but also about in-plant logistics.

APPENDIX G. Semistructural interview transcript

Supply chain priorities identification

1. CODING based on semi-structured interviews with top managers of the focus company

№	ROLE (FC)	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	The essence of the statement	CODING
1	Director of supply chain management	1. SC strategic goal: ensuring RTM strategy with aggressive growth of the Company: 20-25%. 2. Key tasks: control / compliance with KPI on costs within the framework of the approved business plan. 3. Current SC priorities: Service level, costs and flexibility - prompt response to changes to ensure sales without losing the level of service and not exceeding the costs in accordance with the approved budget. Ensuring sustainable sales growth is the main goal of the supply chain.	Aggressive sales growth must be ensured	Aggressive growth Cost control Operational flexibility, SL, no cost overrun Sales growth
2	Operations Director (Production)	To produce a product that meets the specifications, meets the requirements of the consumer in a safe environment with an optimal price: within the budget, cost optimization through a system of improvements.	Production of quality products at the lowest price	Cost reduction and quality improvement through improvements
3	Quality Director	Creating a binding environment between all departments: a quality product is created in conditions of quality processes. If all departments work normally, then the conditions for creating a low-quality product are not created. Responsibility is distributed among all divisions. Methodological support (normative, advisory, and so on.) of all departments for their quality work.	Creating conditions for quality	Creating quality processes

2. CODING based on semi-structured interviews with middle managers of the focus company

№	ROLE (FC)	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	The essence of the statement	CODING
1	Head of Planning	Supply chain planning: sales forecasting, production planning, supply planning, procurement planning	Company transformation for aggressive growth	Supply chain planning
2	Head of Design, SC	1. Organization of portfolio project management: selection and prioritization of projects in conditions of resource constraints, balancing resources 2. Supervision: training project managers on project management, quality control of project management 3. Conducting supply chain projects, also managing financial projects and projects in the production function	Analysis and monitoring of financial indicators	Balance of resources, priorities and projects Project Activity Training Project Management
3	Head of Analytics SC	1. Regular monitoring and analysis of the current situation over the past period 2. Comparison of activities with plans, budget (primarily financial indicators) 3. Analysis of factors to identify the reasons for the deviation of the fact from the plan 4. Building a system of regular reporting and KPI, analysis of costs and operating indicators 5. Participation in project activities For the future: creating a relationship and information structure: regulating information flows in order to gain a full understanding by all participants of their impact on the financial results of the Company	Improving financial performance Ensuring aggressive sales growth	monitoring and cost analysis budget matching reasons for deviations Transparent reporting supply chain planning

№	ROLE (FC)	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	The essence of the statement	CODING
4	Regional Logistics Manager West SC	Fulfilment of commitments for internal and external customers: the right product in the right place at the right time. 1. Security: operations, safety of goods and materials, control of receivables, registration and control of the return of shipping documents 2. Service level: - fulfilment of its obligations for internal and external customers, targets for fulfilling requirements - SLA both within the company and outside 3. Costs: limits on transaction costs	Company transformation for aggressive growth	Satisfaction of external and internal customers resource limit
5	Head of Procurement SC	1. Reducing Company Costs 2. Increasing the transparency and efficiency of the procurement department 3. Meeting the needs of the Company in the procurement of goods and services of optimal quality 4. Improvement and development of the work of suppliers Priorities: 1. Creation and functioning of a balanced department structure (development of competencies) 2. Procurement management by regular categories - the most expensive for the Company 3. Coverage of the costs of the Procurement Company: maintaining the right balance, where certain functions can be purchased independently 4. Cost reduction and increase in operating profit of the Company 5. Centralization of procurement	Minimum cost Satisfied customer Improving the quality of work of suppliers	cost reduction increased transparency of operations balance of quality and cost of purchased goods and services improving the quality of work of suppliers Cost management Operating profit centralization of procurement

№	ROLE (FC)	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	The essence of the statement	CODING
6	Head of Transport Logistics Department	1. Delivery of products with the highest level of service with the lowest possible costs using various types of optimal transport (cars, trains) 2. Return of shipping documents, accounting of shipping documents, correct reception of shipping documents, cost accounting	Deliver on time at the lowest cost with the required quality.	high SL at minimum cost cost accounting
7	Head of Production Kostroma	Satisfying the needs of the market with products in accordance with forecasts with minimizing costs in such a way as to reduce the cost of production. We strive to produce a product of the right quality at the lowest cost in the volumes expected from us.	Satisfy the market Minimum cost Quality product	production cost balance of quality and value
8	Project Manager (Quality)	Copacking management, i.e. transferring production volumes to partners, due to the full utilization of their own capacities. Or to release products directly in places of mass consumption of products and the subsequent reduction in logistics costs. Development of new projects and solutions for further implementation on their own sites.	Using the power of copakers Lower Logistics Costs	use of partner capacities reduction in logistics costs formation of new solutions
9	Production Manager Novosibirsk	1. Implementation of the production plan with efficiency and productivity not lower than target values 2. Meeting the needs of the sales department to prevent shortages of products 3. To produce a product with a minimum amount of resources: human, material, financial 4. Conduct optimization to improve financial performance, production costs. 5. Management of water resources and water treatment, provision of needs and development in the long run ahead of demand for consumption: obtaining licenses and so on; operation according to technological conditions	Implement the plan Minimum cost Improve financial performance	production according to plan OOS Prevention Minimal Resource Usage cost reduction Anticipation of needs
10	Production Manager Lipetsk	1. The release of products of good quality in the planned volume at a given time 2. Reducing the loss of materials, reducing the cost of production, their correct accounting, compliance with production plans	Fulfil the plan on time Minimum cost	low cost production cost reduction and loss

3. CODING based on semi-structured interviews with managers of partner companies

№	Company	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	The essence of the statement	CODING
		<i>Raw Material Suppliers</i>		
1	Resilux Distribution LLC	Production of necessary goods of good quality, cost reduction, access to new markets for innovative packaging, the creation of new types of goods Making a profit, conquering new markets, developing new types of products	Cost reduction Expansion Innovation	Cost reduction Expansion Innovation
2	PlastiForm LLC	1. Making a profit 2. Promotion of own brands Strategy: to be proactive. For this, a team of professionals has been assembled.	Market Leadership = More Profit	Profit Development
3	Limaton Packaging LLC	1. Enhancing people care by creating environmentally friendly and reliable packaging 2. Quality, focus on continuous development, teamwork, respect for the production process, rational use of raw materials and materials, reduction of waste, timely maintenance of equipment, concern for the convenience of the product 3. Production of high-quality products that meet customer requirements, the required margin levels and the required level of costs	!!! high standards of responsibility based on the principles of humanism !!! - profit is not an end in itself	caring for people rational use of resources balance of quality and value
4	Manuli Stretch	1. Supply of packaging materials - industrial packaging 2. The increase in distribution in Russia Mission- we do not sell a product that is mass produced. We do not sell film, we sell solution. Due to quality, we make packaging cheaper.	Business scaling Innovation is the way to reduce costs	Company growth
5	RETAL AO	Our mission is to offer a high-quality product at the best price. Creating Solutions. Improving consumer properties of products.	High quality Optimal price Finding New Solutions	Quality at the best price
6	EUROPLAST TD LLC	To be the most efficient packaging company in Russia and the world. Efficiency is not only costs per unit of production, but also compliance with the goals of our customers.	Ambition Balance of Interest: Client Profit	Customer focus Efficiency

№	Company	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	The essence of the statement	CODING
		Customer focus, compliance with external and internal factors.		
7	Polymers LLC	Production of quality safe and cheap packaging	Low cost segment	Quality at the best price
		<i>Transport companies</i>		
8	LLC "Logistic company" VESTA "	Provision of transport and logistics services	Customer hugging	Service
9	Garant Trans Express LLC	Entering the top three carriers of Russia	Ambition	Company growth
10	LLC "ITECO Russia"	1. To become the largest logistics company in Eastern Europe through the use of advanced IT technologies in the field of logistics (control of its own fleet of vehicles, hired carriers, personnel) 2. The use of an environmentally friendly fleet of vehicles through the use of gas engine fuel (cost reduction)	Ambition	Company growth
11	LLC "L-Trans"	Building long-term relationships by providing a high level of service	Customer focus	
12	DENTRO LLC	1. Become a leader in the trucking industry 2. Enter the top 3 carriers in Russia 3. To be a federal leader that ensures industry development	Ambition Ambition Ambition	Company growth Company growth Company growth
13	LLC EUROPARTS	1. The increase in turnover in cash 2. Expanding the car fleet	Capacity and profit growth	Profit growth Company growth
14	KRAFTER-CFD LLC	1. Become a leader in the road transport segment in Russia 2. The best service for strategic partners	Ambition Focus on Priority Customers	Company growth Customer focus

№	Company	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	The essence of the statement	CODING
15	MONOPOLY LLC	Be a reliable service provider and increase sales. The challenge is to grow - over the past two years we have doubled. Using modern technology to optimize our work. The goal is to increase volumes up to 65 thousand traffic per year. We are developing an expedition, by the end of the year we are expanding the number of offices to 20.	Reliability Aggressive business growth and scaling	Innovation Company growth
16	LLC "Gardarika-Region"	Providing quality service to all existing customers to the maximum extent possible	Maximize customer satisfaction	Customer focus
17	Boardline LLC	1. We are a customs representative - we have a license, we provide services for customs declaration in any mode. We have an agreement and have been cooperating for more than 5 years. We exempt from customs formalities.	We facilitate the work with client	Customer focus
		<i>Co-packers</i>		
18	UBG (Tver)	Maximum profit		Profit growth
19	Megapack (Prominent)	Production of quality products that meet the requirements of the specification. Providing a high level of service for the development of our partner's business.	Product quality We develop ourselves and together with partners	Customer focus
		<i>3 PL operators</i>		
20	HAT LLC	Timely and correct / competent performance of work. Our priority is a satisfied customer. There is no mission, there is a task to grow, to attract new customers, high-quality performance of duties in a reasonable time at an adequate cost.	Satisfied Customer - Business Stability	Customer focus Company growth
21	Total Terminal	1. The provision of high-quality logistics services with delivery of the "last mile" to the client. 2. To be the best and modern, able to quickly change their logistics model to the requirements of a partner, while maintaining price, quality terms.	We take care of the client Meet requirements through continuous change	Customer focus Continuous improvement

Identification of supply chain problems and improvements

1. CODING based on semi-structured interviews with top managers of the focus company

№	ROLE (FC)	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	The essence of the statement	CODING
1	Director of supply chain management	Problems: The company is growing very fast, the development of the internal environment does not keep pace with business growth. Therefore, the transformation of SC is very important at this stage to achieve the level of full compliance of the internal environment with the requirements of the business and the external environment Emerging tasks: - continuous growth: new business needs that need to be met - prioritization with limited own resources: it is not always clear what is more priority - resources providing cross-functions are limited. Low rate of change due to incomplete readiness of the internal environment for change Personnel hunger, the competencies of existing personnel require development Improvements: Transformation is aimed at changing and aligning processes for current and future needs. After formalization of processes, the transition to continuous improvement Changing the thinking of the team, instilling modern technology to improve activities (project approach) Prioritization based on the importance and availability / availability of required resources Focus on changing processes online if you have enough analytics for this - transition to continuous improvement Goal-setting - the establishment of cross-cutting strategic goals to the final executor It is required:	Company growth Growing needs difficulty in setting priorities limited resources low rate of change competency development meeting future needs performance improvement task prioritization visibility cascading goals Proper allocation of resources task consistency long term planning staff development efficient use of resources	Company rapid growth Growing needs difficulty in setting priorities limited resources low rate of change competency development meeting future needs performance improvement task prioritization visibility cascading goals Resource management task consistency

№	ROLE (FC)	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	The essence of the statement	CODING
		To do only what is extremely important for business and to allocate resources correctly All priorities of cross-functions should be interconnected and not conflict with each other, including for resources SC long-term change planning: plan for years on what and at what point to do, what resources and with what result (Strategy Road Map 2019-2025) Focus on development and personnel management (people management): strengthening teamwork + professional development of the team, managerial competencies Improving the efficiency of using current resources (capitalization of opportunities)		long term planning staff development efficient use of resources
2	Operations Director	Problems: Resource: everything related to planning, it also gives a resource limit, for example 5l. This is a seasonal product, in the first quarter we produce in 3 shifts, in the second quarter in 4 shifts, and from March it is necessary to increase by N%, we do not have this in the budget, we also have no resources. Temporary resources and internal environment: time management requires that all managers at the n-1 level in factories have the same skills that would prioritize and manage time, prioritize, and use a project approach. External harm is suppliers - when we needed to do something, and it was not on the budget. It is not always possible to set the date of activity implementation, to set the correct priority. Cross-functional interaction. Communications when you need to implement something and wait for everything to get involved, to consider with the same immersion. Improvements: There is a development strategy until 2025, our production capacities are growing, our geography is increasing. We optimize the structure, bring something to the level of the head office, create the Lean-manager function, HR BP, a production trainer.	mismatch of plans, resources to needs time management mismatch of plans, resources to needs difficulty in setting priorities Cross-functional interaction Operations optimization rate of change focus on value creation competency building speed of operations Automation and unification of business processes	mismatch of plans, resources to needs time management mismatch of plans, resources to needs difficulty in setting priorities Cross-functional interaction Operations optimization rate of change

№	ROLE (FC)	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	The essence of the statement	CODING
		Production - we can quickly respond to changes, mobilize for key projects, make decisions assessing risks. Centralization of functions, the withdrawal of non-specific functions from production: procurement, cleaning, security. Maintenance of new equipment - use of our own expertise: the first year is the use of outsourcing, the next year is yourselves. We take into account the number of formats on new lines, to reduce changeovers (change over) - one shape approach is required - only the label and cover change, there is no mechanical changeover. Automation and unification of business processes: at the moment at the level of function managers and n-1 in factories, there is no sufficient understanding of what business processes are and what should be. Business processes should be unified, there should be an understanding of where synergy should be. The processes should be the same, transparent and understandable. Difficulties in different types of equipment, different components in terms of costs. But now this is not a priority. Management of production costs is a unified approach for all plants in terms of cost centres. There is a MOMO project - a program for collecting production costs (constant. Variables, non-productive) allows you to collect benchmarking and manage costs. There is no description of operational project management in terms of costs. There is a process of continuous improvement, but effectiveness is little appreciated. Requires Lean Manager function. There should be understandable processes, managers and performers. We went through the project phase, closed it, appreciated the strengths and weaknesses, outlined what we are doing next. They closed the shift, produced the product, evaluated with what efficiency, realized where there are weaknesses, recorded, put in the activity plan, tracked by dates, and then look at it in the next phase. We do not evaluate how important it is to develop a particular function or department. The staff is staffed, we do not plan to recruit new people, we	A single approach to managing production costs implementation of the project approach Competency development Learning New Knowledge Cross-functional interaction	focus on value creation competency building speed of operations Automation and unification of business processes A single approach to managing production costs implementation of the project approach Competency development Learning New Knowledge Cross-functional interaction

№	ROLE (FC)	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	The essence of the statement	CODING
		need to develop competencies, we were self-sufficient, until we began to actively develop - volumes, seedlings of new sites. At this stage, a resource is spent, something that could be estimated. What did not work out was to get involved in the process, that we can take something from those projects that are implemented in supply chains, for example, collaborative trainings. To see common cross-functional tasks, how we implement them, tracking, cycling Monthly Business Review.		
3	Quality Director	Problems: Operating costs: laboratory costs. Focuses, difficulties and limitations: high staff turnover due to low salaries due to low labour costs. From this, laboratory control tasks are complicated. Improvements: Restriction: production planning - indirectly affects the quality and exposure time of products after production, production runs planning. It is required to redefine the goals and objectives of the quality service. Quality service should go towards R&D, leadership should be from the marketing function. The main lesson is to take lessons, because we cannot stand lessons. There is no system for identifying obstacles and limitations. Need a meeting system. If a problem has not been tested for root causes, then it cannot be called a problem. In order to correctly identify them, there is a need to have a system for determining and removing restrictions.	cost reduction wage production planning goal setting innovation error handling root cause analysis work with restrictions	cost reduction wage production planning goal setting innovation error handling root cause analysis work with restrictions

2. CODING based on semi-structured interviews with middle managers of the focus company

№	ROLE (FC)	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	CODING
1	Head of Planning	Problems: Sales Forecast based on historical data with manual cleaning of various activities and external factors, a time series is constructed with a trend according to forecasting formulas from the past to the future, imposing promotions and generating a sales forecast with subsequent coordination with the SALES function. Then, production and logistics are planned, and a production and supply plan are formed on the basis of the received sales plan. It takes into account all the restrictions at the moment. If it is not possible to provide a sales plan, then a decision is made on further actions at regular meetings. The disadvantage is: Large time costs for calculating plans. Laboriousness is a very long process of forming and coordinating plans; dividing plans into operations is 4 working days. Rigidity, low speed of reaction to changes. Inability to quickly process incoming changes. The probability of errors in the calculations due to the imperfection of the Excel models and the quality of the input data. Improvements: Advantages: a limited number of participants are involved in the process and the process does not depend on the cross-function, the performer can add something based on his experience, add the missing information on his own and complete the process. In the IBP IT system, such flexibility is lost; the system does not provide such an opportunity. Planning department: information recipients, plan coordinators, and plan provider. Cons: Timing, speed and quality in the formation of plans. Growth area: Development is required between the sales department and the supply chain; a single goal-setting between the two functions is required. High-quality communications with cross-functions within SC are required: the IBP IT system should align this. Together with cross-functions, conducting projects to optimize costs, with one single look, see what can be optimized.	time consuming labour input low rate of change inflexibility mistakes and imperfection synergy between user and IT system single cross-functional goal-setting Cross-functional interaction End-to-end cost optimization Automation Data Quality in IT Systems

№	ROLE (FC)	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	CODING
		Lack of automation. Improving the accuracy of forecasts due to collaborative planning with partners in the supply chain: retail and distributors, it is required to align the data transfer process and the quality of the transmitted data. This is a very time-consuming process, but so far these are plans, so far, we are not reaching the final point in the near future.	

2	Head of the project department SC	Problems: Lack of resources: IT resources, lack of performers and their level of competence. The absence of an IT architect - the program code is not consistent with factories, contractors - this leads to errors in work, crashes, periodic problems. Lack of established project management processes: lack of experience in project management among process owners. A large number of mistakes were made when choosing suppliers of IT systems, system support, a lot of time was spent on implementing systems with insufficient functionality, and on their stable operation. More stringent selection is required, the concluded agreements do not allow to completely oblige the contractors to carry out their work. The absence of an architect and business analysts - a large number of problems and shortcomings arise; it is necessary to redo up to 50% in the IT projects that have been started. Problem: human resources and their competencies. due to the lack of quality control, the result of each implementation will be unstable for some time. It was not possible to launch the master data program in a year due to a lack of IT resources and a lack of business understanding of the importance of this project. Improvements: There is a cycle of seminars: training project managers with pitfalls, analysis of current situations. Each project has a project office curator who helps the project manager. IT resource limit: - we try to solve with the help of the contractor, transferring the maximum work to the contractor, - a very strong dependence on the quality of work of the contractor. - finding additional resources outsourcing, outstaffing: quality control is required. Implementation Resistance to New: - interest staff in the results of implementation - passing 5 steps of adoption, gentle pressure through the manual Lessons Learnt: Before starting the project, conduct a large training for project managers: what stages and what documents. It is necessary to very strictly fix in the charter of the project: resource requirements - resources must be guaranteed by resource managers, the boundaries of the project must be clearly defined (what is included in the project, what results are expected, what results are not included in the project - endless projects).	Lack of IT resources IT architecture Project activities Lack of IT resources Data Quality in IT Systems Lack of IT resources Project Activity Training IT outsourcing Staff motivation Project Activity Training meeting project deadlines motivation
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		It is necessary to work on the bonus part at the end of the project of important milestones of the project - the speed of completion of tasks.	
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№	ROLE (FC)	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	CODING
3	Head of Analytics SC	Problems: Building cost control processes and automation: a problem with the timing of the provision of information and integrations between systems, a problem with master data, the constant transfer of technical tasks from hand to hand in the IT department - leapfrog, a lot of time is wasted. The impact of IT restrictions on operational activities: discipline, entering information, entering correct information. Analysis of transport costs: the systematization of information management is not regulated due to the many IT systems: from 10 different sources - this can be halved, I would like to reduce to 4 sources: international transport, small-tonnage transport, long-distance transport, groupage cargo. This will reduce the time for analysing information and checking its quality, quickly find inconsistencies, and quickly get the final result. The leapfrog begins, who and where has entered the data. Analysis of warehouse costs of plants - a report template has been compiled, again in Microsoft Excel - automation is required. The share of storage costs is 20% at present. There is no unified reporting structure in QCD with the prescription of all sources of information and understanding of visualization There are time limits - reporting appears after the 25th of the month following the reporting one - it's too late to do anything. The sooner reporting, the faster the response. The creation of optimal stocks is detached from the results, an understanding of corrective actions is a multiple transfer of responsibility: planning warehouse operations, delivery. At S&OP we get a very complicated picture - the task is to catch inefficient work, for example, organize direct shipments from the line Improvements: When IT resources are released, we will be able to achieve operational success, there are many bottlenecks. Purpose: building information flows - automation - understanding what the problem is: controlling the arrival of information, its quality, its filling, establishing restrictions on entering information. The complexity of automation - there is no culture of data maintenance, restrictions on data entry. Effective cost management - understanding of the factors that affect the final costs, all the relationships are built and quick response. Large drains, excess tariffs. The difficulty is that everyone is used to working with different types of information.	Cost control Lack of IT resources A large number of IT systems There is no single reporting system late reporting S&OP is not effective automation end-to-end goal-setting

№	ROLE (FC)	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	CODING
		It is necessary to bring everyone together and understand what needs to be done. Conducting general meetings. Formation of a single report that will allow everyone to see something that is really needed	

4	Regional Logistics Manager West SC	Problems: An incomprehensible structure in operational logistics: an obscure, fuzzy vertical, tasks must be cascaded, which is not currently available. Work with low planning accuracy - from the formation of the sales budget to operational planning, there is no holder of budgeting - through whom would the input data on storage go, why they differ from the previous year. Attracting personnel: the personnel of the factories are not in the market for wages, because of this, projects are not being implemented (there is no WMS administrator, and so on.). We have to adapt to an increase in production not provided for in the plans: deviations from planned volumes often having a certain surplus of resources - there is a plan for the month ahead - you need to have a surplus of space of 20%. Requires the formation of budgeting rules, consolidation of general rules. We take on increased obligations and do not always fulfil these obligations. Also, tasks are always carried out, but not always the deadlines are met. Everything is done with the same resources, volumes are growing, resources remain the same. Growth problem - not enough resources. There is also a lack of motivation (monetary and non-monetary), the comfort of being in the workplace, with constructive and correct criticism. Improvements (what you need to work with): Tricks for loggers: service level - return of the TSD from the shopping centre, work with losses with imported products, claims work with the shopping centre, LO, incoming claims from distribution networks. We draw conclusions from each project, create more comfortable terms, make a deferred payment, you need to lay + 30% for each project. We process the volume of operations completely, we have not the worst tariffs, our warehouses are much cheaper for us. Perhaps two logistics managers are needed: one with a focus on accounting and customer service, the other with a focus on transport and storage. Communications are not entirely incorrect, somewhere the information is lost. Focuses: warehouse processes - transparency, productivity and cost retention within the budget. Warehouse management needs to be developed and pumped. Focusing all employees on the level of service - for 2018, the level of service was greatly enhanced due to the involvement of all employees.	Logistic structure ineffective quality planning wage lack of resources lack of budgeting rules breach of obligations failure to meet deadlines lack of resources lack of resources Staff motivation service level improvement creation of conditions for the result focus on own operations division of responsibility increased transparency
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		You should not spray on many tasks. The priority is only security, level of service and costs. Requires continuous improvement technology, a bank for receiving ideas.	and productivity staff development service level improvement continuous improvement
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№	ROLE (FC)	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	CODING
5	Head of Procurement SC	Problems: Vision - the supply chain structure has been created, but approved this month, within the budget, areas of responsibility are defined by category. Internal limitation: employees of the procurement department are registered in different legal entities, there is dual power - this is a significant challenge - employees have different KPIs by area of responsibility - unification is required. There is no proactive HR position; it is required to centralize personnel assessment in different legal entities. Not all department employees have the same competencies. Development plans should be developed for each employee. A roadmap for assessing achievements and performance should be agreed upon. There is no development of a personnel development system at the corporate level. Costs are covered by the procurement department, optimization of the function, non-core functions have been identified - 35% of the time the procurement officer is engaged in planning - you need to transfer the planning functions of raw materials All strategic materials are planned by profile functions. Different accounting systems at production sites are a serious challenge. External challenges - coverage assessment - there is no single accounting system, different bases, counterparties are different, but we have an understanding of what to do with this - unification by a centralized establishment of suppliers. Factors: external economic are not predictable, according to some materials there are significant effects, currency risks, but we assess them and know how they can arise Improvements: The procurement department covers more than 85% of the company's costs, it is necessary to free up resources in order to increase the coverage area, and take the costs with a high price segment to the procurement department in order to increase the number of processed applications from internal customers. Vision for the future: 90-95% should be covered by the procurement department - they must conduct tenders, sign contracts, and conduct high-quality negotiations. Centralized system of work with suppliers of C&M, a responsible employee of the procurement department has been appointed, knows the requirements for suppliers, the timing and implementation I expect that the reaction of the suppliers will be positive. Currently, the company does not use 100% standard service contracts, we have created and agreed standard contracts, agreed on the level of quality service and products at a centralized level. Example: contracts for the	single cross-functional goal-setting no staff rating no staff development no performance rating no staff development Procurement planning A large number of IT systems Lack of a unified accounting system unpredictability of market conditions Redistribution of Procurement Responsibilities by Business Functions Using the competencies of the procurement

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		supply of raw materials and materials, the provision of transport services. The task is to re-sign model contracts with all suppliers. Not all suppliers can accept our requirements. Procurement management by regular categories, coordination of standard reporting forms, agree on frequency. Requires ERP implementation with the Procure-to-Pay module. Acceleration of approval and signing due to the electronic document management system. Focus on cost reduction, quality negotiations, quality selection of suppliers. For each project, we analyse and identify bottlenecks. As an example, the delivery of two production lines - there was no project manager on the part of the function, the team was not clearly fixed, there were no clear KPIs, the procurement officer was the leader, but did not have the resources to influence. Delivery deadlines were disrupted, documents on the part of accounting, finance, and production were not provided on time. We evaluated, concluded, with a similar delivery, painted resources, created a project team, installed KPI for each member of the project team, the project team includes all the functions that affect the result. For all large projects, we apply a similar practice. We also shared the practice with colleagues from Georgia and Ukraine so that they could take into account all bottlenecks.	department to obtain the best conditions for the Company from suppliers transition to standard contracts with suppliers with uniform conditions for all ERP implementation implementation of an EDI system for working with contractors Building project competencies and sharing best practices within a group of companies

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6	Head of Transport Logistics Department	Problems: market component Tough competition. Deadlock in the development of some regions (Kostroma). Competition for transport resources: seasonal - the season of fruits and vegetables, tenfold increase in agricultural exports. Sugar and grain producers will give any money in the season due to limited transport resources - feeds the day a year. We have to strictly negotiate with the TC so that the terms of the contracts are met. Improvements: Building clear and transparent relationships with TC and partners. Compliance with mutual obligations. Automation of all routine business processes, including with the TC. Increasing transparency: so that we can at any time analyse all past operations and understand where we should develop further. Mutual development - the diversification of risks through the establishment of the largest players and the diversification of volumes between them. Building and planning shipments, and the subsequent transfer of TC plans for building their resources so that they can provide maximum service for the lowest possible money. Compliance with the cost on both sides, compliance with the guaranteed volume of export from both sides. Shipments from Georgia by attracting cars along with railway - risk diversification and cheaper delivery. Fine of the TC for being late, failure to provide documents, and other violations. It is necessary to focus on diversification between federal and local TCs. Compliance with mutual agreements and mutual requirements. Automation. It was not possible to build relationships with carriers, since earlier the priority was price, while today the guaranteed volume of export of products was spent a year on the break of consciousness of logistics and transport companies. We need to focus on mutual compliance.	Market unpredictability Competition Regional restrictions Competition Transparency Compliance automation Visibility Management of risks Collaborative planning Compliance Delivery diversification Execution control Diversification between transport companies Compliance automation

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7	Head of Production Kostroma	Problems: absent. Improvements: The development of production in terms of technological progress. Cost minimization. Achieve goals and constantly improve. Reaction speed: at the lowest cost to give more products. Comparison of costs with possible technological improvements and what they will bring. We monitor production costs 2/3 of the cost, reduce energy consumption, personnel. Reduce the amount of marriage: technological marriage and production marriage. We reduce the costs of variable staff, when reducing volumes, cancel shifts or transfer staff to other types of work, thereby reducing the cost of outsourcing Increasing the resource of production, we strive to take readings as often as possible and monitor the parameters in order to slightly increase the resource of spare parts and assemblies. Together with the planning department, we establish a number of indicators that evaluate collaboration, we introduced several concepts of production plans, a monthly production plan - which we take on the 1st of each month and freeze it, then see how much we deviated from the plan that was at the beginning of the month. There is a weekly plan, a week is the period for which, ideally, we would like to freeze our production plan, but it does not always work out. And the operational production plan, that plan that we consider every day, which we are forced to change in accordance with the changes. the first indicator is MSA - the deviation from the monthly plan for today is 60%. The second indicator is the production service level - deviation from the operational plan, the plan for the day - 90%. In the future, we would like to increase the MSA so that it can be adjusted as little as possible within a month. Our company has set a goal - loading equipment by 70%, i.e. 70% of the time production lines should produce products. In the planning process, a very often conflict of interest occurs, in the number of readjustments, the transition from one SKU to another. For us, the fewer readjustments, the better. For planning, to meet demand and maintain optimal stocks, it is better to have frequent readjustments. Being in close contact with a specialist in the planning department, we manage to find the optimal ratio of the production plan for the production of products. On my part, there is communication on how to plan the optimal schedule, on the part of the planning department	Innovation cost reduction continuous improvement more volume at a lower cost innovation effectiveness cost reduction product quality improvement cost reduction Equipment operation control Improving Planning Accuracy Capacity utilization

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		specialist, comparing the optimal schedule with the established indicators for the stocks that he is monitoring. Currently, the performance of 71%, this is a good indicator. We also monitor the Capacity Utilization indicator, i.e. % utilization of the line, related to calendar time, including maintenance time. The fulfilment of this indicator suits both us and the planning department.	

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8	Project Manager (Quality)	Problems: The risk of not releasing the planned output. The release of low-quality products - this has not happened for a long time. Improvements: To regulate the production of copacker products, the contract provides for bilateral responsibility for the implementation of volumes - compensation. In terms of quality, there is a production control program that is carried out by copackers. The data on the program are laid out on a common resource, the dates of visits are determined, the frequency is determined, experts on operational quality control. Currently, the SMART project is being developed, the difficulty is that the project is launched in the season, so it's difficult to agree with the copakers, this issue is being developed. Copakers Dana - a project is underway to switch to shrink film, which will lead to lower costs (from packaging to boxes). Last year, the project on launching small and medium formats was not implemented at Dan's copakers, due to a quality problem. This year, a water treatment program and its further validation and confirmation of the possibility of production are being implemented. Last year, the Megapack copacker revealed problems with the formation of inclusions, these were fixed in 2018, the copakers was launched. Copakers UBG - this year a project was completed to increase the efficiency of the line - the transition to a new bottom, to increase productivity in the format of 0.5 gas. A project is underway for all production sites to address productivity and reduce difficulties with the moment of unscrewing the covers.	Monitoring partners increase production efficiency cost reduction increase production efficiency Product quality improvement
9	Production Manager Novosibirsk	Problems: A growing demand for production volume is the need for personnel and a low level of wages, an increase in production usually occurs due to refining, as the staffing table is filled, wages fall and demotivation occurs. Losses of materials do not meet the targets. The consumption of materials for new lines is calculated based on the consumption of materials on old lines that worked slowly, with a low reject rate. During the merger of CCW, it was necessary to ensure the integration of IT systems, the procedures duplicated each other, this is still happening, which creates difficulties. Improvements:	Lack of resources Low salary Increased material consumption IT systems integration

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		After the analysis, remove duplicate IT systems so that one system collects data. Pulling the average wage to the average level in the market. Time management training required, or external evaluation. At different production sites there are different personnel, engineers, specialists, and the tasks are the same - you need to make a comparison and align the production staff. All that was planned in 2018 was done: a new production line was launched, water treatment was modernized, new wells were drilled. The development of the production site went by leaps and bounds, the output was already three times more than a year ago, and next year 5 times, this is good news. There is a concern that sharp scaling may lead to loss of quality. This cannot be allowed. There is a contradiction in increasing the volume of production and maintaining quality. A balance must be struck between this. For CAPEX-projects, a project manager is needed, all projects are led by operational managers, the quality of work is affected. Dedicated FTEs are needed to organize this activity.	eliminate duplicate IT systems Salary increase Time management Unification of competencies of production personnel Output growth prevention of quality degradation while increasing output
10	Production Manager Lipetsk	Problems: At the production site, the largest labour costs, the largest loss of materials, high cost. It requires the formation of the right production schedules, maintaining the correct accounting of materials, reducing defects at all stages, extensive work with suppliers - everything is presented to suppliers. All shortcomings are presented to suppliers. Production in small batches, a lot of readjustments - this reduces efficiency - you need to increase the series. Unplanned stops reduce efficiency. Sometimes it is necessary to produce fewer products, which takes up less storage space, or completely cancel production. Improvements: The withdrawal of personnel to work only for the production of products, the exclusion of non-core activities.	Introduction to Project Managers high material losses and high costs A large number of readjustments Unplanned stops overstock

3. CODING based on semi-structured interviews with managers of partner companies

№	Company	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	CODING
		<i>Raw Material Suppliers</i>	
1	Resilux Distribution LLC	Problems: Here innovations could help - EDI, a lot of documents. The introduction of the blocks - the placement of forecasts, applications, protocol exchanges, including negotiating monthly prices, deliveries, as well as exchanging accounting documents that come with the delivery. It would be great to remove the labour involved in exchanging letters. Production planning - we have a large turnover in the summer season - April-August. If we know in advance about the sample for the season, we can pre-stock in January for a painless passage of the season from January, we could reduce our lead-time, we could pre-order various dyes, we could pre-purchase, we could contract our raw material is granulate, we could do it more efficiently. The more effective and more accurate the forecast will be, even taking into account a possible increase in deliveries, the more likely that we can provide this volume, but we would also like our partner to provide us with guarantees that we will produce. Perhaps these are contractual obligations, if we take obligations to keep stock, we would like our partner to take the obligation to acquire this stock, this affects our budget indicators. Difficulties: forecasting, difficulties last year, volume was announced, we allocated our equipment and resources, deliveries were lower by 15%. For us it was significant. This year we are trying to track contractual obligations more carefully. We take forecasts from the focus company, take the fact and monitor what was announced and what was delivered, down to each position. Warranties, perhaps this is investment equipment, we request volumes from the Focal Company that go to order this equipment. The return on investment is calculated based on the volume of products shipped, if the forecast is inaccurate, this affects the budget indicators and the performance of the entire group of companies. Accurate forecasting is the main layer to work with. we may not include investment in the contract, but we need guarantees - for example, the purchase of manufactured products for 2 years. Improvements: We are a responsible supplier, we will not spoil relations, but nevertheless this can be a rather big problem for us.	Lack of information exchange between IT systems Low accuracy of plans There is no guarantee of redemption of products produced under the focus company Lack of product buyback guarantees Improving Planning Accuracy Automation of planning processes

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		A significant area is forecasting and compliance with the fact of delivery, in the first quarter we see a lag of 15% -18% from the forecast, a difference of 50% in April, the stock was not selected on time, we do not see that the supply of products that we predicted for the year will be ensured . We know that you have launched a demo version of the sales forecasting program, we wish the program to be launched successfully so that forecasting is the most accurate. For our part, we are ready to create a working group to help you if necessary.	

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2	PlastiForm LLC	Problems: There are no difficulties. We receive applications for the year. We receive applications for the quarter, month. We have a two-month stock under FOCUS COMPANY. The limitation is not so high level of utilization of our facilities. We bring the preform truck - we unload it ourselves, here you unload the junk yourself. At the same time, we bring at the request to bring as soon as possible, but we get the answer: you need, you unload. Improvements: We are comfortable working with the FOCUS COMPANY. We can learn from you, I want to say thank you for this. We want to get an extension of the assortment. We suggest moving to a new standard with you (26/22).	low volume of supplies Increase in supplies, incl. Extended assortment Introducing a new packaging standard
3	Limaton Packaging LLC	Problems: Market changes, volatility of consumption, more accurate forecasting is required. We would like the client to analyse their own processes in this zone, so that there is a result in this direction. Frequent rotation of personnel; people change; it is not always possible to transfer qualitatively the entire history of interaction with the supplier. Improvements: Openness to a collaborative dialogue on both sides. We try to close risks as much as possible, have spare suppliers, we have stocks in warehouses, when the market changes, our company is well adapted with an increase in the volume of work. When volumes fall, we are poorly adapted, as there are financial obligations for operating equipment. For a full-fledged information exchange, it would be possible to improve the integration of systems - what the client wants, what he plans, how the situation is changing - in order to flexibly integrate into these changes.	Low accuracy of plans Receive information on changes in demand in advance Integration of IT systems for collaborative planning

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4	Manuli Stretch	Problems: The human factor - the lack of maximum involvement in the process, two types of people work in the same company - are ready to take risks to achieve the goal, and someone is happy with everything. If you manage to get to people who are happy with everything, then the process is an idea, if not then the process has been standing for years. we estimate virtual losses, lost savings, up to tens of millions per year. Customers who have switched to the status of our partners are grateful to us for this. The main risk between us is the euro. All other parameters are the same as other suppliers. The weak point is pricing; the duty is poor. The rate of return is 10-12%. We can show savings for our customer. Improvements: Forecasts are important to us; delivery time is limited to logistics	Exchange difference Improving Planning Accuracy
5	RETAL AO	Problems: Deviations in planning, changes in delivery dates relative to the agreed dates. We understand this and find a compromise, re-plan on other sites of the FOCUS COMPANY. Seasonality can be controlled and it depends on the efficiency of the processes of all partners, stocks can be kept in the warehouses of suppliers and the focus company. Improvements: Creating stocks in the warehouses of Retal and FOCUS COMPANY, when creating serious stocks, you can create stock at a high price, and the supplier can lose or FOCUS COMPANY. When forming large drains, we are forced to freeze raw materials, when the cost of raw materials falls, we lose. To overcome seasonal outbursts, more precise planning is needed - it is - but it should be planned by selecting products for the optimal distribution of supplier resources. Info-sharing can enhance partnerships.	Low accuracy of plans Improving Planning Accuracy
6	EUROPLAST TD LLC	Problems: An understanding of the strategy for the current and next year, as well as 2-3 years in advance, is required to see where the market is going, because if everything is planned correctly, we use optimal resources, storage capacity. Improvements: Quality planning. Operational interaction. New projects, we are ready to share experience in new areas of how to implement this.	Low accuracy of plans Improving Planning Accuracy

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7	Polymers LLC	Problems: Working moments. Copackers - orders are changing up and down. It is difficult to work with FOCUS COMPANY, at the last moment applications change. A big link to efficiency and quality - a thin film in the heat can tear, stick. They probably do not want to test a product that will bring them problems. We write letters and explain how to advance work in this direction. Improvements: Contractual obligations are respected. There are no complaints, letters are considered, payments are made as agreed. No wishes. You give a good volume and reduce the price.	Low accuracy of plans Quality issues -
		<i>Transport companies</i>	
8	LLC "Logistic company" VESTA "	Problems: “We observe poor planning, declared volumes do not correspond to reality, a weak volume distribution scheme, documentation is being prepared for a long time, we can’t issue invoices. In general, the company doesn’t pay badly, but since the documents cost this topic for a very long time, you don’t know what you want The root cause is the inability to make plans, a huge number of spontaneous actions, should focus on staff training, demand planning, deepen inventory management work with distributors, stores. 100% of the problems is the ability to manage stocks leads to problems with budgets, problems with making plans for moving and arranging stocks, and inability to correctly forecast distribution areas. Improvements: There is no perfect partnership model. The leader in the partnership is the product owner company. Will the desire of the goods owner company share its plans to jointly build business projects? The more accurate the information will be on demand, the more correctly the resources will be allocated, the better performers are selected. The better planning is done, the better it is for building business processes. Insufficiency of information exchange, we could work better and better, infrastructure limitations - accounting is in different places, spot traffic restrictions, sloppy provision of plans. Ready to engage in staff training and building processes. A general reduction in the cost of work with the simplification of workflow, work planning, using TMS - application management, the transfer of powers of attorney via EDI systems.	Low accuracy of plans Improving Planning Accuracy

№	Company	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	CODING
9	Garant Trans Express LLC	Problems: Transportation to large retail chains, no one wants to go to large chains, many cost several days, you need to require downtime. Networks do not want to sign any downtime documents. In the case of electronic documents, you will not turn away. Cars earn when they drive. Everyone wants to work with those who quickly load and quickly unload. They give discounts for this. Improvements: Automatic data exchange, to exclude the human factor - from receiving an application from a client, bidding, transferring data to a driver, ending with electronic documents, accounting documents, documents for payment. There are no difficulties as such. Unfortunately, much happens on the knee, it is easier with other clients. The Logist-Pro program satisfies only the needs of FOCUS COMPANY, we are forced to transfer data to our systems manually, look through our eyes, auto-exchanges are not configured, no one hears us. This would reduce our labour costs and transport costs for Borjomi. it takes us a lot of time to interrupt the same data. Planning - it is difficult to carry out transportation the day before the receipt of the application. Each time a fire is extinguished. On average, cars drive two to three days, so it is advisable for us to have applications for 2-3 days, so that while the car is on the way, we plan another route. We cannot forecast volumes. We would like to put the car in a circle (round-trip), but it does not work. It's hard to give a price for a year, fuel and foreign exchange differences are laid down in the tariff, and we lose the tender. Companies do not want to export at prices that are not market prices. Either we must lay the risks and the first months, or the FOCUS COMPANY will overpay. Integration by IT system - you need a platform that automatically exchanges data, leave for half an hour to close one order. They asked us crazy money for finalizing the information exchange from Logist-Pro. We need to establish information exchange through the API.	Establishment of information exchange Delays in unloading products

№	Company	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	CODING
10	LLC "ITECO Russia"	Problems: Most major counterparties make the contract in one direction. There is little opportunity to make a complaint. During downtime, they pay us a penny, use downtime as a temporary storage warehouse. We are a reliable counterparty, we ensure cargo, not liability, pay payments to Plato - we do not go in separate directions. We want to be compared with counterparties who also fit our criteria: Plato pays, insures the goods, and so on. Prices for guaranteed volumes do not change for 2-3 years. Improvements: Ideal partners do not exist. Every company makes money. We are open with all counterparties. There are no global difficulties. As a counterparty, I communicate with three departments - the procurement department, the finance department, and the logistics department. There are questions of accounts receivable - subjective in nature, if there were downtime, or small deviations - there is a slowdown in the payment of already rendered services. We have to connect top leaders. This is not entirely correct. Most major counterparties make the contract in one direction. There is little opportunity to make a complaint. During downtime, they pay us a penny, use downtime as a temporary storage warehouse. We are a reliable counterparty, we ensure cargo, not liability, we pay payments to Plato, we do not go in separate directions. We want to be compared with the counter	Improving Planning Accuracy Establishment of information exchange

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11	LLC "L-Trans"	Problems: “We observe poor planning, declared volumes do not correspond to reality, a weak volume distribution scheme, documentation is being prepared for a long time, we can’t issue invoices. In general, the company doesn’t pay badly, but since the documents cost this topic for a very long time, you don’t know what you want The root cause is the inability to make plans, a huge number of spontaneous actions, should focus on staff training, demand planning, deepen inventory management work with distributors, stores. 100% of the problems the ability to manage stocks leads to problems with budgets, problems with making plans for moving and arranging stocks, and inability to correctly forecast distribution areas. Improvements: There is no perfect partnership model. The leader in the partnership is the product owner company. Will the desire of the goods owner company share its plans to jointly build business projects? The more accurate the information will be on demand, the more correctly the resources will be allocated, the better performers are selected. The better planning is done, the better it is for building business processes. Insufficiency of information exchange, we could work better and better, infrastructure limitations - accounting is in different places, spot traffic restrictions, sloppy provision of plans. Ready to engage in staff training and building processes. A general reduction in the cost of work with the simplification of workflow, work planning, using TMS - application management, the transfer of powers of attorney via EDI systems.	Low rates Constant communication and feedback

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12	DENTRO LLC	Problems: Transportation to large retail chains, no one wants to go to large chains, many cost several days, you need to require downtime. Networks do not want to sign any downtime documents. In the case of electronic documents, you will not turn away. Cars earn when they drive. Everyone wants to work with those who quickly load and quickly unload. They give discounts for this. Improvements: Automatic data exchange, to exclude the human factor - from receiving an application from a client, bidding, transferring data to a driver, ending with electronic documents, accounting documents, documents for payment. There are no difficulties as such. Unfortunately, much happens on the knee, it is easier with other clients. The Logist-Pro program satisfies only the needs of FOCUS COMPANY, we are forced to transfer data to our systems manually, look through our eyes, auto-exchanges are not configured, no one hears us. This would reduce our labour costs and transport costs for Borjomi. it takes us a lot of time to interrupt the same data. Planning - it is difficult to carry out transportation the day before the receipt of the application. Each time a fire is extinguished. On average, cars drive two to three days, so it is advisable for us to have applications for 2-3 days, so that while the car is on the way, we plan another route. We cannot forecast volumes. We would like to put the car in a circle (round-trip), but it does not work. It's hard to give a price for a year, fuel and foreign exchange differences are laid down in the tariff, and we lose the tender. Companies do not want to export at prices that are not market prices. Either we must lay the risks and the first months, or the FOCUS COMPANY will overpay. Integration by IT system - you need a platform that automatically exchanges data, leave for half an hour to close one order. They asked us crazy money for finalizing the information exchange from Logist-Pro. We need to establish information exchange through the API.	Improving Planning Accuracy
13	LLC EUROPARTS	Problems: Most major counterparties make the contract in one direction. There is little opportunity to make a complaint. During downtime, they pay us a penny, use downtime as a temporary storage warehouse. We are a reliable counterparty, we ensure cargo, not liability, pay payments to Plato - we do not go in separate directions. We want to be compared with counterparties who also fit our criteria: Plato pays, insures the goods, and so on. Prices for guaranteed volumes do not change for 2-3 years. Improvements:	Low rates Data Mismatch

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		Ideal partners do not exist. Every company makes money. We are open with all counterparties. There are no global difficulties. As a counterparty, I communicate with three departments - the procurement department, the finance department, and the logistics department. There are questions of accounts receivable - subjective in nature, if there were downtime, or small deviations - there is a slowdown in the payment of already rendered services. We have to connect top leaders. This is not entirely correct. Most major counterparties make the contract in one direction. There is little opportunity to make a complaint. During downtime, they pay us a penny, use downtime as a temporary storage warehouse. We are a reliable counterparty, we ensure cargo, not liability, we pay payments to Plato, we do not go in separate directions. We want to be compared with the counter	
14	KRAFTER-CFD LLC	Problems: “We observe poor planning, declared volumes do not correspond to reality, a weak volume distribution scheme, documentation is being prepared for a long time, we can’t issue invoices. In general, the company doesn’t pay badly, but since the documents cost this topic for a very long time, you don’t know what you want The root cause is the inability to make plans, a huge number of spontaneous actions, should focus on staff training, demand planning, deepen inventory management work with distributors, stores. 100% of the problems the ability to manage stocks leads to problems with budgets, problems with making plans for moving and arranging stocks, and inability to correctly forecast distribution areas. Improvements: There is no perfect partnership model. The leader in the partnership is the product owner company. Will the desire of the goods owner company share its plans to jointly build business projects? The more accurate the information will be on demand, the more correctly the resources will be allocated, the better performers are selected. The better planning is done, the better it is for building business processes. Insufficiency of information exchange, we could work better and better, infrastructure limitations - accounting is in different places, spot traffic restrictions, sloppy provision of plans. Ready to engage in staff training and building processes. A general reduction in the cost of work with the simplification of workflow, work planning, using TMS - application management, the transfer of powers of attorney via EDI systems.	Low volumes

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15	MONOPOLY LLC	Problems: We build work so that the needs of our partner coincide with our capabilities. It doesn't always work like that. Volumes are not distributed quite systematically, there is a human factor, there is a misunderstanding, sometimes there are downtime - contractual relations do not require damages. We suffer serious losses when idle at unloading. We have more transport than applications. We are looking for additional freight for return flights; this is not always the case. If we were given the volumes that were stated, it would be good, the tender volumes are not always true. Improvements: For example, 100 is declared upon the fact of 20. Relaying your orders to our system following the example of Okay, it was possible to reduce labour costs Planning - transparency and predictability are required, if we know the volume in a direction in a week, we can take a reverse load. If there is interest in a full transition to EDI, this would reduce our costs. I would like more openness in volumes, an understanding of how they are formed.	Low accuracy of plans Information exchange Improving Planning Accuracy
16	LLC "Gardarika-Region"	Problems: A low level of tariffs, close to the minimum, uneven transport orders, sharp surges - the end of the quarter, month. Improvements: "The company is a constant large volume of cargo transportation, with a wide geography, and a good price. The pricing policy of FOCUS COMPANY is not very good. The cost of production should not be expensive cargo, payment speed. Unstable volumes, pronounced seasonality. The fact of transportation is close to plan. In emergency mode, you have to look for transport to close guarantees, there is, in addition, an additional volume. It is difficult to predict. Low tariff level, close to the minimum, uneven transport order, sharp surges - the end Vartan month. Own transport allows eliminates the risk of an emergency closing volumes. Transportation cost (up as much as possible) and the speed of payment. In all the cities where there FOCUS COMPANY, have our offices, it improves the efficiency of the interaction "	Low rates Low accuracy of plans
17	Boardline LLC	Problems: Problems are created by your partners who supply products (imports from Georgia). Improvements: The ideal partner is the consumer of our services, fully complies with the Russian legislation, without any creativity that has transparent cargo, the conformity of TSD cargo by weight and	Improving Planning Accuracy Tariff increase

№	Company	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	CODING
		name. Limitations - innovations of the customs service. Problems are created by your partners who supply products. Work with carriers and partners, elimination of the human factor.	Acceleration of payment for services rendered
		<i>Copackers</i>	
18	UBG (Tver)	Problems: All the difficulties from the fact that this production is a lot of SKU. We cannot make stocks for a year, half a year. There is no perfect model. Production is people, we spend money in foreign currency, and we sell for roubles. The human factor - people are alive, sick, tired. Macroeconomic factors - improvement technologies only from abroad. Improvements: "FOCUS COMPANY is 90% suitable, close to the ideal model: one SKU, financial discipline, accurate planning. There are internal difficulties, there are no difficulties in the interaction. Current difficulties are solved in the working mode - defective label, preform, overfulfillment of stock, failure to fulfil plan. All the difficulties come from the fact that this production is a lot of products and requires uniform loading from January to December.	Low accuracy of plans Compliance
19	Megapack (Prominent)	Problems: It is difficult to say what your difficulties are, the powers of your performers are limited, I would like to get a person with great powers on your part. Improvements: Everything is contained in the contract. If everything is done, this is an ideal partnership model. The first stage - the production plan arrives on time. Export plan - information does not arrive at the right time; upon completion we are not sure that it will be completed, it is 52% complete. We ask you to put a plan of raw materials and materials - we want to see in one document. in fact, several letters from different managers, you need to see all the correspondence - this is implemented with other customers. Shelf life - there are expired items, we ask you to export, the export does not occur on time, the storage limits are full, we can't accept the goods of normal quality. Recycled packaging - must be removed in a timely manner. - take up storage space. The plan fact does not strongly coincide - on average 52%. If we replenish the figure by 70%, I don't understand how many pallet places will be occupied, we can choose the entire limit in three days. Non-optimal car delivery hired transport costs 3-4 hours. Car transfer to another number -	Exchange difference Technological development Uniform production load

№	Company	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	CODING
		documents have to be redone for a long time. It is difficult to say what your difficulties are, the powers of your performers are limited, I would like to get a person with great powers on your part. You have to spend a lot of time going through each problem along the chain of decision makers so that the business does not suffer problems.	
		<i>3 PL operators</i>	
20	HAT LLC	Problems: FOCUS COMPANY is a big company, it is impossible to compare everything, somewhere the human factor, somewhere the employees of FOCUS COMPANY do not think that it will be difficult or inconvenient for us, we urgently need to redo something. Need to work. Improvements: There is nothing ideal - but the ideal model is based on trust, if you do not trust a large counterparty, then it is better not to cooperate with him at all. It should be possible to communicate at the level of leader - leader. We need to work with suppliers so that the materials do not linger. There is a clear understandable task, the party is ready to pay as much as the performer wants, all tasks are solved immediately, and the customer is satisfied with the result. We are slowly improving, but some of the nuances have not been finalized so far. Lack of weights - we were promised, but all the time postponed, we paid heavy fines. There are minor nuances, with a delay in materials, with pallets the situation has improved, with the film it has also become better, with cardboard the situation has remained. FOCUS COMPANY is a large company, it is impossible to compare everything, somewhere the human factor, somewhere the employees of the FOCUS COMPANY do not think that it will be difficult or inconvenient for us, we urgently need to redo something. We need to work so that we can be heard, pay more attention to our comments, try as much as possible to resolve more issues, so that everything is operational, I would like to see feedback. "different approaches, different departments ask for the same thing in different ways, they disposed of the glass at their own expense, rolling scales - discussed many times - everything went quiet, you have to spend time on communication and synchronization - you will agree on yourself and understand what you want.	Limited powers of Focus Company performers Give more authority to Focus Company performers Compliance

№	Company	SEMISTRUCTURAL INTERVIEW TRANSCRIPT	CODING
21	Total Terminal	Problems: FOCUS COMPANY is in a growth stage, difficulties always arise, a new model needs to be built, bones / costs appear, changes are required from us now. The company is young, there is a change of personnel, processes. This will happen as the company develops and changes its distribution model. This is the difficulty. The speed of change in IT in FOCUS COMPANY is not fast. All key personnel have been located to Moscow; managers in the region do not have authority. Planning allows us to plan a resource. We see problems in planning the balance of goods, overstocking our warehouse, we are a buffer for storing goods. Any partner earns on sales. we could sell this place to another value-added customer. We bear these costs. 3000 pallet places would be enough, and we keep 5000. This creates costs for us. It would be great for us that we did not have shipping peaks. We ship 50-70 tons, at some point we need to ship 200-300-400 tons, these days we completely switch to manual control, rebuild the shift system, create a night mode, select additional windows. FOCUS COMPANY is in a growth stage, difficulties always arise, a new model needs to be built, bones / costs appear, changes are required from us now. The company is young, there is a change of personnel, processes. This will happen as the company develops and changes its distribution model. This is the difficulty. The ability to change the approach or tariffs when changes occur in the market so that they have the opportunity to bring their point of view. It is important to be able to review tariffs every three months. We have to pay extra with our margin. We do not solve all problems at the expense of the tariff; we lack feedback from FOCUS COMPANY. We are creating a break point, because the tariff has not been raised for three years. This would bring the positions closer. Uncomfortable when tariffs rise sharply. Costs are rising faster than tariffs. We have difficulty attracting staff. Improvements:	Improving Planning Accuracy Not taking into account the interests of the partner

APPENDIX H. Semistructured interviews coding sample

Respondent number	ROLE / Position	Participant Type	Dimension	The essence of the statement	CODING	Suggestions for Themes
34	Production Director	Focus company - TOP	Problems	mismatch of plans, resources and needs	Mismatch of plans, resources, needs	Planning
4	Head of Planning	Focus company - Middle	Problems	time-consuming planning	Time-consuming planning	Planning
4	Head of Planning	Focus company - Middle	Problems	the complexity of calculating plans	The complexity of calculating plans	Planning
7	Regional Operations Logistics Manager West	Focus company - Middle	Problems	quality planning	Quality planning	Planning
8	Head of Procurement SC	Focus company - Middle	Problems	Procurement planning	Procurement planning	Planning
35	Production Manager Lipetsk	Focus company - Middle	Problems	Overstock	Overstock	Planning
11	Resilux Distribution LLC	Partner - Supplier	Problems	Low accuracy of plans	Low accuracy of plans	Planning
11	Resilux Distribution LLC	Partner - Supplier	Problems	There is no guarantee of redemption of products produced under the focus company	There is no guarantee of redemption of products produced under the focus company	Planning
11	Resilux Distribution LLC	Partner - Supplier	Problems	Lack of product buyback guarantees	Lack of product buyback guarantees	Planning
18	Limaton Packaging LLC	Partner - Supplier	Problems	Low accuracy of plans	Low accuracy of plans	Planning
23	RETAL AO	Partner - Supplier	Problems	Low accuracy of plans	Low accuracy of plans	Planning
24	EUROPLAST TD LLC	Partner - Supplier	Problems	Low accuracy of plans	Low accuracy of plans	Planning
37	Polymers LLC	Partner - Supplier	Problems	Low accuracy of plans	Low accuracy of plans	Planning

12	Logistics company VESTA	Partner - Transport	Problems	Low accuracy of plans	Low accuracy of plans	Planning
28	MONOPOLIA LLC	Partner - Transport	Problems	Low accuracy of plans	Low accuracy of plans	Planning
36	Boardline LLC	Partner - Transport Company	Problems	Low accuracy of plans	Low accuracy of plans	Planning
27	Total Terminal	Partner - 3PL	Problems	Low accuracy of plans	Low accuracy of plans	Planning
27	Total Terminal	Partner - 3PL	Problems	Unreasonably high use of resources	Incorrect Resource Planning	Planning

APPENDIX J. Feedback to the partners on results of the study

From: Nikiforov Igor
Sent: Tuesday, June 11, 2019 9:31 AM
To: *SC PARTNERS*
Cc:
Subject: Generalized findings of the study

Dear partners,

We thank you and your company for participating in the study “Optimization of business processes in the international FMCG supply chain”. The study was conducted from early March to mid-May 2019. This study involved 37 respondents from focus company and partners.

By this letter, we are sending you generalized conclusions based on the results of the study:

The results of the study showed that bottlenecks and possible information gaps do not give reason to believe about ineffective integration between partners. Of course, they can be considered as areas for improvement, but the effectiveness of integration is more determined by the quality of established business rules for the supply chain partners' processes. Business rules should be understood as defining or limiting directions / requirements for daily operations. Bottlenecks and information gaps are only a consequence of poor-quality business rules that should be initially designed when forming requirements for business processes to create an effective supply chain. Another important result is that the study found that supply chain resilience depends on the ability of business processes to adapt to various variances. Managers should focus more on building adaptable business processes to various kinds of deviations. This means that deviations that somehow arise in daily work should not require increased attention and be eliminated by the predetermined most effective standard method as they appear.

According to the results of the study, we came to the following conclusions:

- It has been empirically proven that bottlenecks are not a significant limitation that reduce the speed of business processes. Information gaps and non-transfer of responsibility in the end-to-end business processes of an integrated supply chain

should certainly be considered as a limiting factor. However, based on the responses of the respondents, it was concluded that this statement does not correlate with the main reason for the loss of effectiveness. In this case, the results obtained should be interpreted in such a way that the main cause of inefficiency may be another more significant factor, which can be found in further studies.

- The results of the study confirmed that the business rules that govern business processes should be consistent with the goals of the company and at the same time aimed at constantly improving efficiency by initiating projects to reduce costs.
- An immediate response to deviations in the supply chain is not a significant factor that affects sustainability in the supply chain. Business rules should determine possible scenarios and options for the implementation of processes, so an immediate reaction to a detected deviation may conflict with the established order. This indicates that deviations are acceptable and the business processes of supply chain partners are largely adapted to their appearance. One of the tasks that can be taken out of the tested hypothesis is to determine the limit of flexibility at which an immediate reaction will be required. However, in this case it will be more consistent with the definition of “force majeure”.
- The manager’s control of the sequence of business process dates is not significant for the sustainability of the supply chain, nor is the presence of excessive coordination or steps in business processes. In this case, the readiness of the supply chain to eliminate deviations (temporary disruptive events) can be interpreted as carrying out system work and establishing control points for continuous monitoring of deviations, as well as the formation of predetermined response methods. This means that the stability of the supply chain directly depends on the business logic that controls the elimination of restrictions at the system level, that is, the leader who exercises control does not have to be creative in each case and figure out how to deal with deviations every time. This was largely confirmed by the results of the study that well-formed business rules that have no contradictions should correspond to the goals of the company in such a way that at the system level they manage both the efficiency of the processes and the elimination of deviations in these processes.
- It was revealed that there is a dependence of supply chain efficiency on the automation of the costliest business processes, which can significantly increase their manageability and at the same time get a reliable tool that helps reduce costs. The effectiveness of business processes in terms of their ability to scale up increases depending on the effective business rules that govern them. However, the study did

not affect the determination of the permissible limit, if exceeded, a negative effect on scalability can occur.

Thanks again for participating in the study.

Best regards,
Igor Nikiforov
Head of Standardization and Development

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