DEVELOPING PROCESS MODELS OF COMPLEX BUSINESS STRUCTURES

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Abstract. Increasing globalization requires the search for new solutions to form and manage enterprises. One of a possible approaches is creating business groups with different types of cooperation. The analysis of European Union law and Polish law carried out in the article speaks in favor of creating business groups with the principle of vertical cooperation. Achieving the strategic goals of the individual members of the group requires a flexible and adequate model of cooperation. One such solution is developing business process models. The main goal of the paper is presents principles of creating such models for both individual and cooperating companies using the IDEF methodology.

Keywords: business structure, vertical cooperation, European Union law, Polish law, process model, IDEF.

1. Introduction

Usually a company is defined as a separate, organizational, technical, production and economic unit, conducting business activity, which is an entity of fundamental importance in a market economy. A legal separation means that an enterprise is subjected to rights and obligations. The legal form of an enterprise is determined by its owners and depends on legal regulations in force in the territory of the entity. Organizational separation means that the unit organization is based on specific management methods and internal processes that enable conducting business (Narodowy Bank Polski). The prevailing question is how to organize the company's activities to make them lawful? At the same time, one has to take into account other spheres of the company's operation including the impact of the internal and external environment.

Progressing globalization in each area of activity (social whether economic) impacts, among others on the pace of development of the Economies, the free movement of capital or the increase in the level of competitiveness, which can have both positive and negative effects on the units’ operating in the market (Krzakiewicz, et al., 2004, p. 60-71; Kolka et al., 2010,
Dynamically and unpredictably changing environment causes difficulties in choosing a survival strategy in the market. As a result, task-oriented company management is not flexible enough and can lead to its failure. New efficient techniques, such as Total Quality Management or re-engineering are the suitable replacement of traditional management methods since they are concentrated on business processes.

Having globalization in mind small and too weak actors are unable to meet the market challenges and therefore are eliminated from it. One of the ways to overcome the difficulties is to increase the force of the entities by establishing cooperation with other companies. Continuous changes in legal, organizational, economic or socio-cultural aspects do not allow determining of dynamics of the environment. This fact makes any case of cooperation, especially in the long-term horizon, challenging and complicated. As it is possible to see, the cooperation process requires constant monitoring, measuring, searching the ways of improving and pursuing to advance the measured parameters.

In spite of many problems, we can observe the active development of two categories of cooperation, namely horizontal and vertical agreements. Suppose that the cooperation is concluded between companies competing at the same level of turnover (market level). This type of agreement is referred as horizontal one. Unfortunately, these arrangements can lead to the elimination of competition from the market with the result that not the market mechanism, but business partners will decide on the prices or supply of the goods. The second mentioned category includes agreements among at least two enterprises operating at different levels of the production or distribution chain, which means that they do not compete with each other. This type of cooperation is called vertical one. Moreover, very rarely, the manufacturer of the goods is also involved in its distribution. In fact, it outsources the sale of the manufactured products to the wholesaler, which in turn conclude agreements with retailers. In general, such division of tasks (functions) has a positive effect on competition. Therefore many economists, as well as the European Commission recognize this type of cooperation as more beneficial and less harmful to competition. However, it should be mentioned that both categories have validity, advantages, and disadvantages (Kostecka-Jurczyk, 2014, p. 56; European Commission, 2010; Publications Office).

Taking into account the trends of research (legal, economic, socio-cultural aspects), we can observe the lack of the construction concept of process models for combined business structures (Nowosielski, 2009; Grajewski, 2012; Nowosielski, 2012, p. 153-165). Applying system approach to complex management systems (the structures described undoubtedly belong to them), we will elaborate on some methods for creating the process models of selected business structures. Development of these models can be helpful in different kinds of decision-making processes connected with the enterprise management.

The purpose of this work is to present the analysis of National and EU legal basis allowing for cooperation, as well as the principles of creating process models for both individual and cooperating enterprises based on the IDEF methodology. The development of
such a model will allow for improvement of financial results, improvement of internal processes and sustainable development of individuals.

The structure of the paper is as follows. Having in mind, that the cooperation of enterprises should comply with the applicable legal regulations, the main issue discussed in the second section are the most important Polish and European Community acts on vertical agreements. In the third section, using the IDEF0 (Integrated Definition for Function Modelling) formalism, the process model of how a single enterprise was created. In the fourth section, how the process model of vertical cooperation between two companies was created. In the last section, the conclusions were formulated.

2. Analysis of the legal basis of vertical agreements

An undertaking that independently conducts the process of creating a new product or service by implementing all activities within the so-called value chain has a negligible chance of achieving market success. Nowadays, the effective implementation of the adopted strategy is dependent on the interoperability of many partners, i.e. suppliers, manufacturers, service providers, distributors, end users and others (Walas-Trębacz, 2004, p. 144-145).

The cooperation of undertakings can occur on two levels, either concentrative or cooperative. Concentrative relationships consist in tightening cooperation on the basis of capital relationship resulting in total or partial resignation of entities involved in the relationship from the economic independence. The most popular forms of concentrative relationships include mergers and acquisitions (Marcinkowski, et al., 2012, p. 17). The second of the above-mentioned levels – cooperation – is one of the basic forms of enterprise integration (merger) allowing us to reduce risk by spreading it on a larger number of entities. It is understood that it consists in the cooperation of many entities aiming at achieving a common goal, and individual entities are mutually supportive in its realization (Walas-Trębacz, 2004, p. 144). The purpose of establishing a cooperative relationship is to increase the competitiveness of entities, while retaining their legal and economic independence. Cooperative relationships can be created in various forms, as well as at different levels of formalization and legal fixation. The most common forms include strategic alliances, clusters, licensing, franchising or agreements. Due to the direction of cooperation they can take the form of either horizontal or vertical cooperation (Marcinkowski, et al., 2012, p. 17).

Both Polish and EU legal regulations do not ban undertakings from entering into cooperation, however as it may pose a threat to fair competition, it is of great importance that the entities entering the competition respect certain legal conditions, in particular competition law (Aluchna et al., 2013, p. 56).
Under Article 101, sec. 1 of the Treaty on the Functioning of the European Union, traders are prohibited from entering into agreements that may affect trade between Member States and which prevent, restrict and distort competition (European Commission, 2012, p. 7). On the other hand, in the Polish antitrust law, following the EU legislation, Article 6 of the Law on Competition and Consumer Protection (OCCP) prohibits the conclusion of agreements which aim at or result in eliminating, restricting or otherwise distorting competition on the relevant market. In addition, this article specifies the list of the most notable banned agreements, the conclusion of which constitutes the most serious law violation. These agreements include:

- price collusion, involving direct or indirect price fixing and other conditions for purchase or sale of goods,
- quota agreements aimed at controlling or limiting production and sales or technological progress and investment,
- split agreements resulting in the distribution of markets or purchases.

Agreements that were specifically banned involve:

- in similar agreements with third parties using burdensome or uneven contractual terms, which create for them diversified conditions of competition,
- making the contract conditional upon fulfilment or acceptance by the other party of another benefit, which has no substantive or common-law connection with the subject matter of the contract,
- eliminating from the market traders not included in the contract or restricting their access to the market; determining the conditions for submission of tenders, in particular concerning the scope of work or prices offered by the tenderers and the tender organizers (Ustawa z dnia 16 lutego 2007 r. o ochronie konkurencji i konsumentów. Dz.U. 2007, nr 50, poz. 331, s. 5).

The ban on concluding agreements restricting competition may concern the said horizontal or vertical cooperation. One is related to cooperation between competitors, whereas the other links entities operating at different turnover levels and represents different stages of production or distribution, ergo undertakings which do not compete with each other. An agreement between a manufacturer and a retailer can be an example of a vertical agreement.

Vertical agreements are considered more beneficial for cooperation and less detrimental to competition than horizontal agreements. Many economists, as well as the European Commission, claim that they can produce pro-competitive effects. Thanks to many advantages, including the lack of competition between cooperating undertakings, facilitating the distribution of goods, contributing to market integration, enabling manufactures and salespeople to specialize in areas where they have comparative advantage, steered towards consumer welfare, in the majority of cases they are positively perceived (Kostecka-Jurczyk, 2014, p. 53-56).
In the European law the definition of the vertical agreement can be found in the Commission Regulation (EU) No 330/2010 of 20 April 2010. Accordingly, a vertical agreement means “an agreement or concerted practice concluded between two or more undertakings operating under such an agreement or agreed practice at various levels of trade in production or sales, which relate to the terms of purchase, sale or resale of certain goods or services by their parties” (European Union, 2010, p. 1-7).

In Polish law, the concept of vertical agreement is defined in the Council of Ministers Regulation of 30 March 2011 on the exclusion of certain types of vertical agreements from the prohibition of restrictive agreements.

According to it, vertical agreements are „the agreements concluded between two or more traders, each of whom operates – within the agreement – at different level of trading, the subject of these agreements includes the terms of purchase, sale or resale of goods” (Rozporządzenie Rady Ministrów z dnia 30 marca 2011 r. w sprawie wyłączenia niektórych rodzajów porozumień wertykalnych spod zakazu porozumień ograniczających konkurencję. Dz.U. 2011, nr 81, poz. 441). The Office of Competition and Consumer Protection, however, points out that this definition was created solely for the purpose of the above-mentioned regulation and that vertical relationship may be also regulated by other regulations of the Council of Ministers, including those relating to the exclusion of certain agreements on technology transfer or the motor vehicle sector (Wojtczak, 2013, p. 8).

It should be noted that not all banned agreements must pose a threat to the market. On the contrary, some of them can also bring many benefits. Bearing this in mind, in the Community law, and more specifically in Article 101, sec. 3 of the Treaty on the Functioning of the European Union the agreements that bring sufficient benefits that outweigh the anti-competitive effects are exempted from ban and in the EU Commission Regulation No. 330/2010 on block exemption, vertical agreements, whose market share on the relevant market does not exceed 30 per cent, were recognized as compatible with internal market (European Union, 2010, p. 1-7). In line with the European legislation Poland adopted some exemptions including (Wojtczak, 2013):

- the so-called block exemption from the Council of Ministers Regulation of 30 March 2011, under which vertical agreements can be recognized as legal when the relevant market share of the supplier and the purchaser independently does not exceed 30 per cent;
- the so-called individual exemption from Article 8, sec. 1 OCCP relating to a specific individual situation in which an agreement was concluded between traders. The possibility of its use requires no more than 30 per cent market share;
- the so-called de minimis rule, in the case of which, due to the small market share of the undertakings participating in the agreement (it is permissible for any participant of the vertical agreement to have a 10 per cent market share) and a negligible degree of negative impact (the so-called “trivial agreements”), it is possible to recognize the anti-competitive agreement as lawful.
The vertical agreements that are considered as the most harmful are those affecting prices or terms of offering a product, therefore vertical agreements relating to setting a minimum or rigid resale price (price and tendering collusion) and relating to market sharing or purchase of goods (quota and quota arrangements) restricting the possibility of sale, are the agreements to which the de minimis rule and the block exemption do not apply.

The so-called black clauses, whose occurrence in vertical agreements constitutes a violation of the ban on concluding anti-competitive agreements, are prohibited by the Polish law (Wojtczak, 2013).

In the case of vertical agreements, especially those which are in a minor breach of competition law, the correct determination of the relevant market in which the trader operates and the definition of what is understood by the term agreement, is essential for the assessment of their legality.

According to Article 4 sec.5 OCCP the agreement is understood, inter alia, as contracts or some provisions of the agreement, as well as arrangements in any form, resolutions or other acts.

Whereas, the relevant market in accordance with section 9 of this Article is understood as “the market of goods which because of their destiny, price and features, including quality, are considered by their purchasers as substitutes and are offered in an area where, due to their nature and characteristics, the existence of market access barriers, consumer preferences, significant price differences and transport costs; occur similar competitive conditions”.

The concept of the relevant market always takes on a product dimension (defines the products it comprises) and a geographical dimension (indicates its territorial scope) (Ustawa z dnia 16 lutego 2007 r. o ochronie konkurencji i konsumentów. Dz.U. 2007, nr 50, poz. 331; Wojtczak, 2013).

In practice vertical agreements are usually concluded in the form of distribution contracts, cooperation contracts, or contracts for purchase and sale of goods, which may not always be of a civil law nature.

They may be also established informally. It is known that making such arrangements is a common practice applied by undertakings, and therefore not each of them violates antitrust law. The vertical agreement is considered to be in breach of law only if three conditions are fulfilled, namely:

- an agreement has been concluded between the undertakings,
- the purpose or effect of the adopted agreement is anti-competitive,
- none of the exceptions to the ban from Art. 6 sec.1 OCCP apply to the concluded agreement.
It is worth mentioning, that the most popular vertical agreements include distribution agreements, concluded between the manufacturer and the distributor\(^1\) in order to purchase the goods for the purpose of subsequent resale. These agreements may concern not only the rules of mutual cooperation, but also regulate the issue relating to selling prices, at which the distributor will purchase goods from the manufacturer.

When entering into a distribution agreement, the parties to the agreement must also pay particular attention to the provisions on any further relationships, e.g. between the distributor and his customers (consumers, retailers), to whom the goods purchased from the manufacturer are resold by the distributor.

When entering into a distribution agreement, the parties to the agreement must also pay particular attention to the provisions on other, further relationships, e.g. between the distributor and his customers (consumers, retailers), who resells the goods purchased from the manufacturer.

Prices applicable to further customers are the resale prices and can be established directly (by defining their specific size, e.g. distributors are required to use only catalogue prices) or indirectly (by indicating for example, the maximum discount off the catalogue prices used by the distributor)

Regardless of the adopted method of price fixing and the period for which they were set, it is important what resale prices were established for the sake of legality of this agreement.

Vertical agreements prohibit the use of minimum resale prices (prices below which the distributor cannot resale goods purchased from the manufacturer) and rigid resale prices (exact prices at which the distributor would resell the goods purchased from the manufacturer).

In the case of applying rigid resale prices, the contractor may only use the resale prices specified in the agreement, he can neither increase nor decrease them. The vertical agreements also include prices that can be established.

Namely, cooperating companies have the opportunity to establish maximum or recommended resale prices. Maximum prices are those above which a contractor cannot resell the goods purchased from the manufacturer. They do not restrict the use of promotions or discounts, and only set the upper limit for the resale price. Recommended prices are those which suggest at what price the distributor should resell further the goods purchased from the manufacturer, e.g. they may include catalogue prices, or the prices printed on the product.

For breaching the ban on vertical agreements the cooperating undertakings are threatened mainly with financial sanctions. The antitrust authorities are entitled to impose them on such entities. In the case of Poland it is the President of the Office for Competition and Consumer

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\(^1\) The distributor is understood as the trader who purchases the goods covered by the vertical agreement with a view to their later resale at the wholesale (wholesale distributor) or retail (retail distributor) level. It is also an entity that concludes an agreement with a supplier on the basis of which they sell goods covered by a vertical agreement on behalf of the supplier.
Protection, and the maximum amount of this type of financial penalty equals to 10 per cent of the revenue generated in the accounting year predating the year of penalty imposition. Many national antitrust authorities have similar competence. Also, the European Commission, acting as the antitrust authority of the European Union, has the power to impose penalties (fines) on undertakings whose activities restrict competition to a degree that may affect trade between member States by ten per cent of the annual turnover (Wojtczak, 2013).

In conclusion, each vertical agreement must be compatible with competition and consumer protection law, and it should be borne in mind that, in accordance with the fundamental principle of Community law, as adopted by the Court of Justice of the European Union, European (Community) law is superior to Polish law (Wojtczak, 2013). For vertically integrated undertakings this directly implies a ban on all actions aimed at or resulting in the violation of rules for establishing prices, production methods, as well as ways and areas of distribution.

In addition, agreements must be flexible enough to adapt to the dynamic changes of the law. Therefore at every level of strategic, tactic and operational planning, the economic and mathematical models of these structures should be used to reflect adequately any possible situations.

Thus the solution to the problem of constructing a model that is an abstraction of an undertaking rather than reality is never explicit and still remains a current scientific issue, so the next chapter will be devoted to exploring this problem.

3. Principles of enterprise process model construction

Taking into account the legal, economic, technical, production, and organizational independence of each enterprise as well as the environmental uncertainties, it is very difficult to organize, control, monitor, and forecast the results of the enterprise actions. To discover cause and effect connections, it is required to assume a certain simplification, namely the model of the enterprise's functioning. The functioning of the enterprise is usually determined through the selection of some strategy which aims at achieving the superior goal. Each strategy is a process; therefore, one of the solutions is to create a process model of the enterprise. In this part of work, we consider the principles of the process-model development for an individual enterprise as well as for cooperating enterprises.

3.1. The single enterprise case

We can consider each enterprise as a system of interrelated elements (its units, departments, etc.). Moreover, each company chooses its long-term development strategy, so that the system can be perceived in time based on the observation of the effects of the
Developing process models of complex business. Since the pursuit of the goal by itself is a process, it is logical to choose such an enterprise model which simultaneously takes into account its complex structure and the dynamics of change over time. During the model selection it is important to remember that the enterprise as some system must meet the controllability criterion, that is to say, every decision taken at different levels of management hierarchy has to affect the functioning of the business and to lead to the goal. The use of an abstract model in the form of a "black box" is not sufficient. The ordinary observation of the inputs and the outputs of the system (the system is some synthetic description of the enterprise) does not give information about the degree of interconnection and influence of different internal components. We assume that each element of this system has its specific dynamics, which should be considered separately. The problem of system's decomposition arises, namely how to select the level of abstraction taking into account the reachability of the strategical goals of the enterprise.

An alternative approach is the application of the triad principle which is the basis of dialectical materialism where thesis, antithesis, synthesis are the process (Zgurovsky, Pankratova, 2007; Trocki, 1939; Colletti, 1973). Consequently, the methods of function modeling, which use the IDE formalism, can be applied during the development of process model. The IDE methodology was developed in the USA for the processes, systems or organizational objects modeling. It consists of creating a very general process model of the enterprise. This model on the first stage of the modeling can be compared to the "black box" with its further decomposition to sub-processes, e.g., concerning the flow of information, materials, management methods between individual elements of the studied system. It allows presenting the structure of parameters as well as production and technical characteristics of the company. The essence of this methodology is an abstract graphical language, whose basic elements are blocks and arrows. The connection of blocks and arrows defines an ICOM (Input-Control-Output-Method) box corresponding to the model of the considered process (Stawowy, et al., 2005, p. 279-286). In the model, the blocks represent functions which include processes, operations, actions, while arrows are, so-called, the objects of mutual relations among these functions (Ulan, et al., 2014, p. 1055-1064).

During decomposition the IDE methodology takes into account the four primary groups of factors (see Fig. 1.):

- the first group (Inputs) are elements, determinants which initiate processes, such as material and information expenses;
- the second group (Method/Mechanism/Management) includes factors describing or introducing mechanisms influencing the various elements of the studied object. This includes, for example, competence, material resources (real estate, equipment, machinery, raw materials, means of transport, natural resources), human resources (staff coordinating the process and carrying out the tasks entrusted to them) as well as financial and infrastructural resources;
the third group (Control) is the control elements of the mechanism, i.e. mission, strategy, business objectives, legal provisions, standards and procedures for manufactured goods as well as health and safety at work, corporate policy, business plan, technological documentation;

the fourth group (Output) consists of the factors making up the final result of the activity of the whole enterprise. The output elements are material and non-material effects of the process, such as, e.g., finished products, image improvement, information, cooperation with external organizations or repayment of debt.

**Figure 1.** Process model: the general presentation.

Utilizing the mentioned groups of factors can describe the activity of any enterprises. For example, in the case of the manufacturing company the main activity is the production of goods to maximize profits and meet customer needs. Based on the market information, it makes forecasts of demand and production volume and then acquires materials and semi-finished materials necessary for its realisation. The manufacturing company produces goods uses human, material, financial and infrastructural resources and taking into account certain principles and constraints in the form of laws, standards or policies. The functional model of the manufacturing company is shown in Figure 2.
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Figure 2. Functional model of a production enterprise in IDEF0 notation.

Creating such a functional business model makes it easier to identify the position of the company, enables the company to faster and better respond to changes that take place over time and also if the enterprise has some required resources it gives an opportunity to stabilize the situation. As a result of the application of the IDEF0 method a series of diagrams with a hierarchical structure arises. For the considered production company, the following decomposition of the functional model may be proposed (see Fig. 3.).

Figure 3. Process decomposition of the manufacturer's functional model.
The production process can be presented in the following stages:

- A1 – Business management – is a set of activities (including planning and decision making, organizing, leadership, i.e., managing and controlling of people) directed at the organization's resources (human, financial, material and information) performs with the intention of achieving the goals of the organization in an efficient and effective way.

- A2 – Conducting marketing research – consist of the use of a variety of techniques and rules for the continuous collection, storage, analysis and processing of information to facilitate the decision-making process (Altkorn, 2004). Carried out research reduces or eliminates the risk of making decisions in a constantly changing environment. Thanks for this the likelihood of achieving success is increasing, it possible to increase sales and also profits generating (Dietl, 1977).

- A3 – Production preparation – it consists in defining the assortment and forecasting the future production volume, taking into account its distribution over time, so that simultaneously achieve the expected sales, profits and satisfy expectations of customers.

- A4 – The production process and realization of production – is a collection of production activities, as a result of which from the materials and semi-finished products formed a finished product. The production process begins with the download of the necessary starting materials from the warehouses and ends with the realization of production, and so the passing of the finished product to the warehouse of the finished products or directly to the recipient.

- A5 – Modernization of the structure, personnel management, modernization of the park (e.g., machine) – it is the activity of introducing new solutions, modernizing machines, and devices, means of transport, technologies, products and organization of work to gain lasting competitive advantage.

Decomposition in the case of a distribution company can look following (see Fig. 4.).

Taking into account the specificity of the companies can be observed the differences in the decomposition, which are mainly related to A3 and A4 stages.
3.2. The case of two enterprises with vertical cooperation

Both small and large companies are often too weak to function efficiently taking into account all the dynamic changes which are occurring in their environment. In their case, achieving a stable position and surviving on the market requires establishing cooperation with other companies. By the analysis made in the preceding chapter, the vertical agreement is considered as the indicated form of cooperation in the European Union. Consider the case of collaboration between two enterprises.

Let is take into consideration two enterprises – one of is engaged in production (Enterprise 1), while the other specializes in distribution (Enterprise 2). Both entities have the necessary resources enabling respectively, production and distribution. Product manufactured by the Enterprise 1 can be sold directly on the market or to Enterprises 2 which deals with of its distribution. That means that Enterprise 2 may repurchase the finished product of Enterprise 1 to further resale. Principles of this type of cooperation are as follows: Enterprise 1 is interested in cooperating with Enterprise 2 as far as Enterprise 2 ensure partial or whole distribution of the finished product of Enterprise 1. To benefit from the cooperation Enterprise 1 has to offer to Enterprise 2 some resale price, which is below the market price. Otherwise, the product of the Enterprise 1 will be sold directly on the market, which can result in a decrease in revenue from its sales. It is assumed, that the demand submitted by Enterprise 2 on product manufactured by Enterprise 1 does not exceed the production capacity of
Enterprise 1. The income of Enterprise 2 depends on the conditions of purchase of a finished product, selling price and demand for the product.

To determine the process model of the structure described above using the IDEF method, first of all, we assume that a result of established cooperation, the output elements of Enterprise 1 become inputs elements for the Enterprise 2 process. The output element of Enterprises 2 is a finished product that goes to the final customers. Collaborative enterprises must pay attention to modifying internal and external relationships in the particular areas of activity. Especially important is the control area, where it is necessary to define common plans and business objectives, strategy, and mission, as well as adaptation theirs to legal regulations, especially those concerning vertical cooperation. The adoption of such a model gives many benefits. First and foremost, enterprises will be more stable, competitive (within the law) and will reduce the risk of doing business. Building a competitive advantage together of enterprises is made possible by, among others, assurance of supply, lower transaction costs, lower costs of supplies, more powerful distribution network, to distinguish from rivals by characteristics which are important to customers and also higher product quality.

Figure 5 shows the process model of vertical cooperation of two enterprises.

**Figure 5.** Process model of cooperation of two enterprises: vertical cooperation.

The process model shown in Figure 5 corresponds to the needs of efficient management of the activities of the cooperating enterprises and gives the full possibility of applying it to the optimization.

The process decomposition of the function model of two enterprises is presented in Figure 6.
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Figure 6. Process decomposition of the functional model of two enterprises.

4. Conclusions

The need to meet the new requirements of an increasingly competitive environment and also the desire to improve the effectiveness, encourage enterprises to merge into groups. The cooperation enables enterprises to achieve the intended targets, which would be difficult or even impossible to realize in the case of independent, individual action. Creating variety relationships between enterprises increases the level of their activity and efficiency, as well as contributes to increased competitiveness. In this paper, vertical agreements have been recognized as the most beneficial form of cooperation, which, by better coordination between the actors involved, in most cases contribute to improving economic efficiency within the chain of production or distribution. A similar position is presented by the European Commission stating that these agreements, in particular, may lead to a reduction in transaction
and the distribution costs of parties to the agreement and the optimization of their sales and investment levels (Publications Office).

Improving the performance of cooperating companies is possible due to the use of modern techniques of management oriented by the processes. Having a functional model of business process give many benefits, among others, allows easier and better understand the process and thus facilitates decision-making whether allows identify of those activities which create or not create added value in the enterprise.

In this paper, sample process models of enterprises were created and then, their decomposition in the sub-processes using the IDEF0 methodology.

These actions enable to present the parameters structure, as well as characteristics production and technology of the entity. The creation of functional models and their decomposition are applicable not only to the description of the activity of a single entity, but also to the cooperating enterprises. This fact is confirmed by the process decomposition of the functional model of two enterprises, the manufacturer and the distributor made in the fourth part of the work. It should be noted that deliberately it does not include an essential element which is the price negotiations mechanism. This mechanism requires further decomposition of the decomposition shown in Figure 6, and more precisely A3 blocks, which means that the cooperating enterprises, respectively on the stages of preparing production and sales must necessarily establish price corridors between themselves. Moreover, they have to do it, taking into account the rules of national and Community law concerning conditions of price definition. Because the actions made at this stage will have a considerable impact not only on volume production but also on the terms of the agreement and further cooperation, they require separate consideration.

The mechanisms and rules determined based on the decomposition of functional model give the possibility of introducing a mathematical model which will be a good support for the decisions made at different stages of the enterprise's functioning (Bochnacka, Filatova, 2017, p. 61-65).

In the further stages of the work, issues related to determining the determinants of vertical cooperation will be deepened, which should contribute to the formulation of more precise principles creating of process models of co-operating enterprises.

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Bibliography


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