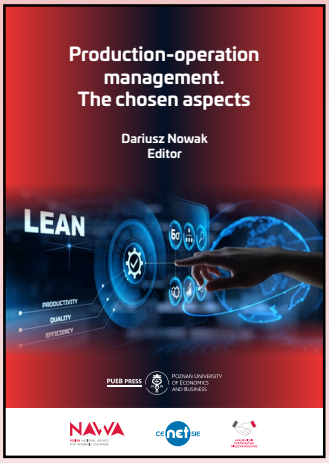

Production-operation management. The chosen aspects

Dariusz Nowak
Editor

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3.

FUNCTIONS AND ROLES IN OPERATIONS MANAGEMENT

Bartosz Marcinkowski
Poznań University of Economics and Business

Abstract: This chapter covers the main functions and roles of operational management. In particular, problems related to the organization of the production process, including its continuous improvement, were raised. In addition, the role of resource management in an enterprise was discussed along with tools for optimizing resource allocation. The issues related to purchasing management, its changing importance over the last years, tasks and methods of organization were also described. The concept of production capacity was explained, as well as the methods of analysing production processes aimed at maximizing efficiency. The importance of inter-organizational cooperation, both in static and dynamic terms, was also outlined, with particular emphasis on barriers and benefits.

Keywords: Enterprise Resource Planning, inter-organizational cooperation, operations management, production capacity, production processes, purchasing management.

3.1. Introduction

Modern enterprises operate in difficult, highly competitive conditions. They constantly have to adapt to the dynamic changes taking place in the environment, growing customer requirements, or the emergence of new, hitherto unknown barriers. It is therefore necessary to use every opportunity to gain a competitive advantage. In this light, the problems related to maximizing the efficiency of the production process and increasing production capacity becomes key. An appropriate approach to the acquisition and allocation of rare, hard-to-reach resources is becoming more and more important. It becomes necessary to change the optics of looking at the organization of the purchasing process. One can also observe a change in the approach to inter-organizational cooperation—more and more entities give up the antagonistic approach in favour of the exchange of knowledge, experience and resources in order to achieve common benefits. This chapter discusses the main functions and roles of operational management in the context of the needs and requirements of a modern economy.

3.2. Organization of production processes

All enterprises operating in the modern economy strive to improve operational efficiency in order to be able to effectively compete in an increasingly demanding market. One of the means to achieve this goal is the proper design and organization of production processes. It is well known that an efficient production flow can be achieved by skilful management of production processes, i.e. planning, organizing and controlling the processes. However, it should be noted that even companies of a similar size, operating in one sector, may significantly differ from each other in terms of production techniques, organizational structure, or the way of organizing work. Therefore, it is difficult to indicate a single, simple and effective method of creating an efficient production system (Szatkowski, 2014, p. 11).

Moreover, in recent years the structure and specificity of industrial enterprises has changed dynamically due to the intensive development of advanced technological solutions, increasing complexity of production processes and the growing importance of high technology products. The nature of these changes was so significant that it is interpreted as a new, fourth technological revolution (Mavlioutov, Belyaev, & Borisova, 2020, p. 2). The changes taking place during the successive industrial revolutions are presented in Figure 3.1.

It should be noted that in the literature there are many different definitions of the concept of a production process. Most generally, it can be said that it is a sequence of activities leading to the production of a product. Otherwise, it can also

be said that it is a set of events and consciously made decisions that result in the expected changes in the product, bringing it closer to the final product (Liwowski & Kozłowski, 2011, p. 15).

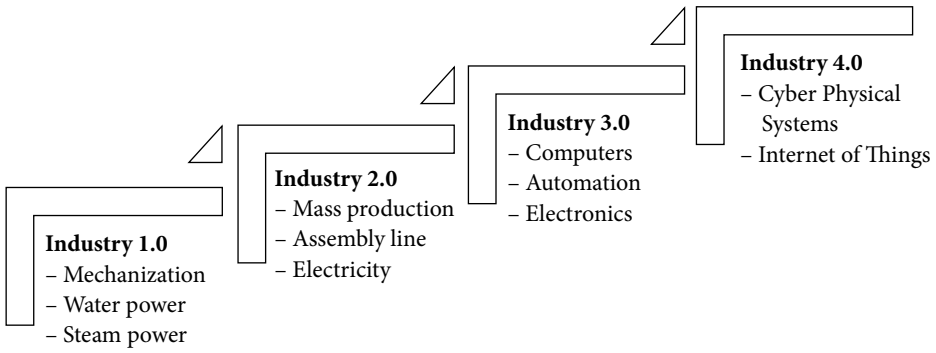

Figure 3.1. Industrial revolutions

Source: Own study.

It can be seen that the production process includes a series of successive activities (shown in Figure 3.2): production preparation, production execution, and production control. Preparation of production includes technical and organizational measures necessary to create favourable conditions for a smooth flow of production. Designing and constructing products involves determining the technical properties of the product, therefore at this stage it is necessary to decide on the following elements that will affect the future product:

- combined products,
- selection of technical characteristics of the product,
- material selection,
- creation of material nomenclature,
- determination of the technical norms of the material.

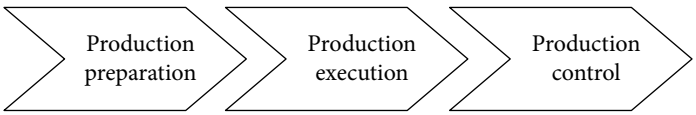

Figure 3.2. Production process

Source: Own study based on (Joksić, Nešić, & Nusev, 2017, pp. 10–11).

When choosing a product, it is important to consider the wishes and needs of consumers. Another important factor is the technical preparation time. The choice of the technical characteristics of the product is based primarily on the

characteristics that will ensure economic profitability. When choosing a metric, the type of material that is the most advantageous is determined, but in each case a replacement is also given if there is a shortage of the base material for any reason. In addition, it is necessary to define a material standard, which is the amount of material needed to create a product unit.

A technological process is a set of activities that change the composition, quality, shape or size of the materials produced in order to produce the desired product. It may undergo changes, e.g. when production procedures are changed in order to increase efficiency. It should be emphasized that organizational preparation measures are closely related to the implementation of the technological process. Correct estimation of the type of production depends on the selection of the optimal method of creating operational plans and its correct implementation. A well-defined business plan determines which operations, parts, and products need to be completed over which time frame so that the plan can be successfully executed when all workplaces are fully loaded.

The organization of the technological process depends largely on the production manager, whose responsibility is to organize workplaces and to ensure product quality. The optimal production rhythm is conditioned by effective production planning. The organization of internal transport represents the total movement of the means of production in the process of their creation. Production control is aimed at correct and timely observation of the flow of achieving planned results, therefore its task is to constantly monitor production results (Joksić et al., 2017, pp. 10–11).

However, it should be noted that before starting the production process, a make-or-buy decision must be made. After selecting the end product line, the manufacturer must decide which processes and intermediate products successively combined to final product will be implemented within the organization, and which will be delegated to external organizations. In the case of a decision to outsource, it is necessary to define the terms of the contract. In practice, this is a series of procurement decisions—sometimes referred to as a producer's make-or-buy program—involving many factors (shown in Figure 3.3) including design requirements; inventory needs; quality control; production, overhead, and transportation costs; and the capabilities, capacities, and negotiating strength of potential suppliers relative to those of the producer himself (Masten, 1984, pp. 404–405).

A very important issue is the continuous improvement of the production process. One method to achieve this goal is the 5S method. It is a set of 5 simple rules and a tool that allows to visually control the workplace. The name 5S refers to the five steps (shown in Figure 3.4) required to fully implement all assumptions of the method (Falkowski & Kitowski, 2013, pp. 127–128). The method is described in more detail in chapter 4.

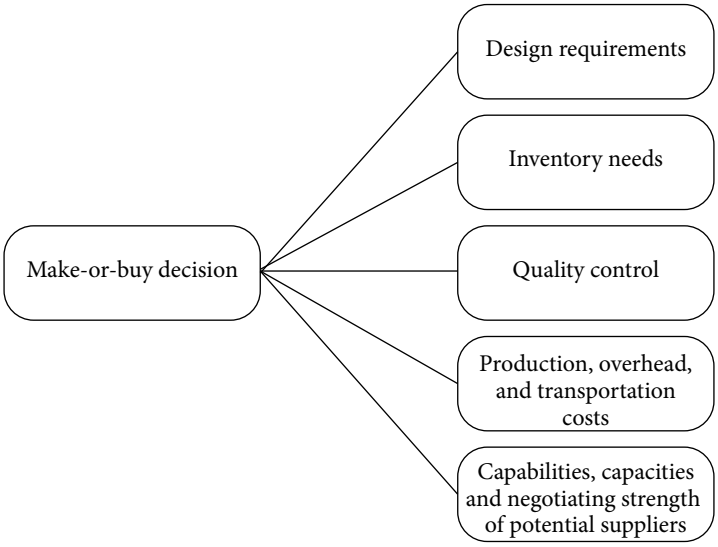

Figure 3.3. Make-or-buy decision determinants

Source: Own study based on (Masten, 1984, pp. 404–405).

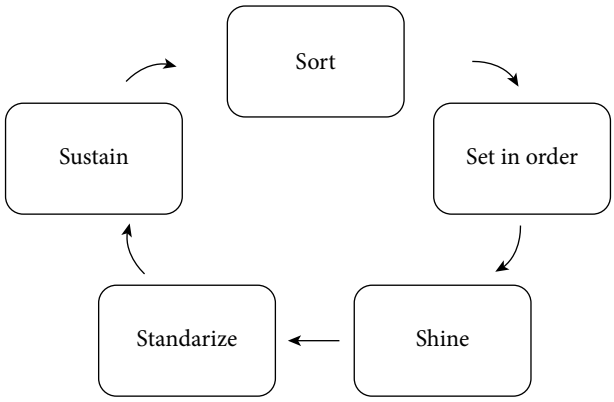

Figure 3.4. 5S methodology

Source: Own study based on (Falkowski & Kitowski, 2013, pp. 127–128).

3.3. Enterprise Resource Planning

In a changing world, organizations that want to gain a competitive advantage, ease of adaptation to customer requirements as well as an increase in the financial

result, often decide to introduce the Enterprise Resource Planning system (ERP). It is a tool that supports the effective planning of enterprise resource management. This support may cover all or some of the management levels and facilitates the optimization of the use of the company's resources and processes taking place in it.

ERP systems are scalable, multi-functional and complex systems that contain at least one module. The goal of ERP is to integrate information from the main functional areas of the organization (shown in Figure 3.5, e.g. finance, human resources, manufacturing, customer relations, supply chain management), in order to facilitate management and streamline the flow of information between functions, as well as between organization and stakeholders. It is now believed that ERP is the fundamental technology that organizations use to manage their information (Al-Mashari, 2003, pp. 22–27).

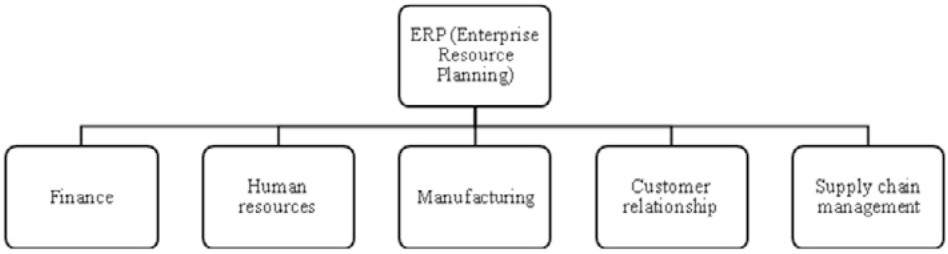

Figure 3.5. Main ERP modules

Source: Own study based on (Al-Mashari, 2003, pp. 22–27).

The implementation of an ERP system in an organization involves making many decisions, from defining business processes, selecting an ERP system supplier, to selecting the implementation methodology. Choosing an appropriate methodology will make it easier to go through each implementation stage. Currently, the most commonly used are *Agile* and *Waterfall* methods (Suder, 2018, pp. 277–285).

"*Agile methodology* was established in 2001 by creating a manifesto called Manifesto for agile software development" (Beck et al., 2001). Nowadays, it is used more and more because of its flexibility and simultaneous cooperation of all teams. When implementing tasks in ERP projects based on the methodology of agile programming, the following stages are distinguished (shown in Figure 3.6):

1) plan,
2) design,
3) develop,
4) test,
5) release,
6) feedback.

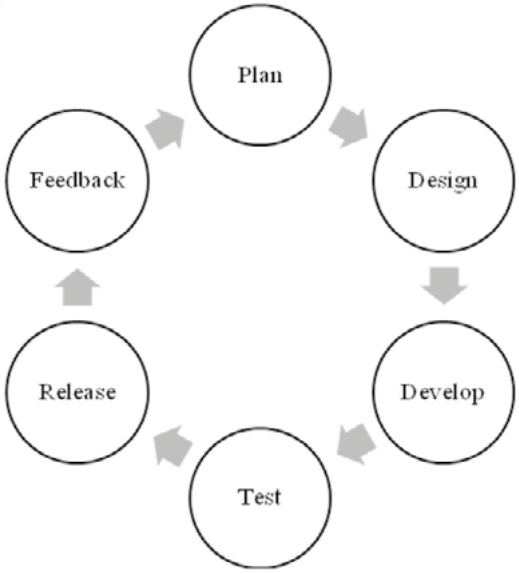

Figure 3.6. Agile methodology

Source: Own study based on (Beck et al., 2001).

The above stages form a cycle that is repeated until the system implementation is completed. It is very important to note that the subsequent cycles are to be used to possibly correct the prepared task on the basis of feedback. The subsequent cycles, however, are not intended to endlessly correct errors of a given task resulting from the omission or inaccuracy of the planning stage (Suder, 2018, pp. 277–285).

Waterfall (cascade) methodology was developed by Royce (1987, pp. 328–329), it consists of carrying out the basic activities as separate design phases, one after the other (see Figure 3.7). Each activity is the next step (cascade):

1. System planning (including requirements specification).
2. System analysis (including requirements analysis and feasibility studies).
3. System design (of individual structures, etc.).
4. Implementation (system creation).
5. Testing (of individual elements of the system and elements connected together).
6. Implementation and maintenance of the resulting system.

If any of the phases returns an unsatisfactory product, we go back by making subsequent iterations until we get a satisfactory product at the end of the steps. It should be emphasized that this model can only be used when the requirements are understandable and transparent, as each iteration is time-consuming and requires large improvement expenses.

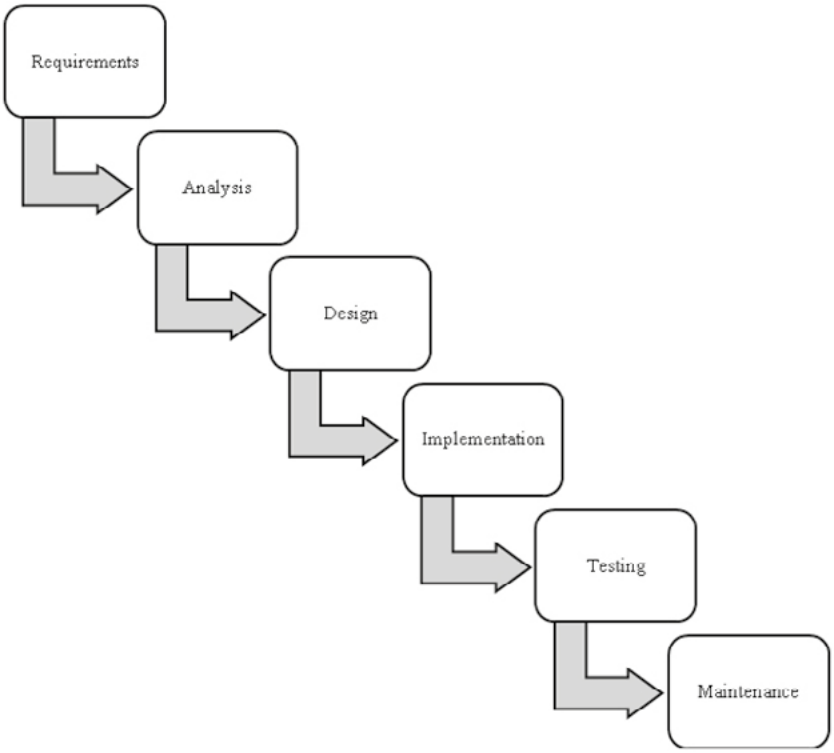

Figure 3.7. Waterfall methodology

Source: Own study based on (Royce, 1987, pp. 328–329).

It should be noted that ERP systems fulfil a number of functions in modern enterprises (shown in Figure 3.8). The main ones are as follows (Wodnicka, 2018, pp. 356–357):

1. They allow for planning, optimization and implementation of activities, as well as measurement of the efficiency of each link. They help in taking actions leading to the optimization or transformation of the implemented logistic processes and, consequently, to the reduction of associated risks, cost reduction, shortening the time of logistics processes, increasing the flexibility and effectiveness of the company.
2. They create the possibility of Internet communication, solutions increasing the level of functionality in the area of comprehensive management of processes inside the company (as well as outside it), from production and procurement planning, through production management, management of widely understood resources, to the sale and shipment of finished products to the customer, after-sales and service.

3. They allow the company to expand the chain of information resources, crossing the existing boundaries of the company and use data from external partners, suppliers or customers in real time.
4. They make it possible to monitor the state of inventories and finished products in warehouses and compare them with the anticipated demand, and thus quickly respond to changes in demand, and conduct ongoing analysis of critical areas in the company's operations, i.e. availability, efficiency, quality, customer satisfaction and profitability.
5. They are a helpful element in the management of an enterprise focused on building strong relationships with customers and business partners.
6. They enable enterprises to both integrate and optimize the logistics process, using additional tools applicable in the supply chain. The importance of integration with WMS (Warehouse Management System) applications is also growing, which not only support warehouse management, striving to optimize warehouse space, coordinating the movement of products, but as a result of creating more intelligent forms—support the management of a wider group of processes: carrier service, communication with sub-suppliers or inventory management.

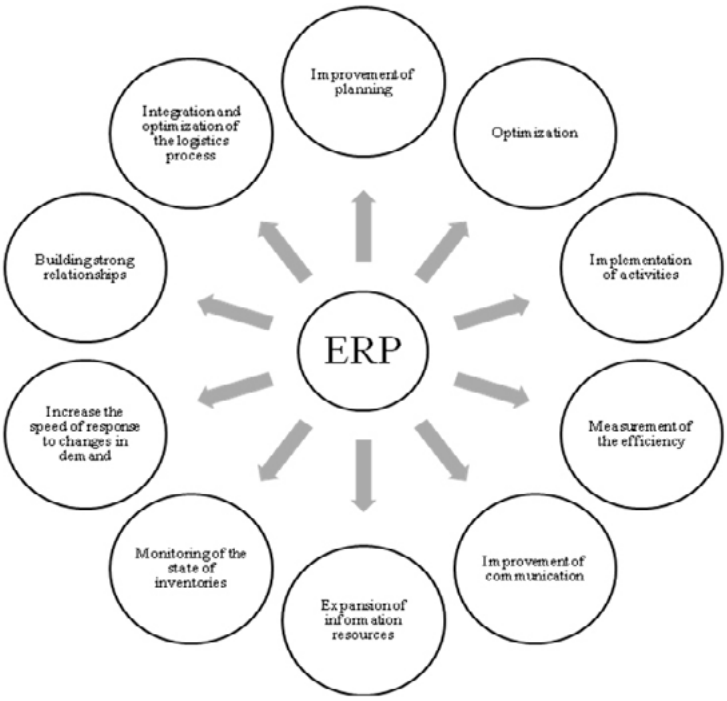

Figure 3.8. ERP systems main functions

Source: Own study based on (Wodnicka, 2018, pp. 356–357).

The importance of ERP information systems is increasing. In a turbulent environment, the possession of an integrated database by enterprises seems to be a necessity, which is an impulse to create new or improve the already existing functionalities in these systems. The possibility of adapting to the needs of each enterprise, regardless of the industry, results from their modular nature, i.e. the fact that they consist of independent, although cooperating with each other, applications and can therefore connect with other programs and applications necessary for management. Their basic foundation is the database, which is usually common to all other modules. These systems support the management of a large number of activities carried out in processes in the enterprise, also in a group of cooperating business partners, by collecting and sharing the collected data, which significantly improves the supply chain improvement. The improvement occurs as a result of a properly organized flow of goods (raw materials, finished products) between individual partners in terms of costs, timeliness of deliveries and quality of operation.

Therefore, the skilful use of ERP-class IT tools supporting the management of logistics processes can contribute, firstly, to their integration up and down the supply chain and, secondly, to support decision-making (Wodnicka, 2018, pp. 360–361).

3.4. Purchasing management

The organization of purchasing processes in the era of global competition and the growing share of procurement costs in the total operating costs in manufacturing companies is gaining new meaning. In the business practice of enterprises, an increased interest of managers can be observed this functional area. In the era of undeniable development of logistics and recognizing the benefits of logistics management, purchasing processes are gaining in importance because they are perceived as complementary to the logistics sphere, and also as another aspect of seeking to increase the efficiency of operations (Hadaś & Ragin-Skorecka, 2017, pp. 40–41).

When defining purchases, it is worth using the concept of Lysons and Klosa (2004, p. 13), who defines purchasing as "a function responsible for acquiring equipment, materials, components, parts and services by purchasing, leasing (...) for the purpose of consumption or resale". It can be seen that this definition focuses primarily on how resources are obtained. It should be noted, however, that in recent years the role of purchases has increased significantly (as shown in Figure 3.9). Nowadays, it can be said that purchasing plays a key role in managing a company (Bedey, Eklund, Najafi, Wahrén, & Westerlund, 2008, p. 6).

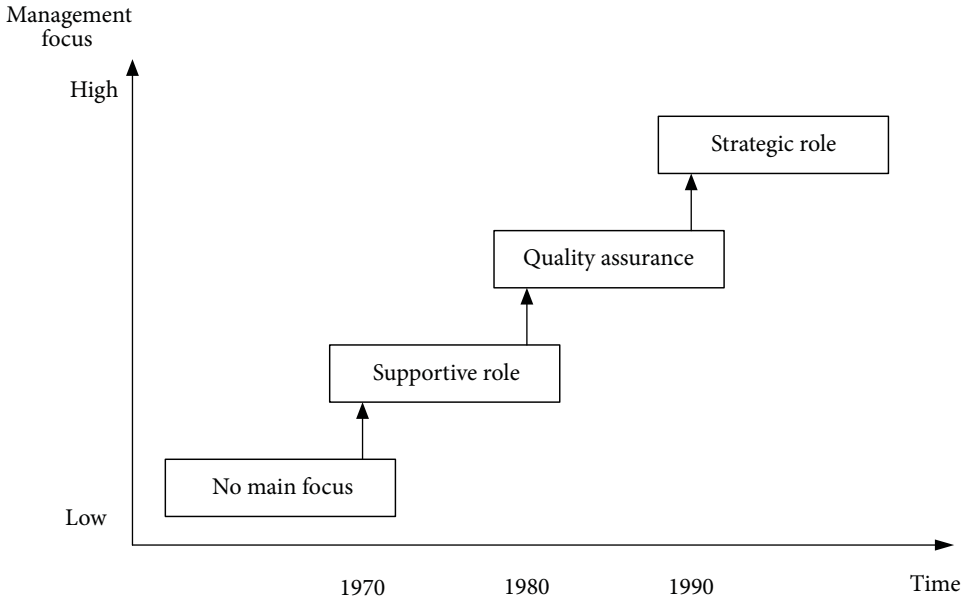

Figure. 3.9. Historical development of purchasing management

Source: (Bedey et al., 2008, p. 6).

In modern companies, as part of the purchasing process, a number of activities necessary for its implementation can be distinguished (presented in Figure 3.10). The most important tasks include (Hadaś & Ragin-Skorecka, 2017, pp. 40–41):

Figure 3.10. Purchasing tasks

Source: Own study based on (Hadaś & Ragin-Skorecka, 2017, pp. 40–41).

- segmentation of purchase items,
- establishing purchasing strategies,
- searching for sources of supply,
- supplier classification and evaluation,
- negotiations with suppliers,
- concluding contracts with suppliers of goods and services,
- determining the demand for goods, services or works based on reported needs,
- planning and inventory control,
- scheduling and control of deliveries,
- inspection of invoices for deliveries.

It should also be noted that in economic practice there are various forms of organizing purchases (illustrated in Figure 3.11). Enterprises adjust the organization of purchasing processes to the specifics of the industry, entity size, market characteristics, etc. The following basic forms of purchasing organization can be distinguished (Bendkowski & Radziejowska, 2005, as cited in Hadaś & Ragin-Skorecka, 2017, p. 41):

- centralized: one specialized organizational unit is responsible for purchases,
- decentralized: lack of one superior organizational unit responsible for purchases; purchasing tasks are scattered,
- mixed: purchases are centralized for selected assortment groups and dispersed for others.

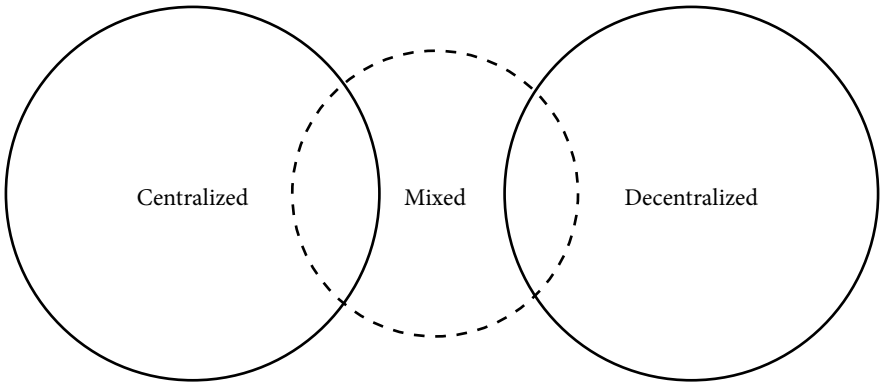

Figure 3.11. Forms of purchasing organization

Source: Own study based on (Bendkowski & Radziejowska, 2005, as cited in Hadaś & Ragin-Skorecka, 2017, p. 41).

Organizations that understand the role of purchasing create purchasing strategies. It is a unified, forward-looking and integrated plan, focused on purchasing activity. The purchasing strategy should follow the company's general strategy and should take into account conditions in the environment. The most frequently

created strategies relate to the number of suppliers (as shown in Figure 3.12). They are as follows (Hadaś & Ragin-Skorecka, 2017, p. 41):

- Single sourcing: there is one supplier, specially selected on the basis of established criteria, responsible for periodically repeated deliveries of a specific assortment item. Such a strategy often allows for large savings due to careful planning and implementation of purchases and deliveries according to the buyer's wishes.
- Multiple sourcing: it is characterized by cooperation with a relatively large number of suppliers, which allows to increase the security of purchases, reduce dependence on suppliers, forces competition among suppliers, and improves the continuity and reliability of supplies.
- Double sourcing: in this approach there are two suppliers. Vendors may provide a different version of the same product. There may be different proportions for dividing the contract. Security of supply increases, the buyer is sure that the object of purchase is always available from the supplier or in the warehouse. The advantages of a single- and multi- vendor strategy are used.

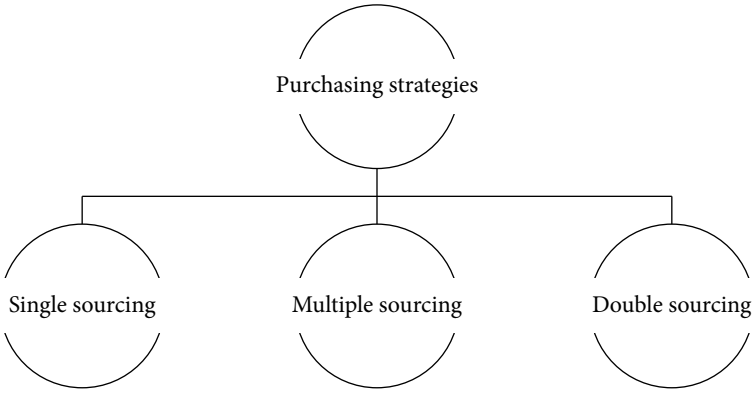

Figure 3.12. Purchasing strategies

Source: Own study based on (Hadaś & Ragin-Skorecka, 2017, p. 41).

Figure 3.13 presents a procurement management model including activities, resources and participants divided into two groups forming the internal and external networks. It should be emphasized that procurement management combines these two areas of activity. The internal tasks include cooperation within the internal network, operational purchasing decisions, defining purchasing strategies and interactions with the external network. As part of the external network of related activities, resources and participants, the main tasks are cooperation within the external network, management of relationships with suppliers, coordination of joint activities and monitoring, assessment and development of cooperation with suppliers (Bedey et al., 2008, p. 3).

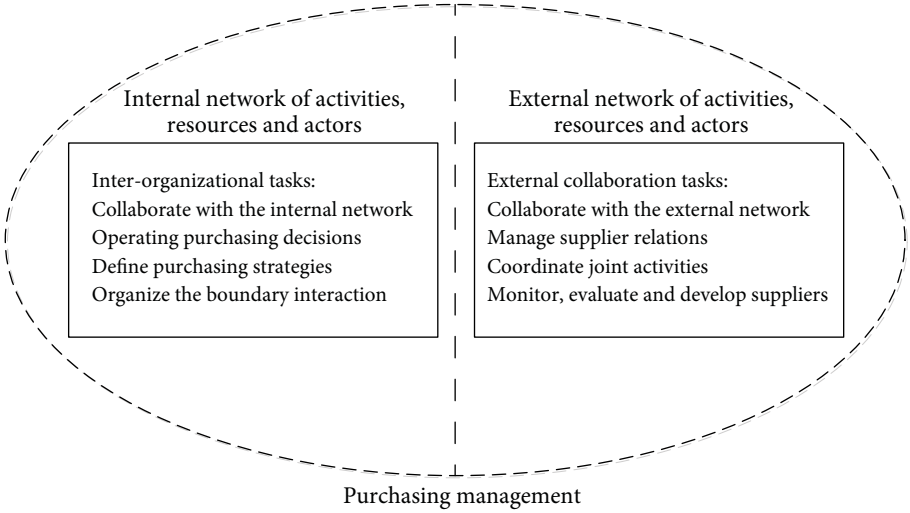

Figure 3.13. Conceptual model of purchasing management

Source: (Bedey et al., 2008, p. 3).

The procurement process can be divided into three basic stages: the stage before negotiations, negotiations and contract execution. At each of these stages, the steps taken in order to move on to the next one is distinguished. The following can be distinguished:

1. Identification of needs and development of specifications.
2. Determining the amount of expenses and analysing the market and potential suppliers.
3. Testing the purchasing strategy and identifying possible adjustments.
4. Preparation of offer documentation.
5. Preliminary selection of suppliers.
6. Supplier selection and contract terms negotiation.
7. Signing the contract and its implementation.
8. Internal operations related to the classification, record and storage of supplies.
9. Evaluation and conclusions regarding the concluded contract.
10. Control of the correctness of deliveries, quantity and quality, their timeliness and other conditions related to the implementation of strategic and operational goals of the company.

The last stage concerns the analysis of the cost of life of the product and the impact of the decisions made on their value. The aim of the analysis is the continuous improvement of, in this case, procurement management. The above considerations can be summarized using the Porter value chain model. The basic stages of the procurement process and auxiliary processes without which the implementation of the basic processes would not be possible are shown in Figure 3.14. This model

takes into account the operational and strategic perspectives and the relationship and impact of purchasing to the value of the enterprise. It is part of the value chain for the entire enterprise (Kukurba, 2016, pp. 9–10).

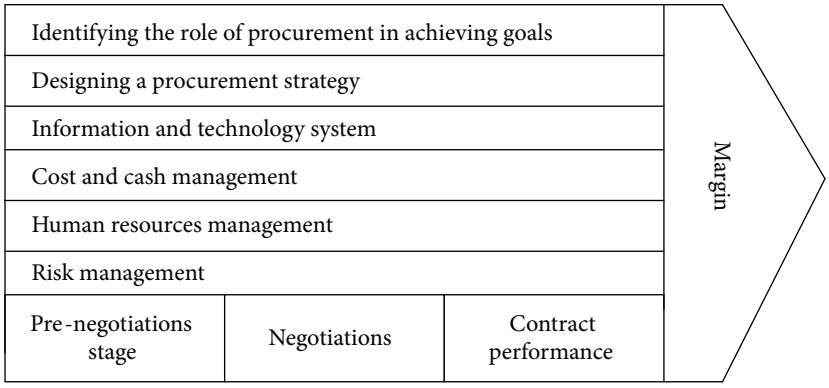

Figure 3.14. Value chain model in purchasing management

Source: (Kukurba, 2016, p. 10).

Attention should also be paid to frequent mistakes made by Polish purchasing managers. Rutkowski (2004, pp. 35–45) indicates the most important of them:

- establishing as the main goal of activities, narrowly understood reduction of purchasing costs,
- belief in the success of confrontational attitudes in negotiations with suppliers,
- narrow specialization in managing purchase categories,
- lack of in-depth financial knowledge and thinking in terms of profitability and goodwill,
- poor knowledge of other management disciplines (operations, logistics, marketing, accounting, etc.),
- misunderstanding of the idea of the supply chain and the role of partner relations,
- lack of strategic orientation.

3.5. Production capacity

The category of production capacity should be understood in many ways. The most common terms are theoretical and practical production capacity and normal and expected use of production capacity. They form pairs of concepts that are essentially convergent. Hence, the theoretical "capacity" of production means reaching the maximum production potential of the unit, with 100% use of resources, without

any disruptions to the process in the form of the so-called bottlenecks, interruptions and faults. Its approximation is the practical production capacity, expressing the production volume close to the upper limit (below 100%), possible to be realized in practice, taking into account downtime, diversified efficiency of machines and devices, and the degree of their use. An important category for the purpose of allocating fixed indirect production costs to inventory processing costs is the date of normal capacity utilization. It is considered to be the average production volume, as expected under typical conditions, for a given number of periods or seasons, taking into account scheduled repairs. There is a reference to the average production volume, characteristic for a specific type of activity, minus the planned repair and maintenance activities. The expression "number of seasons" used refers to the uneven course of production due to its cyclical nature. In this context, one should also read the concept of the expected use of production capacity, understood through the prism of the projected volume of activity in the conditions of constraints of external demand and planned events of the volume of activity for the next period or season, specific to this unit. Due to the restrictions in demand, manufacturing and/or trading companies are usually unable to sell all their products and/or goods in a given period, which results in the accumulation of inventories of tangible current assets in the warehouse. This is how the term of the sales volume is created (Chrobak, 2019, pp. 300–301).

In economic practice, agent systems are often used in the analysis of production processes and determining the production capacity. The manufacturing process can be treated as a certain group of agents negotiating with each other and providing services. Thus, multi-agent systems (MAS) are an ideal model for representing problems related to manufacturing processes that can be seen and solved from many different perspectives. The undoubted advantage of this is the possibility of distributed and concurrent implementation. The disadvantages include the complexity of interactions between individual entities operating in the environment. The characteristics of a multi-agent system are (Obrzud & Mazur, 2011, pp. 142–145):

- no centralized control,
- data decentralization,
- asynchronous operation,
- incomplete information or inability to resolve the problem.

A multi-agent system is formed by a network of computing agents that interact and typically communicate with each other. Agents may only know a partial model of the environment, may have a limited set of means for acquiring and integrating new knowledge within their models, and for directing the system towards their own goals. In multi-agent systems, the decisions and actions of different agents do not necessarily interact. However, only in the case of interactions, a multi-agent system can solve a problem that exceeds the competence of individual agents. In the community, agents must coordinate its activities with the other agents. Coordination

models provide channels and principles for managing agent interactions and dependencies. Coordination requires a certain regulated flow of information between them and the surrounding environment, i.e. communication. It should be taken into account that in MAS coordination, indirect communication through the environment or direct information exchange between selected agents is possible.

Collaboration means carrying out joint activities to achieve a common goal. For example, in an ordered field of machinery, agents may agree to perform certain tasks in order to fulfil an order at a given time. Common goals (order fulfilment) can only be achieved if all agents entrust themselves to the task for which they have previously agreed. General operations performed by the multiagent system affect the organization, which is imposed by individual agents. This is shown in Figure 3.15. It should also be emphasized that the benefits of using multi-agent systems in the analysis of manufacturing processes are as follows (Obrzud & Mazur, 2011, pp. 142–145):

- ensuring the resilience and efficiency of the system,
- cooperation with already existing systems,
- the ability to solve problems where data is distributed.

It should be emphasized that multi-agent systems are a technology that enables the modelling and implementation of individual and social behaviour in production systems. On the one hand, concepts such as autonomy, reactivity or action-oriented reasoning are used, which are related to the modelling and implementation of the individual behaviour of agents, and on the other hand, such terms as cooperation, coordination, negotiation, coalition formation, self-organization, which are related to the social behaviour of a group of agents (Obrzud & Mazur, 2011, pp. 142–145).

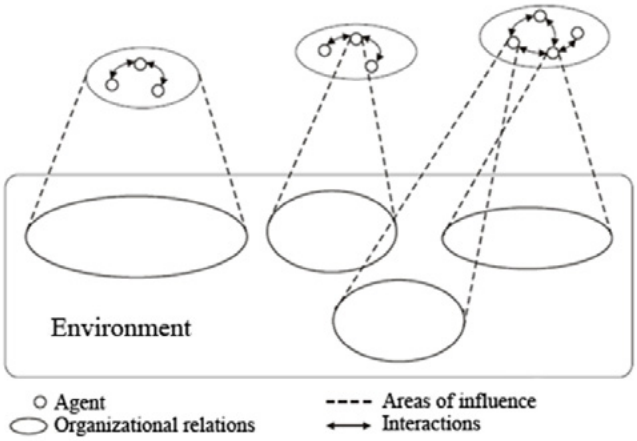

Figure 3.15. The general sphere of the multi-agent system

Source: (Obrzud & Mazur, 2011, p. 144).

3.6. Inter-organizational cooperation

Defining the concept of inter-organizational cooperation from the perspective of management sciences, it can be seen that it is most often treated as a collaboration focused on achieving benefits (Kaczyński, 2012, p. 166; Mazur, 2011, pp. 290–291; Nowak, 2012, pp. 15–35).

It should be noted that inter-organizational relationships are a source of the necessary materials and services, they contribute to overcoming the difficulties, conquering new markets and deploying new technologies. It helps to build a sustainable competitive advantage (Jacobs, Johnston, & Kotchetova, 2001, pp. 353–363; Ulaga, 2001, pp. 315–319). It is worth noting, that by creating inter-organizational relations based on various types of dynamic and multi-dimensional cooperation, each organization expects it will bring tangible benefits. Through cooperation, entrepreneurs seek to increase profitability, reduce costs, optimize the use of production potential, as well as access to scarce resources of knowledge, technology and new markets (Bengtsson & Kock, 2000, pp. 411–426; Dembińska-Cyran, Hołub-Iwan, & Perenc, 2004; Dudzik, 2005, pp. 2–8; Lenz-Cesar & Heshmati, 2009, pp. 1–25).

When deciding to cooperate, enterprises may choose one of several types of relationships, starting with simple forms of cooperation and ending with complex systems in which mutual integration of equipment, processes and management systems takes place. It is assumed that the types of connections between economic units form a certain chain (shown in Figure 3.16), the beginning of which is the so-called clean, non-contractual transactions and the end of a completely hierarchical integration of the company (Webster, 1992, p. 5).

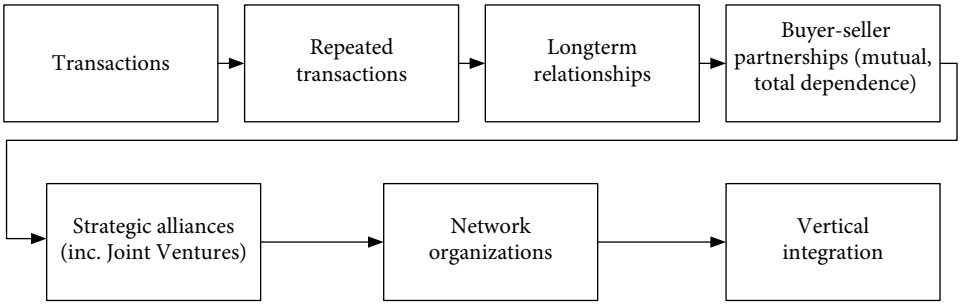

Figure 3.16. The scope of inter-organizational relations

Source: (Webster, 1992, p. 5).

At this point, it should be emphasized that companies operating on the market do not limit themselves to choosing one form of cooperation, but, obviously, decide

to establish many different relationships of a very different nature (Kale & Singh, 2009, pp. 46–47; Macias, 2012, pp. 6–11; Provan & Kenis, 2008, pp. 229–236). Moreover, it can be noticed that the forms of inter-organizational connections are not static, but dynamic and evolutionary—they transform over time, depending on the current requirements of entities, their stage of development, market situation or the adopted strategy of operation (Marcinkowski, 2015, pp. 297–310; Rangan & Yoshino, 1996, pp. 7–9).

It is also worth noting that in today's dynamically changing world an organization is more and more often perceived as a set of defined processes. Such an approach significantly facilitates the control of the achievement of goals, and thus the optimization of production time, reduction of production costs, or an increase in management efficiency. One of such processes is cooperation, which takes the form of an extremely complex, multi-faceted cycle consisting of a series of stages. In order to ensure efficiency and effectiveness of the operation, it is very important to recognize its course and the factors determining its shape.

In this context, the concept of inter-organizational cooperation developed by Ujwary-Gill and Choroszczak (2003, pp. 2–3) deserves special attention. Stressing the difficulties of creating a cooperative relationship, they simultaneously divided it into two basic stages—creation and implementation. In the first of step, a strategic analysis of the company is carried out, i.e. an assessment of its potential and the environment in which it operates. It is emphasized that before making a decision on cooperation, it is necessary to identify strategic options and select a strategy, which determines the selection of the area and form of cooperation most appropriate to achieve the company's goals. Then there is a search and selection of a partner. It is extremely important to use many different criteria when selecting a partner, such as: the ability to settle liabilities, the company's reputation, the breadth and depth of the offer, the quality of services provided, the level of service, timeliness, reliability and commitment, the potential necessary to perform tasks, having the necessary authorizations and permits, as well as the period of operation on the market (Matejun, 2009, p. 291). In the second step, the inter-organizational relationship is implemented by concluding a contract, starting cooperation and managing its course on an ongoing basis. A very important part of this stage is the control and assessment of cooperation, which allows you to see the need to modify the cooperation process. If the assumed goals are achieved, the enterprise may decide to terminate the relationship, and if further mutual benefits are expected, it is possible to continue the cooperation.

A more extensive description of the cooperation process is contained in the four-phase procedure created by Kaczmarek (2000, pp. 166–186), presented in Figure 3.17. It has a very practical dimension, as it can be easily implemented in an enterprise. The concept includes such phases of cooperation as: initiative and design, preparation, decision and implementation and implementation.

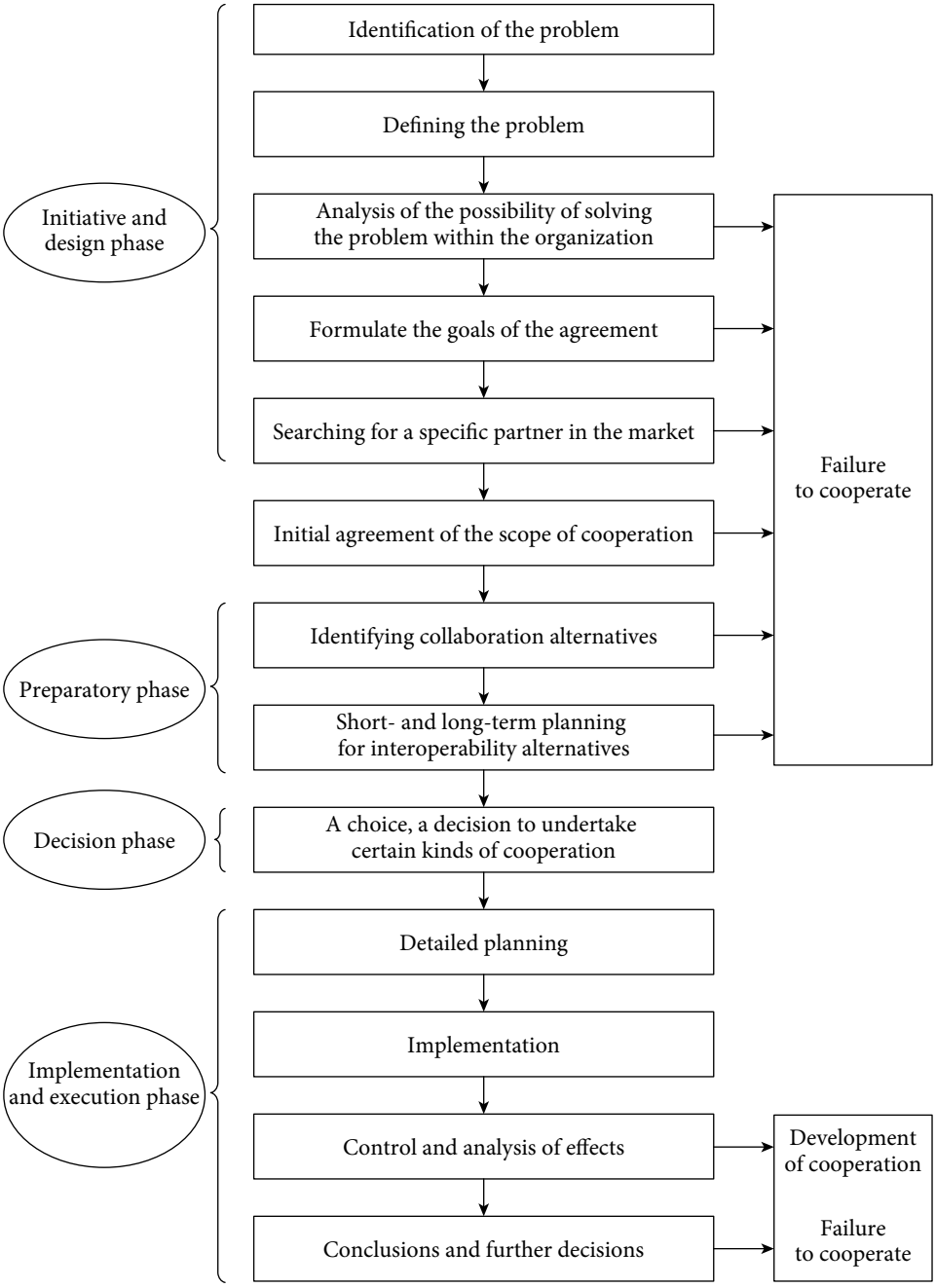

Figure 3.17. Diagram of the methodology for the preparation and implementation of decisions on cooperation between enterprises

Source: (Kaczmarek, 2000, p. 167).

The initial phase is the initiative and design phase, during which the first step leading to possible cooperation should be noticing and defining the problem, and then analysing the potential options for its solution. In this way, the goals that the company wants to achieve are formulated. As a result of the above, if the enterprise determines that the solution to the problem situation will be cooperation with another entity, it is necessary to examine whether there is an enterprise that meets certain requirements, and then whether this entity is interested in establishing a relationship at all. The next step is to determine what possible concessions to the potential partner the company must take in order to achieve its goals. In the event of a situation in which it is impossible to find a suitable partner, you should stop trying to cooperate or revise your goals, and then start the process anew. If it is possible to find an entity interested in cooperation, the decision-making process regarding the subject scope begins to extend beyond the scope of the initiator company.

It should be emphasized that at this stage it is extremely important to choose the right partner for potential cooperation. In the literature, you can find a number of guidelines for the correct selection of contractors, i.e. (Kumar, Vrat, & Shankar, 2006, p. 274):

- selection procedures based on a wide variety of criteria should be used,
- the assessment of potential partners must take into account the specificity of their activities,
- the adopted policy should be followed, which may impose certain restrictions, such as the maximum share of one contractor in the structure of suppliers or recipients, the minimum number of partners, etc.,
- it should be remembered that suppliers may impose certain minimum or maximum sizes of orders, which is most often related to their production capacity,
- when carrying out the assessment, pay attention to the delivery time.

The main goal of the next phase—the preparatory phase—is to transform the initial talks and exploratory contacts into binding agreements, e.g. based on contracts. In the previous phase, it was mainly the initiator-company that was active, while in this phase the burden is distributed more or less equally between both entities. Negotiations take place between the companies, through which the partners try to reach an agreement that takes into account the achievement of the goals of each party. This is the decisive stage for the success or failure of cooperation. In the literature, the following issues are mentioned as important in the negotiation process of enterprises: the learning process, tactics, cultural differences, local conditions, expected future cooperation, social relations, the order of submitting offers by entities, private information, bargaining power, personality of negotiators, contracts low risk, single goals, level of entity aspiration, utility maximization, private goals of partners, convergence of goals, legal agreements, transaction costs, time constraints, existing threats and requirements for contracts and their ratification (Eliashberg, Lilien, & Kim, 1995, p. 52).

The aim of the next phase—the decision—is to choose a specific type, scope, as well as legal and organizational form of cooperation. The decision in this area should be made taking into account the multi-criteria assessment and previously planned and agreed tasks. The basic factor conditioning this type of decisions is, of course, the desire to achieve the basic goal of the existence of each enterprise, i.e. achieving economic profit and increasing the value of the enterprise over time. For example, the right choice in terms of cooperation with the supplier, due to the large share of purchased goods and services in the cost structure, allows achieving a significant competitive advantage over rivals (Kasilingam & Lee, 1996, p. 347). However, economic practice shows that some agreements are concluded for other reasons, e.g. to avoid or limit market consequences, which allows the entity to be protected against competition. When deciding to cooperate with a specific partner, enterprises should follow criteria of an economic, technological, production, personnel, organizational and social nature, as well as spatial concentration and dispersion (Kaczmarek, 2000, p. 170, as cited in Haus, 1983).

The last phase of the procedure is the implementation and realization phase, which consists in developing a program for the implementation of a given solution, its implementation and constant analysis and evaluation. The implementation program should include main tasks related to cooperation, detailed guidelines for teams responsible for a specific area of joint activity, decision-making powers, deadlines and time for their implementation, as well as analysis and control of effects. It is this last stage—control—that is an extremely important part of the implementation and execution phase. Properly conducted internal control allows to be sure that the processes in the enterprise run in a way that minimizes the likelihood of fraud, error or uneconomic and ineffective practices. The control should be a system, the participants of which are the employees and management of the unit, supported by modern organizational and technical equipment, giving the opportunity not only to maintain, but also to constantly improve the efficiency of operation (Saunders, 1996, p. 32; as cited in Nadolna, 2009, pp. 272–273; Najwyższa Izba Kontroli, 2000, p. 74; Kuc, 2002, p. 83).

Questions / tasks

1. What is the fourth industrial revolution characterized by?
2. What stages does the production process consist of?
3. What is a make-or-buy decision?
4. What are the rules of the 5S method?
5. How can you implement an ERP system in an enterprise?
6. What are the main tasks of the purchasing department in the enterprise?
7. How has the role of purchasing changed in recent years?

8. How can purchases be organized in the enterprise?
9. How can the multi-agent model be used to increase production capacity?
10. What are the possible forms of inter-organizational cooperation?
11. What characterizes the process of establishing cooperation between economic units?

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