Krykavskyy Yevhen
Savchenko Yuliia
Rak-Młynarska Elżbieta
Pochopień Jolanta

BUSINESS STRATEGY OF ENTERPRISES IN THE CHAIN OF CREATION OF COMPLEX TECHNICAL SYSTEMS

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Revievers:

dr hab. Liubov V. Zharova (Ukraine/Poland)

prof. dr hab. Jan Wiktor (Poland)

Composition and design preparation:

Aleksander Sapiński

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ANNOTATION

Monograph is dedicated to the solution of the scientific task of developing theoretical-methodical and applied provisions of the business strategy of enterprises in the chain of creation of complex technical systems. The relevance of the scientific research lies in the structure of the participants in the chains of creation of complex technical systems in the market of technical means of economic security of legal entities and individuals of Ukraine, in which mostly small and medium-sized enterprises. They do not have sufficient strategic potential for development, therefore, in order to increase the competitiveness of these enterprises and their adaptation to new market needs, strategic partnership, which will be implemented by the concept of supply chains, becomes important. From the point of view of the impact of such a strategic partnership, attention is paid to the strategic alignment of the goals and objectives of the chain with the goals and strategies of the enterprises that interact in such a chain, which will allow better synchronization of the actions of the participants of such a chain, as well as increase the effectiveness of the participating enterprises and the entire chain of creating complex technical systems

In the first chapter "Complex-technical systems: formation and determinants" the modern meaning of the concept "complex-technical system" was investigated, the object composition of this category was updated, its characteristic features were identified, and key determinants of the development of chains of complex-technical systems were identified.

Based on a review of literary sources, it is customary to divide technical systems according to the level of complexity into two large groups: simple and complex. The object and branch composition of complex technical systems has been specified in accordance with modern market requirements. The object composition of complex technical systems was supplemented due to the expansion of the scope of their use, including the field of information technologies . The market of technical means of economic security of legal entities and individuals is closely related to this industry. The key features of complex technical systems that act as products around which appropriate supply chains are built are highlighted, which made it possible to deepen the understanding of the conceptual economic foundations of the strategic orientation of such chains in order to adapt to new external challenges.

method of identifying the key determinants of the development of chains of creation of complex technical systems has been developed , which involves a preliminary multi-criteria comparison of simple and complex technical systems in the context of the management of chains of their creation. Areas of critical success factors and areas of typical limitations are identified.

The distinction between approaches to the management of supply chains of simple and complex technical systems is substantiated. Adopted relatively complex technical systems use concept "chain of creation", that is, a chain in which, next to the priority of supply system management, technological processes related to the specifics of creating complex products and putting them into operation play a special role. At the same time, if such a distinction expands the concept of "supply chain" in its process interpretation, from an institutional point of view, the chain of creation of complex technical systems will remain identical to the supply chain of such products, covering manufacturers and service providers who cooperate with each other, carry out joint activities necessary for satisfaction of demand for products that move in this chain from the source of raw materials to the final consumer and are connected by material, information and financial flows.

In the second chapter "The enterprise in the chain of creation of complex technical systems" it is proposed to differentiate strategic alternatives of manufacturers of complex technical systems in the chains of their creation depending on such key criteria as: strategic orientation of the chain, market factors of success, the most important element of competitive advantage, type of product, demand and delivery time. It is substantiated that such identification lays the foundations for the formalization of the process of strategic adaptation of the manufacturing enterprise into the chain of creation of complex technical systems and, in particular, the determination of the interdependence between the strategic potential of the chain and the business strategies of its participants.

In the third chapter "The system of technical means of economic security as an object of a complex technical system" the product structure of the market of technical means of economic security of legal entities and individuals of Ukraine is visualized in the form of five key segments, the analysis of the product structure of the market of complex technical systems

is summarized the market of technical means of economic security of legal entities and individuals . It is proposed to single out five key segments of the market of technical means of economic security of legal entities and individuals : 1. Technical means of information protection; 2. Technical means of security purpose (TZOP); 3. Technical means of fire and technogenic safety (TZPTB) and fire surveillance; 4. Technical means of engineering and technical fortification (TZITU); 5. Technical means of low-current engineering equipment and networks.

In the fourth chapter "Identification of factors of the development of enterprises in the chain of creation of a system of technical means of economic security" the analysis of the subject and product structure of the market of complex technical systems in the market of technical means of economic security of legal entities and individuals is summarized, two types of chains are identified: short and full (integrated) and significant differences in the aspect of management systems have been determined in relation to them. Based on the application of the SWOT analysis method , the key factors of the development of the market of technical means of economic security of legal entities and individuals of Ukraine were identified, the analysis of internal and external logistics processes of manufacturing enterprises in the chains of creation of complex technical systems of the market of technical means of economic security of legal entities and individuals was carried out.

The subject structure of the chains of creation of complex technical systems is summarized by identifying their key players and the main types of activities that take place in the chains of creation of complex technical systems in the market environment of technical means of economic security of legal entities and individuals are determined. Characteristic features for the identified chains of creation of complex technical systems (short and complete) are established: short chains of creation of complex technical systems are product-oriented, full chains are service-oriented ; in the short chain, the main role is played by the manufacturer, and the closest link to the consumer is the distributor, and in the full chain, the key role belongs to the integrator, which is the link that is in the immediate vicinity of the consumer.

It is proposed to conditionally group the main factors influencing the market of technical means of economic security of legal and natural persons of Ukraine into three

groups according to the spheres of their influence: caused by the activity of the regulatory bodies of this market, caused by the economic/social policy of the state, caused by the action of the market. For this , a SWOT analysis was used as a tool for verifying the market of technical means of economic security of legal entities and individuals of Ukraine.

It is proposed to carry out an assessment of the activity of manufacturing enterprises based on a set of indicators of property and financial condition. An example of the practical implementation of the evaluation concept is given for the three most integrated in the chain of creation of complex technical systems from the group of investigated enterprises: LLC NVP "Electroprylad", TDV "SKB Electronmash", LLC "Altosan". It was concluded that it is necessary to invest more in capital equipment for effective integration into the chain of creation of complex technical systems. This ensures a significant reduction in the duration of inventory turnover, but somewhat reduces the return on capital. A prospective analysis of the activities of the mentioned enterprises was carried out using the Holt model for forecasting the net income from the sale of products. The calculated reliability indicators are confirmed for LLP NVP "Electroprylad" and TDV "SKB Electronmash". The combination and comparison of conclusions based on the results of the evaluation of the entire set of indicators of the investigated manufacturers of complex technical systems for 2010-2016 made it possible to position the enterprises on a two-dimensional diagram that reflects the strengths and weaknesses of each enterprise in the overall assessment of the analyzed groups of indicators. This made it possible to establish the problem areas of the investigated manufacturers, which are mostly "logistic" in nature, and to actualize the need to modify the functional strategies of the investigated enterprises.

In the fifth chapter, "Development and implementation of a strategy for the development of the manufacturer in the chain of creation of complex technical systems" , a methodology for identifying motives for the integration of a manufacturing enterprise into the chain of creation of complex technical systems was developed, the influence of the integration strategy of the chain of creation of complex technical systems on the business strategy of the production company was studied. enterprises, actual innovative and spatial mechanisms for ensuring the implementation of the development strategy of manufacturers of complex technical systems were analyzed .

Based on the analysis of the strategic effects of partnership in the integrated chain of the creation of complex technical systems on the market of technical means of economic security of legal entities and individuals of Ukraine from the position of manufacturers of components and finished products, it is proposed to carry out three actions to identify the motives for the integration of a manufacturing enterprise into the chain of creation of complex technical systems . The first action is the construction of a SWOT matrix - analysis of the potential of the integration of the production enterprise into the chain of creation of complex technical systems. The second action involves comparing this matrix with a classic SWOT analysis of the strengths and weaknesses of the enterprise itself, which intends to integrate with the structure of a higher order. The third action involves assessing the risks of integration according to a certain pattern, which is advisable to use for positioning each quadrant of the SWOT analysis matrix . These actions make it possible to determine the perspective of the integration of the manufacturing enterprise among other rational economic alternatives of activity for a certain period of time in a changing external environment.

A conceptual model designed for structural coherent analysis in the field of research of the influence of its strategy on the strategic alternatives of the functioning of its participants within the framework of three strategic levels of management (corporate, business level, functional) has been formed. This model involves three stages. The first stage is the development of inter-organizational relations and the establishment of contours for the creation and coordination of the chain of creation of complex technical systems, which, in fact, will set the direction of the strategic orientation of the entire chain. The second stage is the outline of the requirements of the corporate strategy and the adaptation of the participants' strategies to these requirements according to the criterion of compliance with the management concept chosen at the first step: efficiency, elasticity or their combination. The third stage involves setting up the interaction of business strategies with the corporate strategy of the chain of creation of complex technical systems by configuring strategies at the functional level. The result is the formation of a portfolio of strategies for the development of a manufacturing enterprise in the chain of creation of complex technical systems in the market of technical means of economic

security of legal entities and individuals from the point of view of the implementation of an integration strategy through the prism of consideration of such strategic guidelines as "efficiency" and "elasticity".

proposed to choose the methodology of one of the progressive techniques of the IDEF 3 design approach, which is based on the principles of the concept of "parallel engineering" and project management, as a practical tool for implementing the concept of adapting the strategy of the development of a manufacturing enterprise to the conditions of operation in the chain of creation of complex technical systems on the market of technical means of economic security legal entities and individuals. The result is the formation of a portfolio of strategies of the production enterprise, as well as strategic coordination of the conceptual guidelines for the development of both the chain and the individual enterprise.

Evaluation of current innovative and spatial mechanisms was carried out in the context of resource provision of the basic elements of the development strategy of the production enterprise in the chain of creation of complex technical systems and the feasibility of using the technology known by the acronym SMAC (English Social , Mobile , Analytics , Cloud) is substantiated. This technology makes it possible to obtain positive effects due to better coverage of customers and understanding of their needs, improvement of interaction between manufacturers and the integrator as the final link in the chain of creation of complex technical systems , which has direct contacts with a wide network of customers.

Keywords: management of chains of creation of complex technical systems, market of technical means of economic security, strategic adaptation, integration strategy, strategic alternatives, key determinants of development.

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INTRODUCTION

The experience of the world's leading leaders in various sectors of the economy gives reason to single out the most progressive theories of organization management, which form the foundation of the acquired ability of these leaders to be competitive. In this aspect, the concept of supply chains (SCM - Supply Chain Management), is based on the ability to build effective, first of all, partnership relations with the external business environment - customers, suppliers, distributors and other counterparties, to set up a quick exchange of information between them, as well as to adapt with minimal effort and costs their resources and goals to new market needs.

The characteristic features of the market of technical means of economic security of legal entities and individuals in Ukraine, in which mainly small and medium-sized enterprises operate, lack sufficient strategic potential for development, and therefore, in the vast majority, are low-profitable and unprofitable, determine the writing of the monograph "Business strategy of enterprises in of the chain of creation of complex technical systems" from the point of view of the influence of this form of strategic partnership on the competitiveness of enterprises in the long term.

Strategic aspects are mostly considered from the perspective of a complete supply chain or its key link - the integrator, while strategic aspects of management of those enterprises that are included in similar structures, and in particular, in the chains of creation of complex technical systems, remain little researched. A special place is occupied by the problem of strategic coordination of the goals and tasks of the chain with the goals and strategies of each of its participants, which probably has a significant impact on the effectiveness of both the entire association and each of its participants in particular. On the other hand, there is an urgent need to clarify, in accordance with modern market requirements, including taking into account the global trend of industry towards the level of " Industry 4.0 ", the object and branch composition of technical systems, the main features of complex technical systems as objects the creation of relevant chains, which will allow to deepen the understanding of the conceptual economic foundations of the strategic orientation of such chains in order to adapt to new external challenges.

In view of the above, the problem of substantiating the conditions, mechanisms and tools of strategic coordination of the goals and tasks of the chain of creation of complex technical systems with the goals and strategies of each of its participants , which makes it possible to significantly increase the level of synchronization of the actions of the participants of this association, and as a result - the effectiveness of both the entire chain and each of its subjects acquires special relevance.

CHAPTER 1. COMPLEX TECHNICAL SYSTEMS: FORMATION AND DETERMINANTS

1.1. Evolutionary analysis of the creation of complex technical systems from the angle of revolutionary changes in the information era

Rapid technical progress, due to the dominant role of information technologies covering almost all aspects of economic and social activity of people, creates new challenges for scientists and practitioners, raising the issue of irreversibility of transformations of entire production and management systems. We are talking about the revolutionary trend of modern industrial development, which is outlined by the term "fourth industrial revolution" or " Industry 4.0 ".

A characteristic feature of " Industry 4.0 " is the merging of automated production, data exchange and production technologies into a single self-regulating system with minimal or no human intervention in the production process. Already today, there is a massive introduction of cyber-physical systems into production and breakthroughs in previously unseen fields - artificial intelligence, robotics, the Internet of Things, autonomous transport, 3D printing, nanotechnology, autonomous machines, drones, virtual assistants, translator programs, advisor programs, quantum computers, etc. [130].

From the point of view of the production and implementation of new types and forms of technology (with the use of the latest information technologies) and from the point of view of revolutionary changes in consumer demand, it is possible to state the fact that the concept of "technical system" [33] has acquired a new meaning , especially considering it as an object and the product of various manipulations in network structures such as supply chains.

Examples of the most frequently used definitions of the term "technical system" in theory are as follows:

- A technical system (hereinafter TS) is an artificially created system designed to meet a specific need, existing 1) as a product of production, 2) as a device potentially

ready to produce a useful effect, 3) as a process of interaction with environmental components, resulting in the formation of beneficial effect [67].

- A technical system is a complete set of a finite number of interconnected material objects, which has sequentially interacting sensory and executive functional parts, a model of their conditioned behavior in the space of stable steady states and the ability, when in at least one of them (target state) , to independently perform the consumer functions provided for by its design under standard conditions [32].
- A technical system is an artificially created set of elements and relations (connections) that form a complete structure of an object that has properties that cannot be reduced to the properties of elements and is designed to perform useful functions. It consists of elements (differing in properties), connected by connections, which enter into certain relations (conditions for implementing the properties of the elements) among themselves and with the external environment in order to implement a process (a sequence of actions to maintain a state) and perform a TC function [11 7].
- A technical system is a set of elements that transform, store, transport or control materials, energy and/or information for specific purposes [206].

Summarizing the typical definitions of the concept of "technical system" given above, it is possible to single out its two generally recognized properties: first, a technical system is an artificial product of human activity, which is developed, manufactured and operated by people, and, in fact, is a component of combined, human-technical systems (they are also called man-machine systems); secondly, the purpose of creating a technical system is to perform the relevant consumer functions in the process of operation.

The term "technical system" serves as a generalizing term for all types of machines [2, 23, 113, 59, 71, 124, 165]. It is generally accepted practice to refer to technical systems: individual machines, devices, devices, hand tools, their elements in the form of nodes, blocks, aggregates, etc. [118, 119]. A number of authors refer to technical systems not only technical objects - products (from a small nut or washer to large turbines), but also structures (from small buildings to large transport networks, technical complexes) [118, 169, 182]. The variety of objects that can be combined into the class "technical

system" naturally expands the scope of their use and includes the following branches of the economy (Table 1.1).

Table 1.1

Examples of technical systems

Branch of economy	Technical system	
	Appointment	Machine
Mining	Production Transportation Enrichment	Notching machine Conveyor Sorting machine
Energy	Steam production Production of electricity	Steam boiler, drum Steam turbine, hydro turbine, generator
Metallurgy	Cast iron production Steel production Roll production	Blast furnace Martenivska oven Rolling state
Metalworking industry	Pressure treatment Cutting processing Heat treatment Casting Drafting	Press, hammer Machine Oven Molding machine Conveyor
Chemical Industry	Oil refining and processing Production of dyes Production of plastics	Tank Reactor Column
Pharmaceutical industry	Production of medicines	Press, calender
Transport	Railway connection Water connection Air communication	Locomotive, wagon Steamer Plane
Textile industry	Production of textiles Production of finished products	Spinning machine, loom Sewing machine
Food Industry	Production of flour Production of fats Production of milk	Mill Press Centrifuge
Medicine	Diagnostics Therapy	X-ray machine Prosthesis
Typography	Printing	Printing machine
Agriculture and forestry	Land cultivation Harvesting Harvesting wood	Tractor with plow Combine Electric stove

Note: compiled from sources [23, 116]

The classes presented in this scheme correspond to known branches of technology. This approach: firstly, does not give an exact definition of the concept of "technical system", as it can be interpreted both as an object of mechanical engineering and as an object of electrical engineering; secondly, arrangement of systems according to the principles of their operation - mechanical, electrical, etc. - it also does not allow to unify the properties and unambiguously define the classes of system elements, as hybrid

systems dominate today [116]; thirdly, this table does not include an industry that plays a leading role in the information era of industry - the industry of information and communication technologies [1](English, Information and Communication Technologies , ICT), in which technical means are their main hardware part.

At this stage of the development of industry, which is closely integrated with modern information technologies, we can state a significant expansion of the object composition of technical systems, the growth of the role of complex technical systems simultaneously with their acquisition of new properties [3; 114; 160; 167; 183; 205; 178]. Summarizing the material presented above and systematizing the dominant theoretical constructions that make it possible to divide technical systems according to the level of complexity into two large groups - simple and complex, it seems possible: 1) a visual representation of the object composition of each of these groups in accordance with modern market requirements (table 1.2, 1.3); 2) highlighting the main features of simple and complex technical systems (Table 1.4).

Table 1.2

Object composition of simple technical systems in accordance with modern market requirements

Objects	Characteristic	Example
1	2	3
- *Structural element* - *Detail*	Elementary system made without assembly operations	Bolt, bearing sleeve, spring, washer
- *Node* - *Mechanism*	A simple system that performs a simple function	Gearbox, hydraulic drive, lathe headstock

Continuation of the table. 1.2

1	2	3
- *Instrument*	Technical object that _ _ _ has auxiliary purpose (control , management , measurement , regulation) and designed for relief labor a person by partial or full her replacement	Gyroscope, voltmeter, optical-electronic, electromechanical devices
- *Device*	A collection of a finite number of interconnected material objects, which has a model of conditioned behavior and an equilibrium steady state under standard operating conditions	Locking device , alarm device , device for protection

Note: formed by the author based on the study of theoretical and applied materials

[1] ICT - a set of methods, production processes and software and technical means , integrated for the purpose of collection, processing, storage, distribution, display and use information in her interests users.

Table 1.3

Object composition of complex technical systems in accordance with modern market requirements

Objects	Characteristic	Example
1	2	3
TYPICAL LIST OF FACILITIES		
Machine	A technical object consisting of interconnected functional parts (parts , nodes , devices , mechanisms , etc.) that uses energy to perform the functions assigned to it	A car, a lathe, an electric motor
Apparatus	A technical facility designed for obtaining or converting other (including mechanical) types of energy	Television, telephone, camera, rocket, reactor
Installation	A complex system consisting of machines, groups and elements that perform a number of functions	Technological line
Structure / Building	A non - moving man-made structure (also a building) of relatively large size	Engineering structures, large transport networks, technical complexes
Enterprise	A complex system consisting of a set of elements and relationships between them that perform a number of functions	Factories, industrial plants
SUPPLEMENTED LIST OF OBJECTS		
Electronic digital programmable device	A complex system designed to perform calculations according to a predetermined algorithm.	Personal computer / computer system, server
Gadget	An electronic device or other device that combines high technology and a very real application	Mobile phone, smartphone, portable game console, multimedia player, GPS navigator, e-book
Intelligent technical systems	Complex systems based on innovative technologies consisting of: basic system, sensor technology, drive technology and information processing technology.	Intelligent technical systems of the OWL cluster

Continuation of the table. 1.3

1	2	3
Networks that are necessary for the creation, storage, management, transmission and retrieval of information	A complex of technical means of telecommunications and facilities designed for routing , switching , transmission and/or reception of signs , signals , written text, images and sounds or messages of any kind via radio, wire, optical or other electromagnetic systems between terminal equipment .	Local, global, city networks, Internet, Intranet
Cyber-physical system	An information technology system that involves the integration of computing resources and physical processes. In such a system, sensors, equipment and information systems are connected throughout the entire value chain, which goes beyond a single enterprise or business. These systems interact with each	Autonomous robots, autonomous transport, Internet of things, information security system

	other using standard Internet protocols to predict, self-adjust, and adapt to changes.	

Note: formed by the author based on the study of theoretical and applied materials

Table 1.4

Comparative characteristics of key features of simple and complex technical systems

Signs of simple technical systems	Signs of complex technical systems
Designed to perform one function	Designed to perform a set of functions
They are based on the transformation of one object (matter / energy / information / biological objects)	They are based on the simultaneous transformation of several objects (matter and energy, matter and information, energy and information)
Use of traditional materials	Combining the use of traditional and modern materials
Use of traditional production methods	Combining the use of traditional and modern production methods, often merging automated production, data exchange and production technologies into a single self-regulating system, with minimal or no human intervention in the production process
The dominant type of production is serial, mass production	The dominant type of production is serial, single
They usually occupy an intermediate place in the technical process	Take the final place in the technical process
Usually based on the same principle of operation (mechanical / hydraulic / pneumatic / electronic / chemical / optical / acoustic)	Usually based on a combination of different principles of operation (for example, mechanical, electronic and software)

Note: formed by the author based on the study of theoretical and applied materials

Supplementing the object composition of complex technical systems in accordance with modern market requirements naturally expands the scope of their use, including , first of all, the field of information technologies and those market segments whose products are closely integrated with them. One of these segments is, in particular, the market of technical means of economic security of legal entities and individuals, the products of which are both simple and complex technical systems that satisfy the needs of consumers in both physical and informational protection.

1.2. Key determinants of the development of chains of creation of complex technical systems

The global trends of directing the development of world industry to the level of " Industry 4.0 " and the penetration of information technologies into all spheres and aspects of human activity increasingly emphasize the dependence of enterprises not so much on the availability of material resources, but on the ability to build effective, first of all, partnership relations with the external environment - customers, suppliers, distributors and other counterparties, to set up a quick information exchange between them, as well as to adapt their resources and goals to new market needs with minimal effort and costs. In this aspect, the concept of supply chains (SCM - Supply Chain Management), as an integrated platform for the voluntary association of enterprises and organizations in the value chain in order to obtain satisfactory results while simultaneously achieving goals in the area of efficiency, quality, elasticity, customer service, innovation, responsibility to society and the environment.

"Strategic partnerships of enterprises exist now in almost all industries and are becoming a necessary factor in the growth and development of companies. Western scientists, on the basis of conducted research, claim that partnerships are a necessity for the survival and development of the enterprise" [10; 45; 47 ; 50; 56; 64, p. 126; 82; 83; 9 4 ; 135] .

Good reasons for the proliferation of supply chains are given in Table 1.5.

Table 1. 5

Reasons for the proliferation of supply chains

Reason	Explanation
· *dominance of the client's market (a market where the client determines the volume and quantity of goods he wants to purchase)*	caused the need to satisfy a large number of customer requirements in the conditions of a significant supply of goods in terms of ease of purchase (anytime, anywhere), availability of the product (requiring the maintenance of appropriate stocks), low price, individual adaptation to the preferences of the customer
· *increased competition*	led to the need to differentiate products according to the quality of the materials used, their quality level and production technology, and the quality of service
· *the service time for customers and their orders is getting shorter and shorter.*	this causes the need for careful analysis and forecasting of customer needs, timely creation of stocks, data exchange with suppliers and customers
· *expansion of the supply and sales market*	led to the fact that enterprises buy raw materials or sell their products almost all over the world (globalization of supply and distribution); enterprises are constantly looking for new suppliers and customers in connection with the growth of supply and distribution costs

Reason	Explanation
· *reduction of the life cycle of the product on the market*	leads to a higher intensity of all measures to achieve the planned sales volume in a shorter period of time
· *trends towards concentration of trade*	cause the supply of a large number of different products to be concentrated in shopping centers with numerous retailers, which requires good coordination of supply and adaptation of suppliers to the possibility of receiving a large number of orders
· *development of information systems, technologies, methods of communication and automatic identification*	increases the requirements of companies and customers in terms of data access, traceability and high-speed processing for mass flows of goods and the automatic and error-free use and reading of product data in the supply chain

Note: source [31; 50; 62]

In general, a number of foreign scientists, including Bozart C.B. , made a significant contribution to the development of the theoretical platform of this concept . and Handfeld R.B. [148], Chopra S. and M eindl P. [152], Christopher M . [53; 153] , Ciesielski M. and Dlugosh Y. [154], Davande M ., Geismar G.N., Hill N.Zh. and Sriskandarajag C . [158], Defi C . C. _ and Stenk T.P. [159], Fisher M.L. [163] , Hugos M . [170], Hult J. T. , Kitchen D. Zh. and Arrfelt M. [172] , Hoffmann E. [168], Me ntzer J. T . [189] , Shimonik A. [204] , Stank T.P. and Davis B.R. [203] as well as well-known domestic authorities in the theory of logistics and supply chain management: Krykavskyi E.V. [43-52], Chukhrai N.I. and Girna O.B. [133-134], Kolodizeva T.O. [40], Tankov K.M. and Bahurets O.V. [114-115], Posylkina O.V. and Khromykh A.H. [84] . tools of logistics and marketing in achieving competitive advantages by these structures and a number of other important provisions that will form the basis of further author's research on selected scientific issues.

Summarizing the approaches to enterprise management from the angle of its place in the process of creating consumer value for the end consumer, which is reflected in the concept of the supply chain, two fundamental approaches can be distinguished [50; 162, p. 95] :

– the first interprets the supply chain as a process and emphasizes value creation as the main goal of this process. This equates the supply chain to the value chain. The definition characteristic of this approach is: a supply chain is a sequence of events in the continuous movement of goods that increases their value.

– the second (more common in the literature) pays attention to the institutional aspects of the supply chain and interprets the supply chain as an organization. A typical definition for this approach: the supply chain is a group of enterprises (manufacturers and service providers) that cooperate with each other and carry out joint activities necessary to satisfy the demand for products that move in this chain from the source of raw materials to the final consumer. At the same time, enterprises are connected with each other by material, information and financial flows.

The basis of the needs of the supply chain is the structure of the product , based on which the amount and type of materials or components required by the manufacturer for the production of finished products is determined. Often , when there are many suppliers in a manufacturer's supply chain due to a complex product structure, the asset of time acts as a supply hub in the supply chain. At the same time, if the company wants its products to be competitive in the market, the activities related to the creation and delivery of products must include a complete/integrated supply chain . Supply Chain), a typical example of which is an industrial chain, characterized by a relatively stable form of contractual association of organizations that have common goals at the strategic level, and therefore a common mission, vision and values must be mandatory for them [52 , p. 33-34].

Summarizing the most important features of these structures, we can state that the characteristic features of integrated supply chains include [1; 51; 52, p. 40-41; 109; 123]:

- long-term nature of cooperation ,
- exchange of information with partners and monitoring activities;
- coordination of the flow of products , information and money;
- joint planning;
- reduction of chain costs;
- inventory management in the chain ;
- coordination of procedures and rules of cooperation ;
- joint risk of enterprises.

In general, analyzing and systematizing existing approaches to supply chain management from the angle of finding an answer to the question "what are the critical

factors that determine the success or failure of supply chain management?", several fundamental provisions can be identified:

- the dominance of the process approach to supply chain management, which allows for the integration of all activities into the key processes that take place in the chain;
- active use of information technologies;
- development of partnership relations;

Since supply chains are constantly adapting to changes in supply and demand for the underlying product [134], the very understanding of the characteristics of this product and the market in which it is sold is the starting point for the formation of a supply chain strategy, its structure and key parameters management of operational activities, as well as improvement of existing supply chains.

Based on the systematization of information about the most successful supply chains on a global scale, presented by the world's leading research and consulting company in the field of information technologies - Gartner , Inc. , it is possible to trace both the dynamics of the main leaders and identify trends from the point of view of each of them belonging to the chain supplies of consumer or industrial goods, as well as the dominant type of activity and product specialization. A visual reflection of this opportunity is the table of supply chain leaders and their activity and product specialization for the period 2014-2016, created by the author (see Appendix A).

The business management model, based on the concept of supply chains, is currently the dominant type in global economic activity processes, providing world leadership in various sectors of the economy, be it industrial production, production of IT products, trade or the service sector. Product specialization of supply chains of manufacturers, which are the main object of our research, indicates a characteristic feature observed in their structure - more than half of the most successful supply chains in the field of production belong to manufacturers of IT products [145-147]. This emphasizes not only the importance of IT technologies in the conditions of the information society, but also the role played by simple and complex technical systems in the process of their production, as evidenced by the product section based on a detailed study of those

products around which leading supply chains are formed.

If we take as a basis five basic elements, around which the adoption of operational and strategic decisions regarding the actions of any supply chain is focused (Fig. 1.1), then we present information about the characteristic features, object composition and industry affiliation of the object we have chosen. object of this study, namely technical systems, will allow to answer, first of all, the key questions of the first and partly of the second elements.

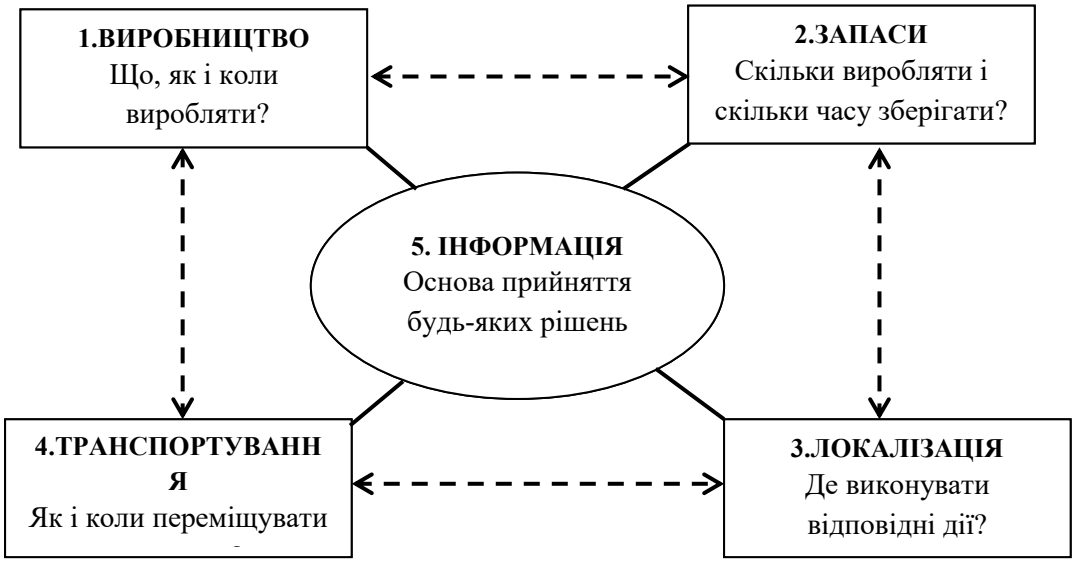

Fig. 1.1. Five basic elements of supply chain management

Note: source [50, p. 297-311]

For this purpose, we will conduct a comparative analysis of simple and complex technical systems from the point of view of managing supply chains of such goods according to technical, production and economic criteria (Table 1.6) [99].

Presented in table. 1.6 comparison of simple and complex technical systems, from the point of view of supply chain management of such goods, makes it possible to identify significant differences between these two types of technical systems, which obviously indicates the need to distinguish between approaches to the management of supply chains of simple and complex technical systems. In addition, it also provides a better understanding of the specifics of each of the supply chains and identifies areas of their critical success factors and areas that are typical constraints or bottlenecks of both types of supply chains. For example, for the supply chains of simple technical systems, the

critical success factor is the effect of the scale of production, the active role of distribution, and the limitation is a significant number of substitute goods, a relatively lower level of margin, while for the supply chains of complex technical systems - the Internet, IT-technologies, innovations, and the limitation is high volatility of demand, high capital intensity.

Table 1.6

Comparison of simple and complex technical systems from the point of view of their supply chain management

	Comparison criteria	Simple technical systems	Complex technical systems
Technical and production parameters	1. The level of structural complexity	Low	High
	2. Design term	Short	Long
	3. Production preparation period	Short	Long
	4. Duration of production	Short	Long
	5. Term of operation	Depends on the technical object	Usually long
	6. Type of application	Usually universal	Specialized
	7. A place in the technical process	Final and/or intermediate	Usually final
	8. Level of standardization	Usually high	Low
Economic parameters	9. Type of production	Single, serial, mass	Single / serial
	10.Required stock level	Not high	High
	11.Purchase price	Low/medium	High
	12.Cost of operation	Usually low	Depends on the specific object
	13.Sales volume	Significant / Insignificant	Considerable
	14.Capital intensity	Lower compared to complex technical systems, but higher compared to consumer goods	High
	15.Product type according to final demand	Usually goods with dependent demand	Goods of dependent and independent demand
	16.Volatility of demand	low	Medium / High
	17.Frequency of purchases	High / Medium	low
	18.The time required to order products	Short	Long
	19.Available level of substitutes	High	Relatively low

Note: compiled by the author

Apart from moreover , it is obvious structural complexity the last ones special scales , nearby from processes movement material flows , provides technological processes , starting from stage design , technological preparation production , directly to himself process production , characteristic a sign whose is many consolidation operations creation modular constructions complex products from simpler - details , subgroups and

groups , finishing stage introduction in operation , installation and further technical service _ In our opinion, such a feature of the supply chains of complex technical systems makes it necessary to clarify the very concept of "supply chain", which in relation to complex technical systems should be used as a "chain of creation", that is, a chain in which, next to the priority of managing the supply system of raw materials, semi-finished products, spare parts and components, packaging materials for products and finished products (goods), technological processes related to the specifics of creating complex products and putting them into operation play a special role. At the same time, if such a distinction expands the concept of "supply chain" in its process interpretation, from an institutional point of view, the chain of creation of complex technical systems will remain identical to the supply chain of such products, covering manufacturers and service providers who cooperate with each other, carry out joint activities necessary for satisfaction of demand for products that move in this chain from the source of raw materials to the final consumer and are connected by material, information and financial flows [2].

Therefore, knowledge about the advantages, limitations and essential features of each type of product carries valuable information for the future adjustment of the chain of creation of complex technical systems and effective management of its key parameters, and can serve as a useful tool from the point of view of adapting strategic and operational management tools of such chains to modern market requirements.

Therefore, one of the consequences of the revolutionary trend of modern industrial development, outlined by the term "fourth industrial revolution" or " Industry 4.0 ", is a significant expansion of the object composition of technical systems, functions, spheres of their use and signs that reflect their properties. Highlighting the key features of simple and complex technical systems, in accordance with modern market requirements, makes it possible to identify significant differences in the approaches to the management of chains of their creation, as well as to better understand the specifics of each type of chains

[2] In view of the above, further on in the text the author will use the term "chain of creation of complex technical systems", which in the institutional aspect is identical to the term "supply chain of complex technical systems"

and to identify areas of their critical success factors and areas that are their typical restrictions. Further in-depth study of the applied aspects of the management of chains of the creation of complex technical systems from the point of view of the formation of the conceptual economic foundations of the strategic orientation of such chains in order to adapt to new external challenges, in addition to the emphasis on the mentioned issues, should first of all be based on the clarification of the strategic profile of these chains.

SECTION 2. ENTERPRISE IN THE CHAIN OF CREATION OF COMPLEX TECHNICAL SYSTEMS

2.1. Strategic alternatives of production enterprises of chains of creation of complex technical systems in the era of global informatization

In the 21st century there is a transformation of industrialization and a transition from electronic and information technologies to a new generation of production systems NGMS (English Next Generation System Manufacturing), also known as intelligent production systems, capable of integrating information processing with matter processing. This direction can be characterized as "digitization of matter", and it is implemented by intelligent factories controlled by cyber-physical systems CPS (English Cyber-Physical Systems) in the environment of the Internet of Things (Internet of Things). According to Plattform Industrie 4.0 [140; 156; 191; 192] this will have a major impact on value creation, business models, derivative services (low-level services) and work organization and will force today's manufacturing companies to look for solutions, primarily, in the directions of: (1) horizontal integration through the value network (2) complex digital integration of engineering in the entire chain, as well as (3) vertical and network integration of production systems.

In fact, for traditional enterprises, functioning in such conditions, despite the emergence of new dimensions for obtaining advantages, is characterized by a number of significant complications and threats: enterprises should act by removing barriers between informational and physical structures; interdisciplinary thinking is necessary, both in the technical and social spheres; the continuous process of learning and cooperation is important [137; 138; 139; 166; 195]. These changes force entrepreneurs to reorganize management processes and inevitably move towards the concept of management 3.0 (Table 2.1).

Table 2.1

Concepts of management from 1.0 to 3.0

Management 1.0	Management 2.0	Management 3.0
Hierarchy	Model	Complexity
- issuing commands and ensuring control over their execution (Command and Control) - hierarchy - flow of information and decisions from above (Top-Down management) - rigid organizational structures	- response to management weaknesses 1.0 - implementation of processes and their improvement (English: Business Process Reengineering, Total Quality Management) - a learning organization - provides top-down tasks (hierarchy) - inherits most of Management 1.0's problems	- an idea based on the theory of complexity of systems (Complex Adaptive Systems Theory) - is considered as a network of connections between its participants - the self-organized network is based on models (Management 2.0), which can be positive, but not always appropriate - management is focused on people and their relationships, not on processes and models - empowerment of people - specifying the framework within which teams should operate, instead of total control - shortening the duration of feedback (English Feedback)

Note: source [5 5 ; 12 1]

In today's economic conditions, managers of enterprises increasingly come to the conclusion that resources and opportunities for the enterprise are not enough to achieve strategic goals and acquire sustainable competitive advantages. The concepts of "co-opetition " and " win - win " ("co-competition" and "together we will do - together we will win") are becoming more and more widespread, as a result of which strategic partnerships of enterprises are not considered as an exception, but become a strategic imperative for the functioning of successful enterprises. This is evidenced by the spread of various types of strategic partnerships in the economies of Western countries. There is a trend of increasing clusters, alliances, network organizations and other strategic partnerships (58; 62; 64, p . 125-131; 86) .

As we can see, the fundamental foundations of the concept of "co- opetition ", " win - win ", and management 3.0 are in many ways related to the concept of the supply chain, however, like the latter, they do not provide ready-made options, the implementation of which could ensure the guaranteed achievement of the expected effects . Rather, these concepts set the direction of development, determine strategically

important priorities , while the choice of the path and methods of their achievement depends on a wide variety of factors, conditions and peculiarities of the functioning of specific business units. This actualizes the importance of the analysis of strategic alternatives of production enterprises of supply chains in general, and, in particular, of chains of creation of complex technical systems in the era of global informatization from the point of view of the specified concepts.

Analysis of the fundamental provisions of strategic analysis, revealed in the works of scientists over the past twenty years [39 ; 5 5 ; 66; 12 1 ; 150; 151, c . 793-815; 17 1 ; 193, c . 61-78] , gives reason to assert that it is strategic factors that have the most significant impact on the development of any business unit, leading to the creation and realization of its potential in achieving success. Without a well-developed strategy, the company's short-term decisions will conflict with long-term goals, depriving the company of potential for development.

At the same time, the functioning and interdependence between the strategic potential of the supply chain and the business strategies of its participants requires a more detailed study, since this issue is practically not disclosed in the existing literature. Therefore, a necessary step is to identify strategic alternatives of business units as potential participants of various types of chains, first of all, the creation of complex technical systems, followed by their analysis to select the most relevant and promising ones, from the point of view of ensuring the realization of the main goal of the chain's functioning.

In general, in the theory of strategic management, three classic levels of strategy can be distinguished, at which the process of adopting a strategy aimed at obtaining a competitive advantage takes place: the corporate level (general strategies), the business level (competitive business strategies), and the functional level [15; 26; 102; 126] (Table 2.2).

Table 2.2

Three levels of strategic management and their corresponding strategies

I. GENERAL STRATEGIES[3]			II. COMPETITIVE BUSINESS STRATEGIES[4]		III. FUNCTIONAL STRATEGIES[5]
Kinds	*Methods of their implementation*	*Dominant field of use*	*Kinds*	*Dominant field of use*	
1. Growth strategy	Concentration Integration Diversification: concentrated, horizontal, conglomerate Total Quality Management (TQM) Product repositioning Customization Reengineering	Dynamic industries with rapidly changing technologies	**1. Cost leadership strategy**	Industries from: strong price competition, standard goods, low costs for customer reorientation	**1. Marketing strategy** **2. Production strategy** **3. Financial strategy**
2. Strategy of stability / stabilization (limited growth)	Integration Diversification: concentrated, horizontal, conglomerate Product repositioning Reengineering Termination of investment Mergers and acquisitions Accession	Industries with stable technology	**2. Differentiation strategy**	Industries in which product variety is most valuable to consumers	**4. Personnel management strategy**
			3. Focusing strategy	Industries in which consumers can be clearly divided according to specific criteria, the satisfaction of whose needs requires high specialization	**5. NDNKR strategy** **6. Environmental strategy**
3. Survival strategy (reduction)	Diversification: concentrated, horizontal, conglomerate Product repositioning Reengineering Termination of investment Mergers and acquisitions Accession Restructuring Bankruptcy / Liquidation	Industries saturated with goods	**4. Strategy of preemption (first mover)**	Emerging industries, dynamic industries with rapidly changing technologies	**7. Logistics strategy**

[3]The general (portfolio) strategy of a diversified enterprise, which is developed at the corporate level and determines the specific composition and structure of strategic business units (SBUs), effective (synergistic) relationships and ways of distributing resources between them.
[4]A set of actions and approaches aimed at ensuring effective activity in one specific area of business.
[5]Management action plan of a separate unit engaged in a separate area of business.

Note: compiled on the basis of [9; 19; 41; 105; 112])

At the same time, E. Hofmann in his recent work [168, c . 256-276] adds another level - the network level, singling out the network strategy (English Network strategy), the scope of which is the inter-organizational interaction of the firm with other companies. According to E. Baraldi [142, c . 99-126], the network strategy consists of structural (namely, the determination of the content of the relationship, the formation of network structures and the evaluation of the correspondence of network goals), as well as dynamic components (combination of resources during interaction through inter-organizational procedures and joint projects).

The focus and purpose of strategy (strategization) are different for different levels, but each level can influence the others (through interrelationships). Agreeing with [163, c . 256-276], its competitive advantage will depend on the strategic relationship between the internal aspects of the organization and the external environment . Possible options for achieving this strategic relationship depend on the use of one of two traditional approaches: resource - based Approach) or market-centric (English Market - Based Approach), which are often confrontational with each other. Current discussions among scientists regarding the priority of one of these approaches are still ongoing, dividing until recently the scientific environment into two camps - strict supporters of the resource-centric approach, according to which the potential the enterprise depends on the level and quality of its resources and supporters market-centric, according to which the emphasis is shifted to customer satisfaction and service level [128]. The prioritization of one of these approaches is also embedded in the basis of two confrontational concepts - the concept of efficiency (which corresponds to the framework of the lean concept) and the concept of elasticity (which corresponds to the framework of the agile concept) [54; 184]. At the same time, recently, given the obvious limitations of each of the approaches, the formation of a third camp has been observed - supporters of a compromise solution and a combination of these confrontational concepts [179, c . 12-21], which actually forms a new approach in business management, according to which the emphasis is shifted to the development of mutual relations (eng. Relation - Based Approach), which conceptually complements and significantly expands the network level of strategic management, also

correlating well with the concept of "supply chain" as a concept whose fundamental basis is strategic partnership.

According to the elasticity concept, a firm gains competitive advantage by identifying external opportunities and then aligning the company with those opportunities. But a strategy based only on the argumentation of the relationship "structure-behavior-productivity" may "not work", especially in the conditions of a changing external environment [46].

The efficiency concept, instead, is based on a resource-behavior-performance argument and emphasizes the importance of resources and capabilities, while competitive advantage and performance are based on dynamic flexibility. Focusing on a single resource and capability also often "doesn't work" in practice, in this case, due to non-compliance with market requirements. Thus, the "efficiency+elasticity" trade-off, based on the relationship-behavior-performance correlation argument, is the conceptual model that is able to reconcile the external environment of the chain with the capabilities of the supply channels at the same time.

A detailed analysis of the relationship between the supply chain strategy and the three classic levels makes it possible to determine the main strategic decisions/competitive strategies, the use of which is most characteristic in the relationship "chain strategy - strategic level" [149; 168; 172; 207]:

1. In coordinating the influence of the supply chain strategy (Supply Chain Strategy, SCS) on the functional level (Functionallevel, FL), the main attention is paid to such competitive supply strategies as lean, agile, leagile.

2. In coordinating the influence of SCS on the business level (English Businesslevel, BuL), the main attention is paid to such competitive strategies as: cost reduction strategy, concentration strategy, differentiation strategy, product manufacturability strategy, logistics strategy, "blue ocean strategy", which have a direct impact on the main activities of the business unit. At the same time, the choice of one or another strategy is influenced by many factors: the type of market served by the company, classification of the product into the category of standard or differentiated, features of the production process, demand, and others.

3. In aligning the impact of SCS on the corporate level (for diversified business units) (Corporatelevel, CL), the main focus is either on minimizing costs and maintaining efficiency or ensuring high elasticity or the ability to find a balance between efficiency and elasticity.

The above makes it possible to differentiate the strategic alternatives of manufacturers of complex technical systems in the chains of their creation depending on such key criteria as: strategic orientation of the chain, market factors of success, the most important element of competitive advantage, type of product, demand and duration of delivery [97] (Table 2.3).

Such a multi-criteria approach to the formation of a portfolio of competitive strategies of manufacturers makes it possible to carry out a detailed analysis of the actual strategic alternatives of enterprises, taking into account their industry specifics.

Table 2.3

Strategic alternatives of manufacturers in chains of creation of complex technical systems depending on them strategic orientation

Strategic orientation of the chain	Market success factors	The most important element of competitive advantage	Goods	Offer	Demand	Conceptual basis of competitive strategies	A portfolio of competitive strategies of the manufacturer
Concept efficiency	Quality Cumulative delivery time Accessibility	Low costs	Standard	Long total delivery time	Stable: intended	Lean	Cost reduction strategy Concentration strategy
					unpredictable	Leagile	
Concept elasticity	Quality Costs Cumulative delivery time	Product availability	Differences yovani	Short total delivery time	Variable: intended	Lean with continuous improvement	Differentiation strategy Product manufacturability strategy
					unpredictable	Agile, Quick Response	
The concept of elasticity+ efficiency		Low costs + Product availability	Standard/ Differences yovani	Long total delivery time	Stable/variable: Unpredictable/ intended	Leagile	Logistics strategy Blue ocean strategy

Note: Improved based on: [134]

2.2. Typical limitations of the business strategy of enterprises in the chain of creation of complex technical systems.

The most acute problem in the development of Ukrainian business and the production sector is the "constantly changing, highly contradictory and unpredictable" environment due to the lack of established rules of operation [86]: "business does not understand what changes it should expect next: if any change has occurred today, it is completely does not mean that it will exist in a year." The second problem is the high cost of credit resources. Under such conditions, in combination with the backwardness of the state business support infrastructure, it is a particularly acute problem for the domestic manufacturer to optimize its activities in areas where a real effect can be achieved. The use of modern technologies in the organization of business processes, the introduction of various production innovations, cooperation between different sectors and types of business, etc., are at the fore in solving this problem. In other words, not hoping for "someone from outside", but diligently working on your "internal opportunities for growth". Strategic aspects of the development of enterprises continue to lead the rating of the most popular directions of finding opportunities for growth in difficult and uncertain conditions, which are the object of attention not only of scientists, but also of practitioners, business consultants, etc.

Since the primary object of the work is the study of the prospects for the development of manufacturers of complex technical systems, which include a large variety of technically complex products, and since there is no universal combination of strategies, we will focus on the analysis of strategic alternatives of the manufacturer of spare parts in the chain of creation of complex technical systems .

To carry out activities related to the production of replacement parts, it is necessary to take into account a significant number of factors, namely [38, c . 836-842] :

- the market is characterized by intense competition, and knowledge-intensive goods are characterized by constant progress in technical and innovative complexity, and it is also necessary to take into account that the range of replacement parts is large;

- demand forecasting is important in production. For spare parts, the difficulty of forecasting their demand is characteristic .

These features make it possible to ensure the availability of replacement parts for consumers and to fulfill quick orders (express).

The difficult economic situation that has developed in the market of spare parts (and not only) requires the optimization of production activities, supply, the field of sales activities (customer service), which will lead to obtaining positive results.

Of great importance is the reduction of costs, which becomes possible if you pay attention to production equipment, increase its productivity, and also use outsourcing in certain areas of activity of enterprises that are manufacturers of spare parts.

Summarizing, the authors [38] included the following three market factors in the list of components of success in the production and trade of spare parts: high availability, high speed of order fulfillment, costs.

The listed market factors will help to make the production and trade of spare parts successful. The relationship between the manufacturer and the consumer will be better in the long run and it will also affect the image of the manufacturer.

Therefore, taking into account the factors of the market success of such manufacturers, as well as the assignment of the vast majority of them to the standard type of products, the production of which is mostly a standardized process characterized by stable demand, it is possible to identify a conceptual basis for choosing a potential portfolio of competitive strategies. The conceptual basis in this case will be the concept of Lean , in the pure case, if the demand is well predictable from the customers in the chain, or if the demand is difficult to predict - the concept of Leagile . It is generally advisable to include cost reduction and concentration strategies in the recommended portfolio of manufacturer strategies.

At the same time, in the case of variable demand and/or hard-to-predict replacement parts in the chain of their creation, this procedure can be complicated, since poor predictability of demand has a significant impact on inventory management. The price of spare parts will increase if the company will stock them (that is, work in a warehouse). Thus, maintenance of original replacement parts becomes less affordable. If

there is a shortage of replacement parts, then the speed of delivery (and not the price) will be more important for the consumer, which may become longer in terms of performance.

In particular, to solve these problems, the authors of [40] suggest using such control elements for replaceable parts as:

– production volumes of spare parts must be planned dynamically;

– it is necessary to consider the placement of elements of the chain of spare parts;

- it is necessary to provide the opportunity to implement individual orders for this type of products;

- more rational management will become possible if production is separated for each type of product in question.

In our opinion, the application of these components can be greatly simplified by integrating the manufacturer into the chain of creation of complex technical systems and giving him access to joint projects, which will be implemented here as part of the implementation of a joint corporate strategy.

It is known that in the environment of supply chains, if the interests of any enterprise diverge from the interests of other participants, its activities will not increase either overall corporate or individual efficiency. On the contrary, by making joint strategic decisions, enterprises can achieve joint benefit and competitiveness of the entire chain.

Taking into account the modern production of complex technical systems as a whole, under the influence of global trends, the main requirements of a systemic nature to this link in the chain are attributed [18, c . 5]:

- reducing the duration of the production cycle;
- maximum reduction in the level of production stocks;
- increase in reliability in compliance with order fulfillment deadlines;
- formation of flexible production - the possibility of entering the market with several product options that meet the requirements and needs of consumers.

In these conditions, the decisive importance belongs, first of all, to efficient productions, which, in turn, can become so in case of an increase in the level of specialization, including by transferring less efficient processes to the outside thanks to

the progressive development of outsourcing, which is a characteristic way of increasing efficiency in network structures of the type supply chains [5, 13, 28]. This makes it possible to increase the flexibility of the main enterprise due to the growing variety of products and, accordingly, its service provision, to reduce a number of costs associated with maintaining its own main, management and service processes. The decisive point here is the target aspect of planning and management of flow processes.

From the point of view of a specific company, for example, a manufacturer in the chain of creation of complex technical systems, then adapting its strategy to the chain strategy will, first of all, require the positioning of the company within this chain, which will require taking into account its entire configuration - key suppliers, key customers or key service providers. Since in chains, the joint efforts of all participants can increase the efficiency of the entire network, it is further appropriate to identify key activities such as joint pooling of resources, integrated planning process and unification of real-time order management systems. The speed and efficiency of this task will largely depend on the degree and intensity of the implementation of information technologies and the management of information flows in general, as well as how effective the information support system of the chain and each of its links is.

In this aspect, the leading role belongs to such technologies as C PFR and VMI - in the field of inventory management, forecasting their replenishment, MRP / ERP - in the field of planning needs for materials and resources between participants within the entire chain, SR M - in the field of managing relations with suppliers, for large-scale electronic data exchange - EDI , the introduction of the same encryption of goods and the use of a single classification of products moving in the chain, the joining of companies to the Global Data Synchronization Network (GDSN), which collectively corresponds to the modern direction of building strategic cooperation within the supply chain, which is based on "improving the relationship between the buyer and the supplier" (English buyer supplier relationship - BSR). Thus, a number of foreign authors [196] consider BSR to be a critically important factor in the chains of creation of complex technical systems from the point of view of the possibility of obtaining competitive advantages by all participants in the era of informatization.

CHAPTER 3. The system of technical means of economic security as an object of a complex technical system

3.1. Product segmentation of the market of technical means of economic security of legal entities and individuals

Based on the logic of life, the typology of sources of danger and threats, the following types of security are distinguished: political, ecological, social, military, technological, ecological, spiritual, religious, informational, sociocultural, state, genetic, food, medical, demographic, nuclear [60] (Appendix B). At the same time, according to the levels of construction of the economic security system - national security, enterprise security, personal security, etc.

"Never in the 25 years of its independence has Ukraine faced so many problems related to its national security. The annexation of Crimea, Russian support for the separatist conflict in eastern Ukraine, a spike in crime across the country, as well as the spread of illegal arms trafficking have made security and safety a top priority for the public and private sectors. According to the forecasts of most experts, in the coming years the situation with security and security in Ukraine will be similar to that observed in Georgia, Moldova and Israel. All Ukrainians face an urgent need for stronger security with less money" [87]. In this aspect, the research of the state and trends of the market of technical means of economic security of legal entities and individuals is relevant.

Economic security of an enterprise according to [4] is a state of a business entity in which, with the most effective use of corporate resources, it achieves the prevention or mitigation of external and internal negative influences, provides adequate protection against existing dangers and threats, and ensures the achievement of business goals in the conditions competition and economic risk. The system for protecting the economic security of the enterprise may include the following areas: protection of material and financial values, protection of intellectual property, protection of the information environment, protection of personnel, protection of the environment. Therefore, the

concept of "economic security of the enterprise" is complex and includes such types of security as property, intellectual, environmental, informational, personnel [61]. Property, personnel and environmental security are closely related to the fire department, which will obviously require its inclusion in the further analysis of the market for technical means of economic security for legal entities and individuals.

Economic security of an individual is a state of protection of his vital interests in the economic sphere. As noted by O.Yu. Chubukova and T.E. Voronkova [132] "the peculiarity of the concept of economic security of an individual is that it acts not only as an object, but also as a real subject of economic relations, which means that it reflects both the state and the ability of an individual under certain conditions to realize natural the right to a quality standard of living". Therefore, the concept of "economic security of an individual" is also complex and includes such types of security as property, information, socio-demographic, ecological and intellectual.

We will investigate the facts of violation of the above components of economic security of legal entities and individuals in Ukraine and, in particular, Lviv region.

Analysis of statistical data of the Main Department of Statistics in the Lviv Region for 1995-2016 [74; 111] makes it possible to analyze the dynamics of the number of detected crimes by individual types (Table 3.1). So, it can be observed that during 1995-2005 there was a significant reduction in crimes both in Ukraine as a whole and in the Lviv region. At the same time, since 2010, there has been a gradual increase in the number of cases that posed a threat to the life and property of individuals and legal entities, for almost all types of crimes in the Lviv region. The biggest surge is characteristic of 2013, as well as 2015 and 2016, when, first of all, in the Lviv region this increase amounted to 53% in 2015 and 10% in 2016.

Table 3.1

Dynamics of the number of detected crimes by individual types in Ukraine and the Lviv region

Crimes detected	Years							
	1995	2000	2005	2010	2013	2014	2015	2016
	Ukraine							
Total detected crimes	641860	567795	491754	505371	563560	529139	565182	592604
chain rate of change		*-12%*	*- thirteen%*	*3%*	*12%*	*-6%*	*7%*	*5%*
	In the Lviv region							
Total detected crimes	26006	22068	18724	17323	20645	21645	33204	36887
chain rate of change		*-15%*	*-15%*	*-7%*	*19%*	*5%*	*53%*	*11%*
including								
hooliganism	1237	1386	783	436	299	341	274	279
chain rate of change		*12%*	*-44%*	*-44%*	*-31%*	*14%*	*-20%*	*2%*
robberies	225	239	211	99	91	84	107	118
chain rate of change		*6%*	*-12%*	*-53%*	*-8%*	*-8%*	*27%*	*10%*
robberies	1306	1193	1902	1106	929	929	1025	1274
chain rate of change		*-9%*	*59%*	*-42%*	*-16%*	*0%*	*10%*	*24%*

Note: Compiled based on [74; 111]

At the same time, the dynamics of the number of persons brought to, first of all, administrative responsibility, by types of offenses in the field of economic, property and information security (Table 3.2) shows that during 2013-2015 a significant reduction in this number was observed and reaching the minimum value in the amount of 1984.6 thousand persons. in Ukraine as a whole, and, in particular, in the Lviv region, 80.1 thousand persons. Most offenders were arrested in the field of trade, finance and entrepreneurship. However, at the same time, positive annual dynamics are observed here. This is followed by persons brought to administrative responsibility in industry and in the field of housing rights of citizens and housing and communal services. The volume of offenders in the field of encroachment on the property of legal entities and individuals is characterized by a smaller number. However, only in the Lviv region, the number of such offenders reaches 129.2 thousand persons. or 6% of the volume in Ukraine, which undoubtedly indicates the urgency of improving the process of providing services for physical, property, economic and informational protection of individuals and legal

entities on the basis of building a strategic partnership of manufacturers of technical means of economic security of legal entities and individuals with their suppliers and distributors actors in the chains of creation of complex technical systems .

Table 3.2

Dynamics of the number of persons brought to, first of all, administrative responsibility, by types of offenses in the field of property, social and information security in Ukraine and Lviv region

Number of people	Years							
	1995	2000	2005	2010	2013	2014	2015	2016
	Ukraine							
Total, thousands of people	22400.6	9395.4	6370.3	8854.1	4249.9	2657	1984.6	2183.6
chain rate of change		*-58%*	*-32%*	*39%*	*-52%*	*-37%*	*-25%*	*10%*
	In the Lviv region							
Total, thousands of people	964.6	170.2	205.9	390.1	142.4	114.7	80.1	129.2
chain rate of change		*-82%*	*21%*	*89%*	*-63%*	*-19%*	*-30%*	*61%*
including								
encroachment on property	4.3	0.4	0.4	0.9	0.5	0.3	0.3	0.5
chain rate of change		*-91%*	*0%*	*125%*	*-44%*	*-40%*	*0%*	*67%*
in industry, construction and in the field of fuel and energy resources use	3.5	4	3.9	6.9	4.8	1.9	0.2	0.7
chain rate of change		*14%*	*-3%*	*77%*	*-30%*	*-60%*	*-89%*	*250%*
in the field of housing rights of citizens, housing and communal services	1.4	2.6	2.9	2.9	1.4	1.3	1.5	1.7
chain rate of change		*86%*	*12%*	*0%*	*-52%*	*-7%*	*15%*	*thirteen %*
in trade, finance and entrepreneurship	37.8	26.5	15.2	54.2	8.6	6,7	5.1	3.5
chain rate of change		*-30%*	*-43%*	*257%*	*-84%*	*-22%*	*-24%*	*-31%*

Note: [74; 111]

On the background given statistics expedient also to analyze dynamics occurrence cases violation fire station security that _ plays back heavy role in provision , first of all , of property and social security legal and physical persons (Table 3.3)

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Table 3.3

Dynamics of fire safety violations in Ukraine and the Lviv region

Violation of fire safety	Years						
	2005	2010	2012	2013	2014	2015	2016
	Ukraine						
Total fires	53751	64743	73405	62118	70592	82016	75323
chain rate of change		*20%*	*thirteen %*	*-15%*	*14%*	*16%*	*-8%*
	In the Lviv region						
Total fires	1954	2078	2576	2572	2502	4356	3586
chain rate of change		*6%*	*24%*	*0%*	*-3%*	*74%*	*-18%*
including according to the causes of occurrence:							
caught fire		12	21	50	136	150	159
chain rate of change			*75%*	*138%*	*172%*	*10%*	*6%*
malfunction of production equipment		2	3	1	-	2	1
chain rate of change			*50%*	*-67%*	*-*	*-*	*-50%*
Violation of the rules for installation and operation of heating devices and heat-generating units		455	538	497	378	821	925
chain rate of change			*18%*	*-8%*	*-24%*	*117%*	*thirtee n%*
careless handling of fire		1368	1703	1832	1767	3162	2225
chain rate of change			*24%*	*8%*	*-4%*	*79%*	*-30%*
The amount of direct losses, thousand UAH.	7044	20491	24677	177898	14777	30144	102115
chain rate of change		*191%*	*20%*	*621%*	*-92%*	*104%*	*239%*
The amount of collateral damage, thousand UAH.	15718	63089	108031	106008	106794	187489	255301
chain rate of change		*301%*	*71%*	*-2%*	*1%*	*76%*	*36%*

Note: [74; 111]

The given statistical data testify to the increase in the negative impact of fire safety violations during the entire researched period (2005-2016), which has significant economic consequences for legal entities and individuals - compared to 2005, the amount of direct losses increased from UAH 7,044,000. to UAH 102,115 thousand, while the amount of side effects increased from UAH 15,718 thousand. up to UAH 255,301,000, i.e. almost 15 times.

key conclusion of the market research of technical means of economic security of

legal entities and individuals and protection in Ukraine by the Commercial Service of the US Embassy in Ukraine is that: "numerous security threats in combination with the economic downturn leave only niche opportunities for Western suppliers in the short term. In the context of the medium-term and long-term perspective, market participants look positively at the expansion of opportunities in the Ukrainian sector of security and security services." The reason for such optimism is not only Ukraine's aspiration to join the European Union (EU), which imposes the need to synchronize Western industry standards with national ones, but also objective processes related to the development of information technologies, standards and opportunities that companies and buyers discover for themselves, against the background of a sharp increase in crime rates, which doubled in Ukraine and exceeded a million cases only in the first half of 2015 (this number is equal to the total number of offenses for any previous year, starting from 2000). As a result, the segment of security services has the best prospects in the security and security services sector [89; 92].

The analysis of the Ukrainian market of technical means of economic security and protection of legal entities and individuals also makes it possible to identify a number of general economic problems: a significant decrease in purchasing power, a long decline in the construction sector (one of the main drivers in the purchase of security and protection equipment), as well as an influx of cheap suppliers as a result of the economic crisis in the country. Under these conditions, almost all market participants, regardless of the segment of their activity, experienced a decrease in their income in the security and security services sector in dollar terms (the drop was 30-40%) and, as a result, the market lost a significant part of small companies. Currently, only major players are active on it. In the conditions of shrinking market and intensifying price competition, the demand for relatively more expensive Western security and protection equipment exists mostly in the niche of advanced technological solutions, where cheap suppliers are not competitive.

At the same time, during 2017, a significant revival of this market should be noted, and in particular, the growth of the role of new Ukrainian manufacturers. In particular, this is evidenced by the results of the Security 2017 International Exhibition of the Security Industry held on October 17, 2017, in which almost 130 companies took part, of

which 30% were Ukrainian manufacturers [122]. Many of the participants and guests noted the trend of strengthening the role of innovations in the field of security, as well as the emergence of a more global view of security issues - both from the side of the state and from the side of enterprises and commercial structures. This is also confirmed by the analysis of statistical data on the number of active enterprises by type of economic activity (KVED) (Table 3.4).

Table 3.4

Number of active enterprises
the market of technical means of economic security of legal entities and individuals
by types of economic activity according to KVED-2010

Number of active enterprises by types of economic activity	Information and telecommunications	Professional, scientific and technical activity	Activities in the field of administrative and auxiliary services
on November 1, 2017	13762	32835	62806
on November 1, 2016	12301	30164	58155
on November 1, 2015	13980	34849	50338
on November 1, 2014	14341	35981	48814

Note: Compiled based on [74; 75]

In particular, analyzing the types of economic activity according to KVED-2010 in accordance with the peculiarities of the market of technical means of economic security of legal entities and individuals, three sections should be distinguished, among the components of which it is possible to choose those types of activity that reflect the specifics of the market to the greatest extent. These include:

- Chapter 61 "Telecommunications (Electronics)", Section J "Information and Telecommunications", which includes activities in the provision of telecommunications and other related services, such as the transmission of voice, text, sound or video data. The equipment, with the help of which similar activities are carried out, can function both on the basis of one technology and on the basis of a combination of several technologies. This section covers 4 groups: 61.1 "Activities in the field of wired telecommunications", 61.2 "Activities in the field of wireless telecommunications ", 61.3 "Activities in the field of satellite telecommunications", 61.4 "Other activities in the field of telecommunications";

- chapter 71 "Activities in the fields of architecture and engineering; technical testing and research" of section M "Professional, scientific and technical activities", which includes the provision of architectural, engineering services, drawing development services, construction supervision services, geodesy, cartography, etc.;
- section 72.1 "Scientific research and development in the field of natural and technical sciences", section M "Professional, scientific and technical activity", which includes three types of scientific research and development activities: 1) fundamental research: scientific work that can have theoretical and experimental the background, with the help of which the laws of nature, human activity, the organization of society and their combined influence are studied. At the same time, the purpose of this work is not to use the acquired knowledge; 2) applied research: works aimed at obtaining new knowledge for the purpose of their practical use, as well as for the development of technical innovations; 3) experimental developments: directions of work that use knowledge and information obtained during research and practice. These directions are used to improve products, services, materials, devices or to manufacture or introduce new ones;
- section 80 "Activities of security services and conducting investigations" of section N "Activities in the field of administrative and support services", which includes security organization and support services: investigation and detective services; bodyguard and patrol services; collection and transportation of money and other valuables with the help of personnel and equipment to protect such property during transportation; management of electronic security systems, such as security or fire protection systems, in the event that the activity is aimed at remote monitoring of these systems, but may also include the sale, installation and repair of these systems. If the latter of these services are provided separately, they are not included in this section and are classified in retail trade, construction, etc.

Expert surveys conducted among business representatives in the market of technical means of economic security of legal entities and individuals, in general, testify to the existence of a significant potential for the implementation of the concept of supply chain management in this environment, which is explained, mainly, by the desire to find effective levers for solving numerous financial, logistical, technological problems of

enterprise development [90; 91; 98], who have an integrated approach to creating a finished product, in which the key to success is the coordination of actions and interests of all subjects involved in the creation, movement and delivery of this product to the end customer.

On the basis of a thorough analysis of the market of technical means of economic security of legal entities and individuals in general and of Ukraine, in particular, as well as the systematization of information that is publicly available on the Internet, the results of numerous expert surveys of the main participants of this market by well-known consulting companies, published in specialized magazines and websites, as well as using scientific and methodological works and relying on the current legislation of Ukraine, it is possible to visualize the product structure of the market of technical means of economic security of legal entities and individuals of Ukraine (Fig. 3.1).

Since the understanding of the characteristic features of the product and the market in which it is sold is the starting point for the formation of the strategy of any supply chain, incl. and the chain of creation of complex technical systems, its structure and key parameters of operational activity management, it is necessary to clarify the composition of the product groups we have identified in the market of technical means of economic security of legal entities and individuals of Ukraine, which obviously requires a more detailed analysis of them.

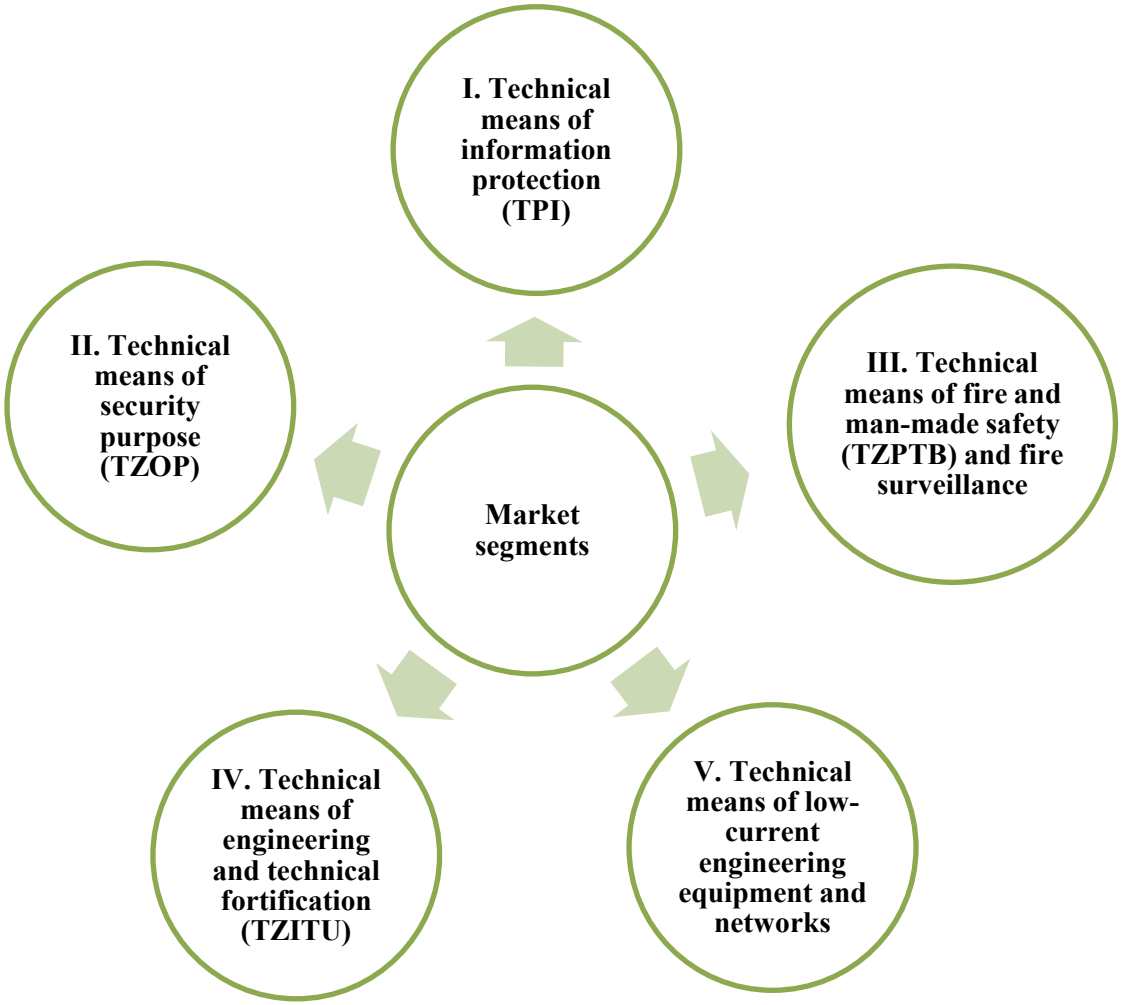

Fig. 3.1. Generalized product structure of the market of technical means of economic security of legal entities and individuals of Ukraine

Note: own development based on the generalization of current legislation and [15; 34-37; 108; 119; 120]

3.2 . Typification of the structure of systems of technical means of economic security

The generalization of the market structure of technical means of economic security of legal entities and individuals on the basis of product segmentation (Fig. 2.1) makes it possible to evaluate the features of each type/segment of technical means in order to more rationally adapt individual production enterprises to the operating conditions of each of them. The described description of the features of the market segments of technical means of economic security is based on the use of M. Porter's model of five forces of competition

with subsequent updating of standard and unique characteristics.

1. Technical means of information protection (TTP).

Providers of information security services and solutions (hereinafter IS) include all companies specializing in the sale and integration of information security products (software and hardware), companies that manufacture products (software and hardware) and auditing companies that perform audits and consulting on IS issues.

Consumers can be divided by market segments as follows:

• public sector (state enterprises and management bodies, military formations, etc.);

• banking sector (banking and other financial institutions);

• commercial sector (enterprises of various forms of ownership).

According to experts [73] , the main problems of the information security market today are:

• backwardness of the legislation in matters of regulating the protection of information, which is a commercial secret;

• the psychological problem of the management of most companies (initially, an IS incident must cause damage and only after that information protection measures begin);

• lack of an effective brand evaluation mechanism (inability to assess reputational risks for the company);

• unclear segmentation of the IT market and, as a result, non-transparent pricing.

According to experts [73], the most important problem is the lack of segmentation or classification of the IS market. According to the vast majority of experts of the studied market, the greatest interest in this segment today is represented by integrated information protection systems, represented, first of all, by unified threat management (UTM) systems, network maintenance (IPS and NGIPS), network controllers and next-generation firewalls (NGFW) [119].

A survey of participants in the Ukrainian market of complex information protection systems showed that Cisco solutions have the largest share, followed by Check Point and third by McAfee. The share of these companies in the domestic UTM/NGFW market exceeds 50% in total. The rest is shared by F5, Fortinet, HP, BlueCoat, Symantec,

Websense and other players. The assessment of the share distribution of UTM and NGFW manufacturing companies in Ukraine is presented in fig. 3.2.

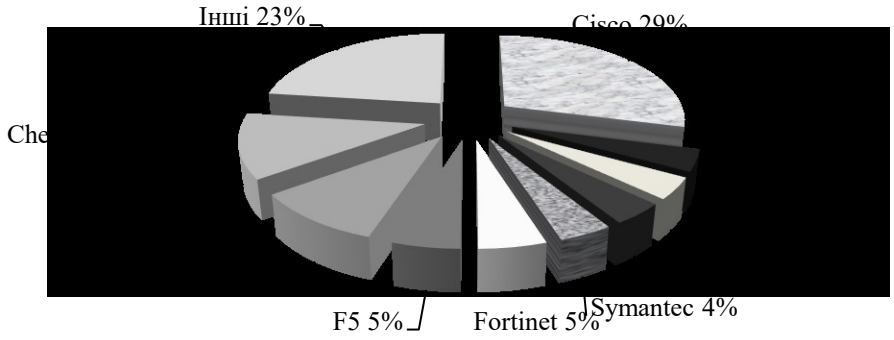

Fig. 3.2. The ratio of shares of equipment sales of manufacturers of complex UTM / NGFW solutions in the domestic market as of the beginning of 2015.

Note: source [119]

Among UTM/NGFW customers (Fig. 3.3), according to the survey, banks and financial organizations dominate (they account for more than a third of all sales), followed by industrial enterprises and state institutions (each sphere accounts for from 5 to 40%), with a significant by a margin - trade, energy, small and medium business. The total volume of the Ukrainian UTM/NGFW market was estimated by experts as of the beginning of 2015 at 815 million dollars.

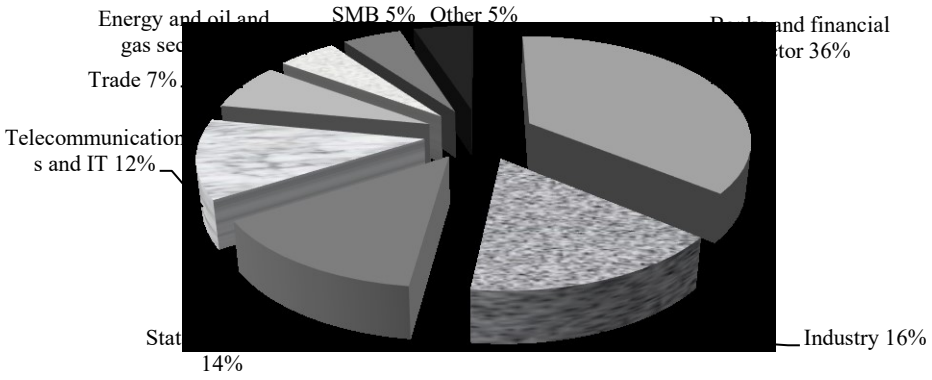

Fig. 3.3. Shares of equipment sales of manufacturers of complex UTM / NGFW solutions on the Ukrainian market by customer categories (beginning of 2015) *Note: source [119]*

As part of the study, installation companies were also interviewed regarding the distribution of the cost structure for installing the solution at the customer. Opinions are divided: for half of the respondents, most of the expenses go to the hardware part, while

the same number - to the software. Integration services add 10-20% to the cost of the project, and paid service maintenance - 5-15% [119]. The main manufacturers of UTM / NGFW solutions for the domestic market are presented in table 3.5.

Even in crisis conditions, companies in this field continue to maintain their positions at a profitable level. As for the Ukrainian market as a whole, here the opinions of experts are divided: most speak of growth of up to 10-20%, others believe that the volume will remain unchanged or even fall (up to 10%). In any case, everyone agrees that the biggest influence on the market is the economic situation in the country, on which the solvency of customers directly depends. It should also be noted that the long-term expectations of experts are also related to the implementation of projects in the field of IS by professional companies specializing in a narrow area of IS, guided by the paradigm: "risk assessment - IS audit - implementation of products and measures based on audit results - certification for compliance with the standard ", instead of the common approach today: "something must be done, let's buy (antivirus, UTM, spam filter ...) must be emphasized" [73].

2. Technical means of security purpose (TZOP).

This market segment is primarily represented by the following product categories:

- Video surveillance systems (hereinafter SV).
- Video analytics systems.
- Integrated video surveillance systems.
- Security alarm systems (hereinafter OS).
- Access control and management systems (hereafter SKKD).
- Perimeter security systems.

Table 3.5

The main UTM/NGFW manufacturers represented in Ukraine and their partners

Producer	Headquarters	Representation in Ukraine	Distributors _ _	Partners	
				Status	Company
BlueCoat	USA	-	Headtechnology UA		Infosystems Jet, Inline Group Zahid
Check Point	Israel	-	RRC Ukraine, MUK	Gold	BMS Consulting
				Silver	Pronet, Svit IT
				Bronze	18 companies
Cisco	USA	+	ERC , Megatrade, MUK	Gold	Incom, BMS Consulting, Sitronics IT (Envision Group), S&T Ukraine, IBM, Winncom
				Silver	Chief Executive Officer, Technoserv Ukraine
				Premier (Advanced Security Specialization)	DISS, OSIS , Softline-IT, National Innovations, Netwave, MK Engineering , SI BIS , Verna
Cyberoam	USA	-	SecNet, ERC, KM Disti, Business Tech		
D-Link	Taiwan	+			
Fortinet	USA	-	MUK, ERC	Gold	BMS Consulting
				Silver	Lan Systems, RIM 2000, Netbox , Netwave , PF Service , Smart Net, Svit IT , Ulys Systems
				Bronze +	Syntegra, Special University of Automation
F5	USA	-	Bakotek		
Hewlett Packard	USA	+	MUK, ERC, MTI, KM Disti	Authorized partners	Inline, Incom, Sitronics IT (Envision Group), BMS Consulting, S & T Ukraine
IVM	USA	+	MUK, MONT		240 partners
Juniper	USA	-	RRC, Netwell	Elite Reseller	Priokom , IT Dialog, S & T Ukraine
				Select Reseller	ITBiz, IT Dialog, S & T Ukraine
McAfee	USA	-	Bakotek		13 companies
Palo Alto	USA	-	Netwell		ITBiz
SonicWall (by Dell)	USA	+	SecNet (SonicWall), MTI, MUK, ERC, Asbis, Everest		BMS Consulting, Inkom, Ulys Systems , Miromiks
Watchguard	USA	-	Bakotek		Intercomputer , IT Pro, SpaceIT , SystemGroup , Starhof
ZyXEL	Taiwan	+	Megatrade, MUK, MTI	Integrator	SmartNet
				Partners	More than 70 companies

Note: source [119]

Today, the world market for video surveillance systems is quite large and, according to the estimates of various analytical agencies, at the end of 2015 it amounted to about 25 billion dollars in monetary terms. [36]. According to the British research company IHS , the volume of this market in Eastern Europe in 2014 was approximately 600 million dollars. (about 50% belongs to Russia). The most popular brands in the region are ADT , Axis , Bosch Security Systems , Dahua and Hikvision .

Based on the study of data from specialized Internet magazines in the field of security and research by analytical agencies, it is possible to compile a product cross-section of this segment. So, the main products of SV are: IR video cameras, H D video cameras, analog video cameras, thermal imaging cameras.

Regarding the ratio of market shares in the product aspect, it should be noted that analog solutions are characterized by a long-term downward trend, on the other hand, low-budget IP cameras are experiencing a relative "boom" in demand. As new models appear and more and more production is transferred to factories in Southeast Asian countries, a gradual decrease in the cost of even branded cameras is also noted - on average 10-15% per year.

In 2014, according to the monetary indicators of the sold cameras for security video surveillance in Ukraine, analog solutions far exceeded digital ones, but according to data for the middle of 2015, their shares equalized. In quantitative terms, the situation is different. Analog systems dominate here. But if in 2013 their share was 78%, then in 2014 it decreased to 75%. The same ratio was maintained in the first half of 2015. As for the share of specific manufacturers, the leader in sales (in monetary terms) is Axis , which occupies a quarter of the entire market (Fig. 3.4 and Fig. 3.5).

Next come ACTi and Hikvision with roughly equal shares. We can note a significant increase in influence compared to last year of the Dahua brand , which shares the same position with Samsung Techwin . Also, Bosch products occupy significant market shares Security Systems , Geovision . Other brands have a total of 28% of the market, but the share of each is less than 3%.

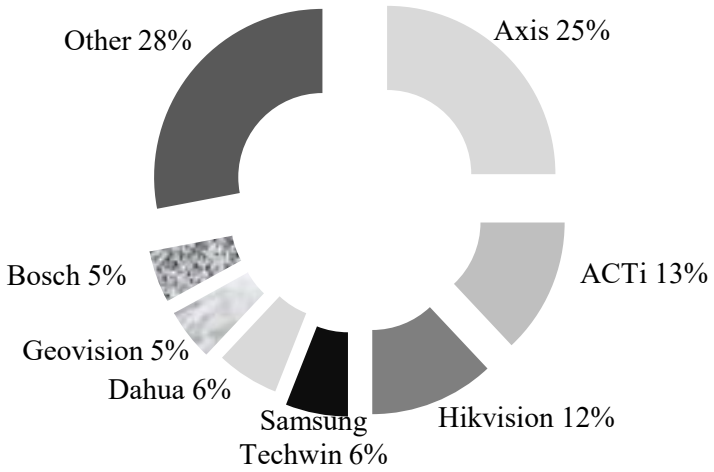

Fig. 3.4. Shares of the main manufacturers of security video surveillance cameras in the domestic market (in monetary equivalents) in the first half of 2015.

Note: source [36]

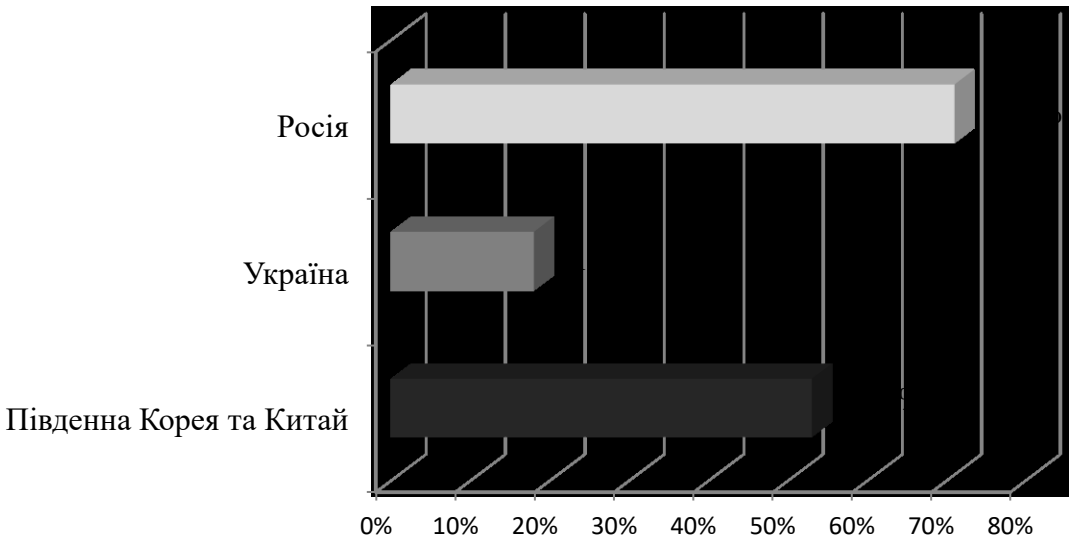

Fig. 3.5. Popularity of brands of computer video surveillance systems of manufacturers in Ukraine

Note: source [36]

In general, the following trends are characteristic of the domestic market of technical means of security purposes [36] :

1. Significant growth in demand for video analytics. According to experts, customers have already realized its advantages in practice, and most new projects are implemented with one or another video stream analysis function. At the same time, the

quality and capabilities of analytical software are also significantly modified and improved every year .

2. Further spread of PoE, because it is much more convenient and practical to connect just one thin cable to the camera. Here, IP systems have another significant advantage over analog models. Actually, PoE is already actively used in video surveillance systems, but the trend is such that soon, obviously, this technology will be supported by the vast majority of new models.

3. Increasing demand for cameras with a wide- angle fisheye lens . The growth in sales of this type of model in the world by some manufacturers has doubled in recent years (for other types of cameras, if sales have grown, then not so much).

4. - way audio communication in cameras is becoming more and more popular . According to experts, 75% of all customers are interested in the possibility of simultaneous audio and video recording.

5. The demand for "cloud" video surveillance is increasing. Also, new possibilities for the use of video surveillance have opened up in connection with the development of technology for processing call "Big Data" (Big Data). The combination of "clouds", Internet channels and a huge number of cameras around the world in a complex with the most powerful means of video analytics allows you to build global video surveillance systems (see Integrated video surveillance systems).

6. Each manufacturer strives to develop and sell the most progressive solution, constantly updating model series. There are more and more camera models with support for Ultra HD (4K) resolution, proprietary technologies Light Finder (Axis), Starlight (Bosch), Moonlight (Mobotix) are being developed, which allow to achieve a significant improvement in the quality of video image processing in poor lighting conditions , the new WDR (Wide Dynamic Range) - Forensic Capture technology appeared, which significantly expands the dynamic range and provides a balanced image (in terms of color and light) even with backlighting and intense lighting. For PTZ cameras, proprietary Speed Dry technology has been developed, which helps to obtain a clear image in rainy weather. Many devices are also available in our country, but due to the economic

incapacity of a large part of domestic customers, it is often not the functional products themselves that are really in demand.

The next product that we will consider in this segment are *thermal imagers* (Table 3.6).

Table 3.6

The main characteristics of thermal imagers for video surveillance systems presented on the domestic market

Producer	Model	Resolution, pix.	Human detection (O/V/I), m max	Vehicle detection (O/V/I), m max	The presence of an optical camera
FLIR	TCX Bullet mini	80*45	O:20 or 40	n/a	-
	PT	640*480	n/a	n/a	+
Dahua	TPC-BF5300-T (lens f 19 mm)	336*256	600/150/70	1500/400/200	-
	TPC -PT8620C (lens f 150 mm)	640*512	4000/1100/500	12000/3300/1700	+
Bosch	Dinion IP thermal 8000	640*480	O:3900	O:5850	-
	VOT-320	320*240	n/a	n/a	-
Hikvision	DS-2TD2136-25	384*288	735/184/92	2255/564/282	-
	DS-DS2TD6160-75/km	640*512	2200/750/275	6765/1700/850	+
Axis	Q1942-E (lens f 60 mm	640*480	2000/500/250	6200/1500/770	-
Mobotix	S15 Dual Thermal	336*252	n/a	n/a	-

Note: source [37]

In addition to cameras and thermal imagers, the market of video surveillance systems is represented by various video capture devices, which include:

- network video recorders;
- HD video recorders;
- digital video recorders;
- video servers;
- video capture boards etc.

The analysis of enterprises that manufacture video capture devices, which are in the greatest demand in Ukraine, indicates the same trend that is characteristic of the previous segment of the video surveillance system market, mainly these are a number of

foreign enterprises representing trade brands widely recognized throughout the world (Fig. 3.6).

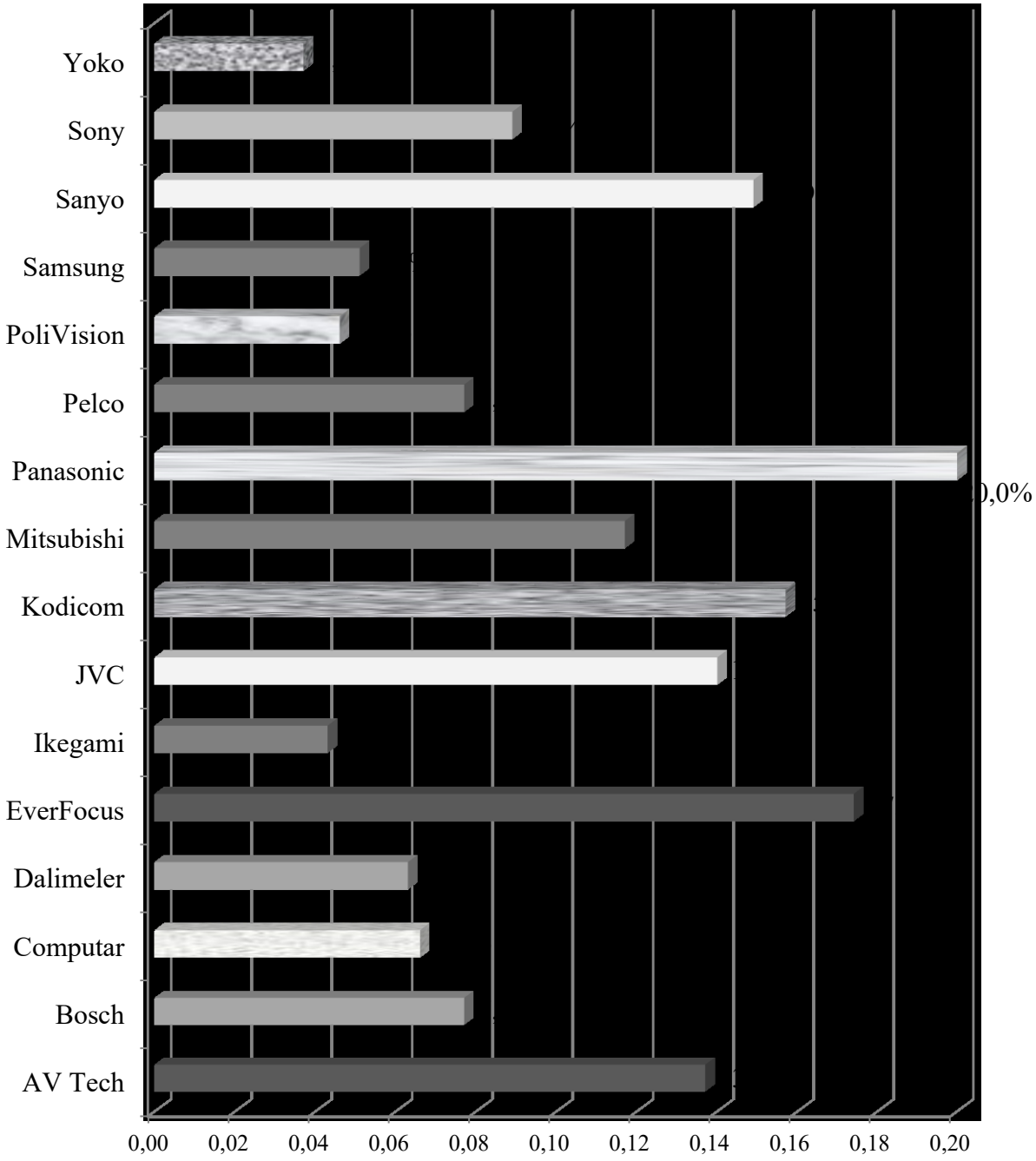

Fig. 3.6. Popular brands of digital video recorders in Ukraine

Note: source [3 0]

The basis of *video analytics* is software that is installed directly on a digital camera, server or works from the "cloud".

In general, the video analytics market can be conditionally divided into security and commercial video analytics. The purpose of the first follows from the name itself and does not require special explanations, while the second serves to improve the operation of trade facilities. The main task of such software is to identify the behavior of visitors to a trade facility and build appropriate reports. The leading global manufacturers of video analytics systems are foreign companies: Axis, ACTi, Bosch, Dahua, Hikvision, Panasonic, Samsung, Sony, Vivotec, which also offer the corresponding proprietary software. The main drawback of their proposals is the strict binding to a specific hardware platform. Therefore, there are many independent software developers on the market that offer solutions compatible with cameras from different manufacturers. At the same time, their software can be both multifunctional (AxxonSoft Intellect, DSSL Trassir, ISS SecurOS, Agent Vi savVi) and narrowly focused (NumberOk, SOVA), but, in any case, it is provided on the basis of license payments.

In Ukraine, this market is just starting to develop, so there are not many big players here. At the same time, among the recent projects, we can note the implementation of the project for the installation of video surveillance systems by the company "Technical for Business" in 2016, which it carried out for the Lviv communal enterprise "Zbiranka" (solid household waste storage landfill). A feature of the installation of the video analytics system was the use of thermal imaging cameras and Axis analytical solutions, the combination of which made it possible to automatically detect the first signs of fires on the landfill and transmit an alarm signal to the operator on duty.

First of all, universal platforms should include: software (software) Axxon Intellect, developed by the company AxxonSoft, software Trassir, developed by the company DSSL. Also, in our country there are large implementations based on the analytical software SecurOS, developed by ISS [34].

next segment of technical equipment for security purposes is closely related to video surveillance and video analytics systems - *Integrated video surveillance systems* [36], the appearance of which owes its appearance to the development of technologies for processing "Big Data" (Big Data). The combination of "clouds", Internet channels and a huge number of cameras around the world in combination with the most powerful means

of video analytics makes it possible to build global video surveillance systems. A similar phenomenon is also called "video crowdsourcing". It allows you to analyze video data coming from a large number of separate devices - not only surveillance cameras, but also car recorders, smartphones, tablets, etc. Such technology is already used, for example, in the USA by law enforcement agencies and in practice allows obtaining much more material for research than that which comes only from "official" video surveillance cameras. It should be noted that this phenomenon is very new and has not yet spread in Ukraine.

A well-planned and effective system of physical security of an enterprise in Ukraine, along with the segments of technical security equipment outlined above, consists of:

✓ Security alarm systems (OS), represented by such technical means as:

- reception and control devices;
- for various purposes (IR sensors or motion sensors, acoustic sensors, vibration sensors, magnetic contact sensors, ultrasonic sensors, IR sensors with a directional detection pattern);
- from the notification person;
- b uninterruptible power supplies.

✓ Access control and management systems (ACMS), represented by such technical means as:

- p erepones;
- with readers;
- and identifiers;
- controllers .

✓ Technical means of perimeter protection (OP), represented by such technical means as:

- reception and control devices;
- (IR barriers, non-contact optical object position detectors, vibration, capacitive and radio-beam detectors).

A significant role in ensuring the physical security of enterprises, including data centers and data centers, is provided *by access control and management systems (ACMS),* which are built on the principle of echelon protection, and in the case of data centers, each subsequent level should be more and more accurate and personalized. That is, if, say, any customer can enter the building of the complex, then only specific persons have access to a specific area or cabinet with equipment.

New developments in the field of visitor identification also come from the world of nanotechnology. A temporary electronic pass can be printed, for example, in the form of a microscopic pattern directly on the skin of a finger. True, so far they can be seen mainly at large international exhibitions dedicated to security systems [35].

3. Technical means of fire and man-made safety (TZPTB) and fire surveillance.

Fire-fighting and technical security means are the most developed segment in the security and security services sector of Ukraine. The main four sub-segments are: fire alarm systems, fire extinguishing systems, automatic fire alarm software, fire alarm systems and evacuation systems [20]. According to the State Emergency Service of Ukraine, there are 2,300 small and medium-sized enterprises that today work in the field of fire protection and technical safety equipment, which makes this segment fragmented and competitive. Growth trends in this segment are highly correlated with trends in commercial real estate construction, which has been in a state of crisis since 2013.

State building regulations regulate the design, installation, operation and maintenance of fire safety systems, as well as determine the composition and application of each component of fire safety equipment (Fig. 3.7, Table 3.7).

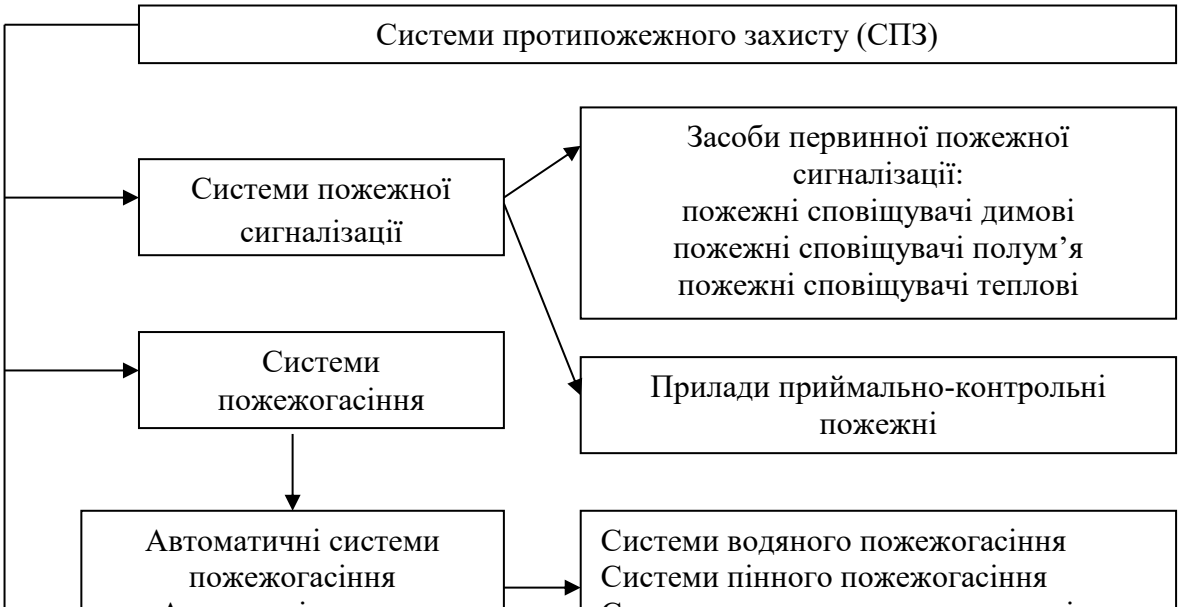

Fig. 3.7. Composition of fire protection systems (SPZ)

Note: own development based on [20]

Table 3.7

Application of components of the fire protection system

A component of the fire protection system	Field of application
Fire alarm systems (SPS)	Designed for early detection of fire and giving an alarm signal for taking the necessary measures (for example: evacuating people, calling fire and rescue units, starting anti-smoke fire extinguishing systems, controlling fire valves, doors, gates and curtains (screens), disconnection or blocking (unlocking) other engineering systems and equipment at the "fire" signal, etc.)
Fire extinguishing systems (CNG)	They perform the functions of detecting signs of burning and supplying a fire-extinguishing agent without human intervention
Fire alarm systems and evacuation management (CO)	Intended for notifying people staying in a house (building) about the occurrence of a fire in order to create conditions for their timely evacuation
Smoke protection systems (SPDZ)	They are intended to achieve one or more of the following goals: ensuring conditions for safe evacuation; provision of conditions for extinguishing fire and carrying out fire-rescue work; reducing the probability of ignition of objects, equipment, substances and materials under the influence of thermal radiation; reducing the impact of high temperatures on building structures during a fire; reduction of damages from thermal decomposition products and hot gases
Centralized fire monitoring systems (CCPS)	They are designed to provide remote round-the-clock monitoring of the state of the SPR of objects. They provide: reception of fire alarm signals and malfunctions from devices of reception and control fire facilities by the alarm notification center of the remote control organization; processing, archiving, saving of all alarm notifications received at the fire monitoring control panel of control organizations; transmission in an automated mode in a single protocol and format of fire alarm signals to the access point of the center for receiving alarm notifications of the central executive body, which ensures the implementation of state policy in the fields of civil protection, fire and man-made safety; prompt response of fire departments to fire alarm signals
Dispatching systems (central control point) and SPR automation	They are designed to provide control, signaling and electrical control of the operation of systems

Note: own development based on [20]

In turn, fire alarm systems according to the Fire Safety Code are divided into five types according to the parameters given in Appendix B.

As Marketsand experts expect Markets , the volume of the global market for fire protection systems will double by 2022, reaching $98 billion, which means growth of more than 10% per year. According to the results of 2015, it amounted to $ 48 billion. As of 2015, the segment of fire extinguishing systems occupies the largest part of the market. This state of affairs is expected to remain until 2022. Experts point to Honeywell and Johnson as key players in the global fire protection market Controls , Siemens , Tyco International and United Technologies Corporation (UTC) [29].

The fire alarm segment will also develop rapidly in the considered period. One of the main driving forces for the growth of this segment is the standardization of norms and requirements adopted in different countries.

Regarding the implementation of promising projects in Ukraine in the segment of fire protection, it should be noted here that one of the most powerful global manufacturers of high-class fire fighting equipment, fire protection systems, fire alarm systems, as well as the development of engineering solutions to ensure protection and safety (emergency safety systems) entered the domestic market , ambulances, mobile hospitals, airport fire engines, etc.) - NAFFCO companies [72]. On June 8, 2017, a Memorandum of Understanding was signed between three parties: the Chernihiv Regional State Administration, the Chernihiv City Council and the NAFFCO company , according to the provisions of which, the Arab company as an investor intends to open a plant for the production of fire-fighting equipment in Chernihiv. The products of this plant will be produced under the NAFFCO trademark , but will be marked as "Made in Ukraine". Chernihiv city council and the regional state administration within the framework of the current legislation of Ukraine will promote the organization of new production with foreign investments in the territory of the regional center. Currently, the amount of investment is not known, but, according to representatives of the NAFFCO company , it is planned to invest approximately 1.5 million to 3 million US dollars for the start [72].

4. Technical means of engineering and technical fortification.

This category includes, first of all, a variety of equipment for the physical protection of property, such as: safes, storage and storage doors, protective glass, protective cabin, armored protection of specialized vehicles, small arms, etc. The complete list of technical means of engineering and technical fortification is defined in DSTU 3892-99 "Means of engineering and technical fortification and protection of objects. Terms and definitions".

The sale of a significant part of these products requires an appropriate license from the Ministry of Internal Affairs in accordance with the Law of Ukraine "On security activities" (weapons, safes).

5. Technical means of low-current engineering equipment and networks.

This category includes a number of products that can also conditionally be attributed to the group of structured cable systems (hereinafter SKS):

- sets of copper and optical cables (by categories: 5e, 6, 6A, 7, 7A [6]);
- cross panels;
- connecting cords;
- cable connectors;
- modular sockets;
- information sockets;
- passive switching equipment;
- mounting boxes for optics and copper cable;
- plastic cable channels, corrugated and smooth-walled pipes, metal trays and cabinets with racks, etc.

Analysis of the SCS market makes it possible to ascertain the presence of more than a hundred installers of SCS, but among them we can single out five leading Ukrainian installers, which include: Verna, RIM2000, "IT-Integrator", S&T Ukraine, "Sitronics Telecom Solutions of Ukraine", among how this market is, in fact, distributed.

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[6]The cable line, built on the components of category 6A, allows you to organize the transfer of information at a speed of 10 gigabits / sec, using 10 Gigabit technology Ethernet (10 GbE), at a distance of up to 100 meters. In the future, it will be possible to increase the transmission speed to 40 gigabits / sec.
Cable line built on components of category 6 - 10 gigabit / sec at a distance of 30-55 meters. It should work up to 30 meters if the designers and installer did everything right. More than 55 meters will most likely not work.
The cable line, built on category 5 e components , allows you to transfer data at a speed of 1 gigabit/s in a channel up to 100 meters long without any problems.

The structure of the main producers of this market in Ukraine as of 2015 is shown in Appendix D.

Regarding the consumer structure of the market, despite the fact that the banking sector of Ukraine is going through a crisis period in the entire history of the country, the share of implemented projects here is 45.5%. The reason for such a high share is that, usually, projects for the bank are implemented immediately as a package for a large number of branches. Each branch is its own SCS. A share of 20.8% is occupied by projects at communication enterprises . Projects in commercial structures make up 10.8% against 16.1% earlier.

Industrial enterprises (6.6%) also reduced their indicator, which in 2014 was 8.5%. The share of projects at trade enterprises was 5.9% (in 2014 - 6.6%). State structures (2.2%) also decreased their activity (their weight in 2014 was 4.7%). Shares of other consumer segments are not significant.

An important place in the implementation of a full-fledged SCS project is played by *auxiliary equipment for SCS* , which includes: plastic cable channels, corrugated and smooth-walled pipes, metal trays and cabinets with racks. The results of the market analysis of the specified products, which are also shown in Appendix E, testify to the leadership in the domestic market of the Russian company, namely DKS, which at the same time has its own production in Ukraine, in such segments as plastic cable channels, corrugated plastic pipes, sheet metal and mesh trays

As for domestic manufacturers, they occupy leading positions in the production segments of assembly cabinets (the market leaders are the KMS company (CMS) and Zavod "Kub Ukraine"), hanging racks (the KMS company (CMS), whose market share is more than 70%). Their role is also noticeable in the segment of server cabinets, where the same companies in general occupy up to 10% of the market. In the rest of the segments, the role of domestic producers is barely noticeable.

As for further prospects for the development of the SCS market, according to experts [108] , foreign manufacturers of cable systems were somewhat disappointed in the possibility of selling products in Ukraine in volumes that are interesting to them, so we should not expect a rise in the market in the near future. At the same time, many

Ukrainian distributors and integrators, seeking to diversify their risks, expand the geography of their representation, entering the markets of neighboring countries. Against this background, there is a noticeable trend towards the future activation of the role of domestic manufacturers of cables, cabinets and metal trays in the SCS market.

Another segment of the SCS market is *assembly equipment* . A typical product of this segment is "yellow boxes", that is, boxes for laying optics (usually of a characteristic yellow color) and cable organizers for copper cable. The systems include a full set of accessories that allow you to build a cable route of the desired configuration.

Based on the analysis of the "yellow boxes" market, which is covered in [120] , it should be noted that there have been no special technological modifications in the development of the assortment of this product in recent years. The product is quite well configured, does not require any significant modifications, even its main standard sizes remain unchanged - except that the already numerous nomenclature of accessories is supplemented with some details, quality is improved, and operational characteristics are improved.

In general, at the moment, it should be stated that there is still no great demand for "yellow boxes/trays" in Ukraine. There are several explanations for this. First, this solution is quite expensive, and customers prefer to save on it by laying cables in a simpler way. Secondly, the main buyers are data centers, but there are not so many of them, and new ones do not appear due to crises. Another factor is the development of SCS technologies themselves.

"Yellow trays" were created for laying a large number of optical cords. At the same time, cables with MPO (Multi-fiber push on) type connectors are already appearing on the market, which allow you to connect up to 12 fibers at once. In addition, the new cables are thinner than the standard ones, accordingly, the bundles of wires are noticeably reduced in volume. Also, "yellow boxes" are justified only for laying optics, while power and low-current copper wires still need to be placed separately. At the same time, if there are not many optical cables, they can be placed in a mesh tray, protecting them from mechanical damage. On the other hand, it should be remembered that alternative solutions such as mesh trays are not originally designed for laying optics. Their cables can be

deformed, and therefore the "grid" cannot carry the same effective load as a specialized system [120] .

Thus, the detailed analysis of the product segmentation of the market of technical means of economic security of legal entities and individuals of Ukraine makes it possible to state that in the vast majority the objects of sale are both simple and complex technical systems that satisfy the needs of consumers in physical and informational protection.

The generalization of the results of the analysis also enables not only the classification of the products of the market of technical means of economic security of legal entities and individuals and its product segmentation in general, but also the identification of the technical levels of complexity of those products that are the basis of this structure. For visual visualization, we can present in tabular form the product structure of the technical means of economic security of legal entities and individuals of Ukraine (Table 3.8).

Table 3.8

Detailed product segmentation of the market of technical means of economic security of legal entities and individuals of Ukraine

Market segment	Product	Market segment	Product	Market segment	Product
I. Technical means of information protection (TPI)	**1.1. Systems of complex information protection:** • application and system software ; • hardware part.	**III. Technical means of fire and man-made safety (TZPTB) and fire surveillance**	**3.1. Fire protection systems:** *3.1.1. Fire alarm systems* - reception and control fire devices; - detectors for various purposes (smoke , temperature, manual fire detectors, etc.); - means of notification; - uninterruptible power supplies *3.1.2. Fire alarm systems* - light indicators - devices for transmitting speech messages *3.1.3. Automatic fire extinguishing systems (ASF)* Equipment and devices: - gas fire extinguishing - in a uniformed fire extinguisher - foam fire extinguishing - powder fire extinguishing - and aerosol fire extinguishing *3.1.4. Smoke, heat removal and air support systems (SDT)* Equipment and devices: • smoke and heat removal fans, air support • valves for smoke and heat removal, air support • smoke removal ventilation devices • control panels are centralized • control devices are localized • notification devices *3.1.5. Dispatch systems* • ARMs of operative-on-duty personnel; • server for processing information flows; • Software; • network equipment for collecting and transmitting information **3.2. Systems of early detection of emergency situations and notification of people (SRVNSO)** Equipment for SRVNSO: • SRVNSO control panels (PC) • PC with zonal notification (PCZO) • switching devices • notification devices (SO) • final technical means of information and notification (KTZIO) • communication channels	**And V._ Technical means of engineering and technical fortification**	**4.1. Equipment for physical protection of property:** • safes, vault doors and vaults • protective glass • protective cabin • armored protection of specialized vehicles • small arms
II. Technical means of security purpose (TZOP)	**2.1. Video surveillance systems (SV)** *.1.1. CCTV cameras:* • IR video cameras; • HD video cameras; • analog video cameras; • thermal imaging cameras. *.1.2. Video capture devices:* • network video recorders; • ND video recorders; • digital video recorders; • video servers; • video capture boards **.2. Video analytics systems** Equipment for: • **server systems (for example , the Kipod platform);** • **embedded systems;** • **distributed systems.** **.3. Integrated means of video surveillance** **.4. Security alarm systems (OS)** - Reception and control devices; - Sensors for various purposes (IR sensors or motion sensors, acoustic sensors, vibration sensors, magnetic contact sensors, ultrasonic sensors, IR sensors with a directional detection pattern) - Means of notification - Uninterruptible power supplies **.5. Access control and management systems (ACMS):** Obstacles; Readers; Identifiers; Controllers **.6. Perimeter protection systems (OP):** - Reception and control devices - Detectors (IR barriers, non-contact optical object position detectors, vibration, capacitive and radio beam detectors)			**V._ Technical means of low-current engineering equipment and networks**	**5.1. Structured cable systems (SCS)** • copper and optical cables; • cross panels; • connecting cords; • cable connectors; • modular sockets; • information sockets; • passive switching equipment; • mounting boxes for optics and copper cable • plastic cable channels, corrugated and smooth-walled pipes, metal trays and cabinets with racks

Note: Own development

SECTION 4 . Identification of factors of development of enterprises in the chain of creation of a system of technical means of economic security

4.1. Key factors in the development of chains of complex technical systems of the market of technical means of economic security of legal entities and individuals

The study of the strategic aspects of the integration of an individual enterprise into the chain of creation of complex technical systems is impossible without identifying and taking into account the influence of key factors of the external and internal environment, the adaptation and skillful use of which is often a source of competitive advantages in both the long and short term. Therefore, the next steps, after a detailed analysis of the product structure of the researched market, are: 1) analysis of its subject structure, which will make it possible to identify the characteristic structure of chains of creation of complex technical systems in the market environment of technical means of economic security of legal entities and individuals of Ukraine, its main participants, and to understand who has the main levers of influence on the rules of the game in its main segments; 2) identification and analysis of the main trends in the development of the main segments of the studied market; 3) substantiation of the key factors of the development of the market as a whole, as well as the existing and potential chains of creation of complex technical systems on it, in order to identify the main market requirements for the key players of the market of technical means of economic security of legal entities and individuals, the ability to comply with which, obviously, will play the role of catalysts for achieving market success.

Thus, the generalization of the results of the analysis of the technical means of economic security of legal entities and individuals and its product segmentation (see clauses 3.1 and 3.2) is not only a presentation of a detailed classification of its products and its product segmentation, a visual visualization of which is presented in tabular form (Table 3.8), as well as the possibility of distinguishing the main subjects of this market, which include:

- from national and international market regulators;

- public organizations and associations;
- domestic and foreign manufacturers of simple and complex technical systems (suppliers of finished products and components for them);
- distributors of well - known brands of complex technical systems (sellers of finished products);
- installers (providers of installation and maintenance of complex technical systems);
- integrators and developers of complex solutions (providers of complex services);
- state and private enterprises, financial and banking institutions, private individuals (customers/consumers);
- insurance companies, consulting companies and others.

The generalized subject structure of the market of simple and complex technical systems of economic security of legal entities and individuals in terms of its product segments will be presented in a table (Table 4.1).

Let's take a closer look at the main regulators of the studied market in Ukraine and their activities.

The most influential organization in the segment of fire-fighting and technical safety equipment is the State Certification Center of the State Emergency Service of Ukraine, which controls all aspects of licensing. All firefighting equipment and services are subject to licensing and certification. Depending on the category of fire danger - high, medium or low - enterprises are issued different types of licenses. State building regulations regulate the design, installation, operation and maintenance of fire safety systems [103].

The most influential organization in the segment of technical and physical protection of property, means of personal protection and maintenance of systems of technical

Table 4.1

Characterization of the subject structure of the market of technical means of economic security of legal entities and individuals of Ukraine in terms of its product segments

Market segment of technical means of economic security of legal entities and individuals	State regulator-licenser	Main suppliers	Characteristics of suppliers	Main consumers
I. Technical means of information protection (TPI)	The State Service for Special Communications and Information Protection in Ukraine, which is entrusted with the functions of a licensor	→ Companies specializing in the sale and integration of information security products (software and hardware); → Manufacturers of software and hardware products; → Auditing companies that carry out auditing and IT consulting	The key role belongs to domestic integrators. Service providers strive to solve absolutely all issues in the field of the customer's IS	→ public sector; → the commercial sector, especially the banking sector
II. Technical means of security purpose (TZOP)	Licensing is under the auspices of the Ministry of Internal Affairs	→ Companies specializing in the sale of security products; → Manufacturers of software and hardware products	The vast majority of manufacturers are foreign companies	→ commercial sector; → non-commercial sector
III. Technical means of fire and man-made safety (TZPTB) and fire surveillance	State Certification Center of the State Emergency Service of Ukraine	→ Companies are contractors engaged in the design, installation and maintenance of fire protection systems. → Manufacturers of fire fighting equipment and software	Complexity of services, which often limits the choice of the final customer (the contractor performs all stages independently - from the project to final installation and after-sales service)	→ public sector; → commercial sector; → non-commercial sector
IV . Technical means of engineering and technical fortification (TZITU)	Licensing is under the auspices of the Ministry of Internal Affairs	→ Companies specializing in the sale and installation of products; → Manufacturers of software and products.	The vast majority of manufacturers are foreign companies	→ public sector; → commercial sector; non-commercial sector
V. _ Technical means of low-current engineering equipment and networks	Licensing is under the auspices of the State Committee for Construction, Architecture and Housing Policy of Ukraine	→ Companies specializing in sales → Installer companies that install low-current engineering equipment and networks . → Manufacturers of low-current engineering equipment and networks and their software	The vast majority of manufacturers are foreign companies	→ commercial sector, especially data processing centers (DTCs), banking institutions.

Note: Own development

protection is the Ministry of Internal Affairs, under whose aegis the licensing of this market is.

The Ministry requires all companies and private individuals working in this segment to obtain licenses and comply with all regulations related to the provision of security services. The main legislative act in this area is the Law of Ukraine "On Security Activities".

The most influential organization in the information security segment today is the State Service for Special Communications and Information Protection in Ukraine, which is also entrusted with the functions of a licensor.

Licensing under the auspices of the State Committee for Construction, Architecture and Housing Policy of Ukraine is typical for the market of technical means of low-current engineering equipment and networks, and the main regulatory document for installers is the "State Building Regulations of Ukraine".

In the video surveillance segment, there are no rules or licensing requirements, provided that video surveillance systems and services are used in technological surveillance processes. If the equipment is installed as security, then the requirements of the Law of Ukraine "On security activities" apply to it.

Regulators of the market of technical means of economic security of legal entities and individuals should also include other state bodies, such as the National Electrotechnical Committee of Ukraine, the National Standardization Body and the Scientific and Technical Council of the Ministry of Technical Regulation on Technical Regulation, and international institutions such as EURALARM - the European association of manufacturers and organizations for installation and provision of other services in the field of electronic means of fire safety and protection, which supports the goals of the current European Commission, CERTALARM - the body for assessing compliance with European standards, the International Technical Standardization Committee IEC / TC 79 " Alarm and Electronic Security Systems ".

The most important normative legal acts regulating activities in the field of security include: Law of Ukraine "On Security Activities", Law of Ukraine "On Licensing of Certain Types of Economic Activities", Resolutions of the Cabinet of Ministers of

Ukraine (in particular, Resolution No. 1698 of 14.11.2000 "On Approval of the List of Licensing Bodies"), Orders of the Ministry of Internal Affairs of Ukraine (for example, Order No. 1417 of 12.30.2014 approved the Fire Safety Rules in Ukraine - NAPB A.01.001-2014, Order No. 470 of 06.06.2017 . approved the Rules of fire safety in the markets of Ukraine), which are mandatory for business entities, executive authorities, local self-government bodies, citizens of Ukraine, foreigners and stateless persons who are in Ukraine on legal grounds), as well as The State Standard of Ukraine (DSTU), the State Building Regulations of Ukraine (DBN), which are subject to changes and improvements in the context of harmonization with European standards and regulations [8] :

- DBN A.2.2-3-2004. Designing. Composition, procedure for development, approval and approval of project documentation for construction.
- DSTU B A.2.4-4-99. (GOST 21.101-97). Basic requirements for project and work documentation.
- DBN D 1.1-1-2000. Rules for determining the cost of construction.
- DSTU B A.2.4-10-95 (GOST 21.110-95). Rules for the implementation of the specification of equipment, products and materials.
- DBN A.3.1-5-96 Organization of construction production and others.

So, today the State Building Regulations "Fire Protection Systems" are being developed, active work is being done on the development of Fire Monitoring Rules, work on DSTU EN 54 "Fire Alarm Systems" ("Fire Detection and fire alarm systems. Components of voice alarm systems Part 16: Voice alarm control and indicating equipment") - Voice alarm system components - Part 16: Voice alarm control and indicating equipment, developed by Technical Committee CEN/TC 72 "Fire detection (fire) and fire alarm systems", the secretariat of which is a part British Standards Institution. It should also be mentioned about the normative document IEC 60849 "Sound systems for emergency purposes" (MEK 60849 "Sound systems for emergency notification"), which defines such terms as audibility, intelligibility and clarity.

There is a belief that the development of the above-mentioned regulatory documents will make it possible to provide a reliable barrier to low-quality foreign

products. Therefore, domestic manufacturers will feel significant support in the conditions of progressive crisis phenomena [104].

Ukraine's signing of the Deep and Comprehensive Free Trade Area Agreement (DCFTA) with the EU, which encourages the introduction of EU standards in the field of security and safety, became a serious impetus for the harmonization of Ukrainian and European legislation in the field of security. As the participants noted, one of the results of the signing of the DCFTA was that Ukraine has already adopted EU standards for all fire-fighting and rescue systems. They believe that this will positively contribute to the further development of the industry in the public and private sectors [108].

An important step towards stimulating the development of the market of technical means of economic security for legal entities and individuals was the approval by the President of Ukraine in March 2016 of the "Concept for the Development of the Security and Defense Sector of Ukraine". The goal of this initiative is to restore the territorial integrity of Ukraine, ensure national security, fight terrorism, cyber security and protect critical infrastructure. Although the government has subsequently significantly increased budget expenditures for defense and national security, bureaucratic and corrupt practices have had a significant negative impact on the effectiveness of many security initiatives. In addition, the corresponding emphasis on national defense rather than public safety signals that increased budget spending on security and safety initiatives has yet to open up opportunities for private sector security and security companies.

Against the background of the preservation of bureaucratic and political barriers, it is impossible not to note a number of positive developments. Thus, an important role in the field of public procurement, including specialized equipment in the field of security, is played by the introduction of the electronic public procurement system, which has become mandatory for use by all institutions since August 2016. As a rule, the government customers in the researched market are: the Ministry of Internal Affairs, the Ministry of Defense, the National Guard, the National Police, the Security Service, the State Fiscal Service, the State Migration Service, the National Bank, nuclear power plants, as well as state educational and medical institutions . This online system guarantees better transparency and fair competition during state tenders for both local and

foreign suppliers of complex technical equipment in the field of economic security of legal entities and individuals. At the same time, in practice, although attempts to manipulate the new state electronic procurement system have been significantly limited, a number of previous problems in " B 2 G " supplies have remained: long periods of coordination of technical requirements with state agencies, delays in payment by state bodies for purchased equipment due to budget deficits and budget cycles, as well as sabotage of equipment by end users in government departments [108].

Along with the implementation of the electronic public procurement system, the reform of the National Police, the implementation of European standards regarding the quality and installation of fire-fighting equipment should contribute to the improvement of business conditions in the market of technical means of economic security for legal entities and individuals in the near future.

In general, in Ukraine, although the normative framework for ensuring fire and man-made safety of civil construction objects has been developed and, in most cases, harmonized with European standards, as well as effective and efficient mechanisms for ensuring fire safety of objects, the parameters of which have been developed and tested are not invested in the limitations of the current norms and standards, the state policy and the development plan of the security and protection sector still remain fragmented, not integral. This is a significant obstacle to the dynamic development of business and the provision of guarantees, qualified service and support to end-consumer customers. Taking this into account, the harmonization of current legislation in the direction of unification with international standards, which especially concerns the regulatory and technical base, and, first of all, the setting of effective feedback between the state and business, become important.

In particular, numerous public organizations operate in the market of technical means of economic security of legal and natural persons of Ukraine to interact with institutions of state power and lobby for legislative procedures: the Corporate Security Council of the Ukrainian Union of Industrialists and Entrepreneurs (USPP), the International Anti-Terrorist Association (IAO), the Ukrainian the Federation of the Security Industry (UFIB), the Ukrainian Federation of Employees of Non-State Security

Services (UFPNSB), the Ukrainian Federation of Security Specialists (UFSB), the Ukrainian Union of Fire and Technogenic Safety (USPTB), the Ukrainian Union of Manufacturers of Fire Protection Products and Services (USVPPP); Ukrainian Association of the Market of Technical Means of Economic Security of Legal and Natural Persons; All-Ukrainian public organization of manufacturers, distributors, integrators and installers of technical means of protection, automation and dispatching of engineering systems.

For example, the most influential organization in the segment of technical and physical property protection is the Ukrainian Federation of Security Professionals (UFSB). The main areas of its activity are the development and improvement of legislation, participation in the advisory councils of state security bodies, the fight against violations of the rights of Federation member enterprises committed by state bodies, as well as the fight against unfair competition and monopolistic practices in the market.

Regarding the analysis of the activities of enterprises in those segments of the market of technical means of economic security of legal entities and individuals, which, according to the law, are subject to mandatory licensing, the results show that domestic producers of products and services quite successfully implement and apply them in the production of products, works and services standards and norms of the European Union, which became possible, first of all, thanks to the purposeful work of the above-mentioned public organizations. For example, it was USVPPP that commissioned the development and implementation of the European standard EN 54.

It should also be noted that public organizations are the main initiators of participation in numerous European projects and political initiatives in the field of security, such as the New European Security Program, the Smart Cities Initiative aimed at improving the lives of citizens in the field of security and protection, acting as members of the European association EURALARM , which, in particular, includes more than 5,000 European companies in the market for providing electronic means of fire safety and protection, with an annual volume of 67 billion euros.

The next group of subjects are suppliers from among manufacturers of finished products and components for them. In particular, foreign suppliers of safety and security

equipment can be divided into three groups by geography and prices [108]: first-class suppliers are companies from the USA, Germany, France, Austria, Switzerland and Great Britain; mid-level suppliers include companies from Canada, Holland and Israel; suppliers of cheap products are based in Poland, China and Taiwan. The difference between top-tier suppliers and mid-tier suppliers lies in the robustness of the quality management system. The largest concentration of foreign suppliers-manufacturers of software and hardware products belongs to the segment "Technical equipment for security purpose" (TZOP). In other segments, their predominance is noticeable, but the role of domestic manufacturers is also noticeable. Having lost Russia as a trading partner, there is a tendency for Ukrainian manufacturers to build up their own know-how and increase their competitiveness, especially through the introduction of modern technologies from Israel and the West. In Annex Z, an attempt has been made to summarize the available information on foreign and domestic manufacturers of the market of technical means of economic security of legal entities and individuals of Ukraine and to form an approximate list of them.

One of the characteristic features of the market of simple and complex technical systems in the field of economic security of legal entities and individuals is the existence in the chain of value creation along with traditional subjects - manufacturers, distributors and consumers, subjects who can be characterized as service providers on market, namely: installers and integrators.

Installers are enterprises whose activities are related to: installation and commissioning of fire alarm and video surveillance systems, maintenance and delivery of turnkey systems, technical support, i.e. provision of warranty and post-warranty maintenance of facilities.

An integrator is, first of all, a comprehensive service provider specializing in the sale and integration of information security products (software and hardware). The main profile of such enterprises is IT , thanks to which integrated management of all processes involved in meeting the individual requirements of their, primarily, corporate clients is possible: from the design of security systems (physical, informational, economic), development of technical tasks, formation of technical requirements to their integration

with management systems of engineering networks, information systems of the facility, installation and commissioning [4; 24].

At the moment, domestic integrators play a key role in three segments: 1. Technical means of information protection; 2. Technical means of security purpose (TZOP); 3. Technical means of fire and man-made safety (TZPTB) and fire surveillance. Of which the first is characterized by their greatest concentration. It is obvious that with further digitization, their role will become even more important. The list of National system integrators of the market of technical means of economic security of legal entities and individuals of Ukraine is given in Appendix Ж.

Analyzing the European and, in general, the world experience of the functioning of the studied market, an important role in improving the quality of services and products, in particular, the segment of technical means for security purposes and the segment of fire-fighting and technical safety means, is played by a developed insurance institute. According to experts, the need for civilized fire risk insurance during the construction of facilities and after their commissioning has long been overdue in Ukraine. Enterprises participating in the fire protection market and insurance companies are not active enough, they do not take into account the European and world insurance experience in this field.

Therefore, on the basis of the analysis of market information available in open sources about the activities of enterprises operating on the market of technical means of economic security of legal entities and individuals of Ukraine, it is possible to generalize the subject structure of chains of creation of complex technical systems on the market of technical means of economic security of legal and individuals of Ukraine by highlighting its key players, which include [88; 89; 91; 106]:

- domestic and foreign manufacturers of complex technical systems (hereinafter STS), which are suppliers to the market of finished products;
- domestic and foreign manufacturers of components for the production of complex technical systems, which are suppliers of suppliers of finished products;
- distributors of well - known STS brands, who are also suppliers (sellers) of finished products;

- integrators and developers of complex solutions, who play the role of direct executors or service providers in the field of physical and information security to end users (legal entities and individuals) on the one hand, and an intermediate connecting link between suppliers and consumers;
- installers, i.e. enterprises whose activities are related to the implementation of installation and commissioning of fire alarm and video surveillance systems, technical support (maintenance) and delivery of turnkey systems, which play the role of subcontractors or independent service providers in the field STS sales;
- customers, i.e. direct customers from among legal entities and individuals;
- a wide range of consulting, logistics, marketing, insurance and other companies, as well as research institutes, design bureaus, which are involved in the creation, implementation and delivery of finished products to the market.

At the same time, from the point of view of the concept of supply chain management, it is important to clarify not only the structure of the chain and the composition of participants, but also the processes that play a significant role here. Our market analysis makes it possible to single out the main types of activities that take place in the chains of creation of complex technical systems in the market environment of technical means of economic security of legal entities and individuals:

→ supply of components for the production of finished products (simple and complex technical systems);

→ production of finished products (complex technical systems);

→ sale of finished products (complex technical systems);

→ sale of a comprehensive service in the event that the finished product requires additional implementation work:

· drawing up the implementation project and its technical task,

· performance of installation and commissioning works,

· performance of commissioning works (turnkey delivery),

· provision of technical support/maintenance, which the customer himself is unable to perform independently or if such work is subject to licensing in accordance with current legislation.

Therefore, depending on what the consumer receives in the end - a complex service, which includes as a finished product / products with a set of relevant services, starting with the selection of the necessary set of technical means, their installation or installation, ending with further technical maintenance, or a specific object of a complex technical system with the required characteristics without accompanying services for selection, installation and/or maintenance, two types of chains of creation of complex technical systems on the market of technical means of economic security of legal entities and individuals can be distinguished: short and full or integrated (Fig. 4.1 and 4.2).

Thus, unlike a short chain, an integrated chain of creating complex technical systems in the environment of the market of technical means of economic security of legal entities and individuals distinguishes among other characteristic features, to which they are traditionally classified [50, c . 40-41]: long-term nature of cooperation , exchange of information with partners and monitoring activities, coordination of the flow of products , information and money, joint planning, reduction of chain costs, management of stocks in the chain , coordination of procedures and rules of cooperation , joint risk of enterprise activities, as well and two characteristic features, the first of which is related to the product aspect - while short chains of creation of complex technical systems are product-oriented, integrated, on the contrary - service-oriented; and the second with a subjective aspect - in the full chain, the key role belongs to the integrator, who, at the same time, is the link that is in the immediate vicinity of the consumer, while in the short one - the main role is played by the manufacturer, and the closest link to the consumer there is a distributor.

Taking into account the above, it can be concluded that approaches to the management of strategic aspects of the development of chains of complex technical systems and their individual participants will have significant differences for these two types at all stages and levels of management, and therefore the direct benefits and threats of the integration of a separate enterprise will also differ in the chain of creation of complex technical systems and vision of the potential consequences of integration.

Thus, the analysis of the subject structure of the market of technical means of economic security of legal entities and individuals made it possible to identify the

characteristic structure of the chains of creation of complex technical systems in the studied environment, its main participants, to understand who has the main levers of influence on the rules of the game in its main segments and structure the processes that take place here.

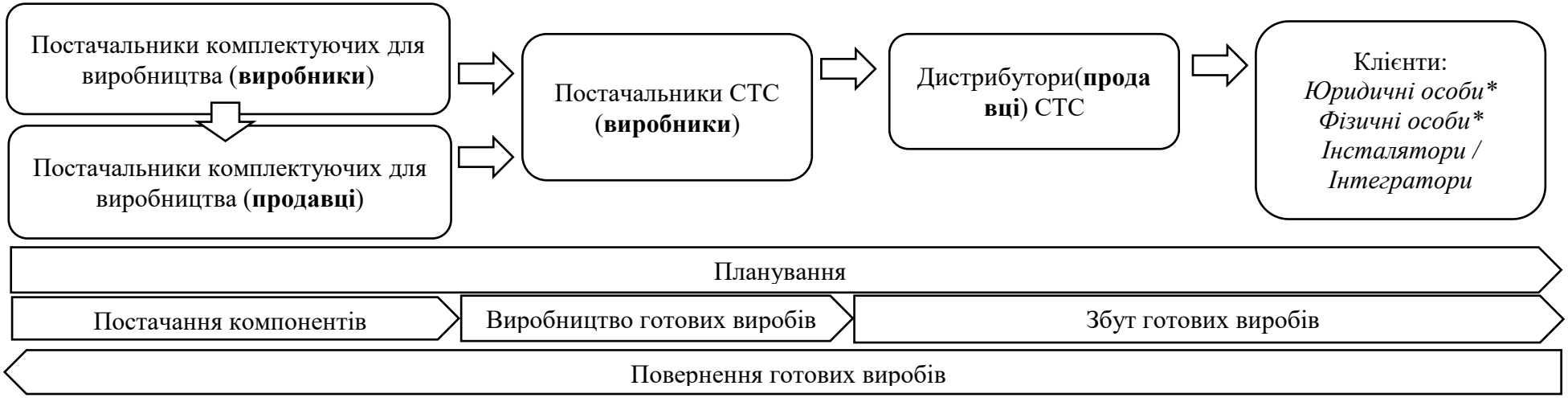


Fig. 4.1. A short chain of creation of complex technical systems on the market of technical means of economic security of legal entities and individuals[7]

Fig. 4.2. An integrated chain of creation of complex technical systems on the market of technical means of economic security of legal entities and individuals

Примітка: власна розробка

[7]- in the case when the finished product does not require additional maintenance

In order to substantiate the key factors of the development of the current and potential chains of creation of complex technical systems in the market of technical means of economic security of legal entities and individuals, it is initially necessary to identify the key factors of the development of the market of technical means of economic security of legal entities and individuals of Ukraine and to analyze the main trends of its main segments.

Summarizing the analysis of the product and subject structure of the market of technical means of economic security of legal entities and individuals of Ukraine, it is possible to single out the key factors of influence (Table 4.2), the actual assessment of the influence of which on the business of this sphere will allow further to outline the factors of influence on the activities of functioning here chains, as well as visualize weaknesses and strengths based on the application of the SWOT analysis technique.

Table 4.2

Key factors influencing the market of technical means of economic security of legal entities and individuals of Ukraine

Sphere of influence	Factors	Current business impact assessment	Influence
1	2	3	4
Activities of state regulators	Lack of a comprehensive state policy and development plan for the security and protection sector	Restrains business development	↘
Activities of state regulators	Absence of mandatory property insurance of buildings	Restrains business development	↘
Activities of state regulators	Implementation of European standards regarding the quality and installation of fire-fighting equipment	Stimulates business development (in the fire safety equipment segment)	↗
Activities of state regulators	Implementation of the electronic public procurement system	Stimulates business development	↗
Activities of state regulators	Reform of the National Police	Stimulates business development	↗
Activities of state regulators	Signing by Ukraine of the Deep and Comprehensive Free Trade Area Agreement (DCFTA) with the EU, which encourages the introduction of EU standards in the field of safety and security	Stimulates business development	↗

Continuation of the table. 4.2

1	2	3	4

Economic policy	Consequences of economic recession	Restrains business development	↓
Economic policy	Problems in business lending	Restrains business development	↓
Economic/Social policy	The growth of crime	Stimulates business development (in the security equipment segment)	↑
Economic policy	Revitalization of the real estate and construction market	Stimulates business development (in the segment of fire-fighting and technical safety equipment)	↑
Economic policy	Reduction of imports from Russia	Stimulates business development	↑
Market	The dominance of the price criterion in the purchase by Ukrainian buyers of equipment and services in the field of security and protection	Stimulates and Restrains	↑↓
Market	Expansion by international giants	Stimulates and Restrains	↑↓
Market	After price, a supplier's ability to provide warranties, skilled service, and customer support is an important criterion for making a decision to purchase equipment.	Stimulates business development, especially the high-tech segment	↑
Market	The presence of public organizations and associations that are able to build effective relationships between business and the government	Stimulates business development	↑
Market	The growth of the presence of IT companies in the market and, as a result, the growing scale of the use of IT technologies in security systems	Stimulates business development	↑

Note : own development

So , the main ones factors impact on market technical means economic security legal and physical persons of Ukraine you can conditionally group by spheres their impact on three groups : conditioned activity regulatory bodies this market , conditioned economic / social politics states , stipulated action market . The assessment of the influence of each of the presented in the table is given. 4.2 factors on business, although it is quite conditional and imprecise, at the same time, it still allows you to structure these factors according to the direction of their effect on enterprises and better understand the chances

and opportunities that business can use for growth. In particular, analyzing the presented factors, the following conclusions can be drawn: 1) despite the lack of a comprehensive state policy and plan for the development of the security and protection sector and the lack of a developed insurance institute, in general, the activities of domestic businesses in the studied market are regulated and aimed at integration with European standards and rules. The latter, in the case of effective implementation, contributes not only to increasing the attractiveness of the domestic market for foreign companies, but will also increase the competitiveness of domestic products in foreign markets; 2) the consequences of the economic recession - the drop in solvent demand, problems in crediting, inflationary processes and extreme devaluation of the national monetary unit certainly created a number of barriers for domestic business in all spheres of economic activity, using a rigid and inevitable mechanism of screening out the weakest units. At this time, new chances and opportunities are opening up for all those who remained afloat in connection with the withdrawal from the market of Russian competitors, the exit from the real estate market crisis and the use of a negative social phenomenon - the growing crime in cyber and physical space - to their advantage; 3) the direction of action of market factors influencing the market of technical means of economic security of legal entities and individuals can generally be assessed as positive. The main driving forces here are the steady trend of the growing scale of the application of IT technologies in security systems, which leads to an increase in the presence of IT companies on the market, which can seriously compete with integrators, stimulating the latter to find effective ways to provide the end client with the best offer. In combination with the dominance of the price criterion and the simultaneous high demand of customers for the quality of products and services, this accelerates and strengthens the importance of considering the concept of management of integrators from the point of view of the chain of creation of complex technical systems. On the other hand, with the simultaneous expansion of international manufacturers, this also acts as a stimulating factor for domestic manufacturers to, first of all, logistical integration with suppliers and sellers, in order to gain advantages over competitors.

Based on the generalizations of the above analysis, the next step is to outline the key business development trends of the technical means of economic security of legal entities and individuals in terms of its product segments.

Based on the analysis of information sources [9; 15; 25; 29; 30; 34-37; 110; 119; 120; 122], let's summarize the key trends of business development in the environment of the functioning of chains of creation of complex technical systems of the market of technical means of economic security of legal entities and individuals (table 4.3).

Table 4.3

Key trends in business development in the environment of the functioning of chains of creation of complex technical systems of the market of technical means of economic security of legal entities and individuals of Ukraine

Key trends that lay the foundation for future business growth in the market of technical means of economic security of legal entities and individuals of Ukraine	Priority segment
1	2
Growth in connection with the increase in the rate of construction of commercial real estate	Segment of fire-fighting and technical safety equipment
Growing demand for automatic fire alarm software, in particular for modern smart technologies, which are much more reliable than the equipment of previous generations, presented today on the Ukrainian market.	Segment of fire-fighting and technical safety equipment
Growing demand for security alarm systems, access control at the entrance and solutions in the field of direct protection	Segment of technical means for security purposes
Growing demand for automated complex security systems capable of solving various issues and producing the necessary action plans	Segment of technical means for security purposes
Increasing demand for software that can help solve general security problems, as well as problems related to the security of cities, airports and enterprises.	Segment of technical means for security purposes
Increasing connections of enterprises and organizations to central control panels in order to gain access to new options for collecting and analyzing information	Segment of security equipment (video analytics)
The growing need for the development of solutions in the field of public security, which will require the integration of security and security equipment of state and commercial structures into a single system	The segment of technical means of security purposes (in the aspect of integration of business and the state)
Continuation of the table. 4.3	
1	2
The growing need for the development of electronic identification systems, given the country's transition to Western norms and standards.	Segment of technical means of information protection
Growing demand for repair services of technically complex equipment	Segment of technical means of information protection

	Segment of technical means for security purposes Segment of fire-fighting and technical safety equipment
Growing demand for monitoring, control and protection systems using GPS technology	Segment of technical means of information protection Segment of technical means for security purpose
The growing scale of application of IT technologies in security systems	Segment of technical means of information protection Segment of technical means for security purpose Segment of fire-fighting and technical safety equipment
Increasing demand for a supplier's ability to provide warranties, qualified service and customer support	All segments
Growing demand for low-cost Asian products and solutions	All segments
Consolidation of the market, as a result of which only the largest and most capable companies will remain	All segments

Note: Own development

On the basis of the identified key factors in the development of the market of technical means of economic security of legal entities and individuals of Ukraine and the trends of business development in the environment of the functioning of chains of creation of complex technical systems, we will apply one of the most common methods in assessing the environment of functioning of a particular object, which is used for the purpose identification of its strengths and weaknesses, with simultaneous determination of opportunities and threats inherent in the external environment - SWOT analysis. To do this, we will form a matrix of the primary SWOT analysis of the market of technical means of economic security of legal entities and individuals of Ukraine and analyze it (Fig. 4.3).

STRENGTHS	WEAK SIDES	
1. Availability of domestic and foreign sales markets 2. The presence of a large number of small enterprises, distinguished by their flexibility and quick adaptation to the conditions of the external environment 3. The growing scale of the application of IT technologies in all spheres of activity, including in security systems 4. Increasing connections of enterprises and organizations to central control panels in order to gain access to new options for collecting and analyzing information 5. The presence of large integrators capable of uniting medium and small production enterprises 6. The presence of public organizations and associations that are able to build effective relationships between business and the government 7. Increasing presence of IT companies in the market	1. The dominance of the price criterion in the purchase by Ukrainian buyers of equipment and services in the field of security and protection 2. Lack of proper technological level of domestic producers 3. Lack of working capital 4. Fragmentation of relationships in the links of the chain 5. Difficult financial situation of enterprises.	Internal environment
OPPORTUNITIES	THREATS	
1. Revitalization of the real estate and construction market 2. The growth of crime 3. Reduction of imports from Russia 4. Implementation of the electronic public procurement system 5. Reform of the National Police 6. Implementation of safety and security standards: · Signing by Ukraine of the Agreement on Deep and Comprehensive Free Trade Area (DCFTA) with the EU; · Implementation of European standards regarding the quality and installation of fire-fighting equipment; 8. Growing demand for: · security alarm systems; · automated complex security systems · repair services of technically complex equipment; · monitoring, control and protection systems using GPS technology; · electronic identification systems; · a solution in the field of public security, which will require the integration of security and security equipment of state and commercial structures into a single system 7. Growing requirements for the quality of solutions and the complexity of proposals	1. Consequences of economic recession: · low solvent demand; · problems in business lending; . inflation; · devaluation. 2. Expansion by international giants 3. Influx of cheap suppliers 4. Lack of a comprehensive state policy and development plan for the security and protection sector 5. Absence of mandatory property insurance of buildings	Environment

Fig. 4.3 . The matrix of the primary SWOT analysis of the market of technical means of economic security of legal entities and individuals of Ukraine

Note: Own development

According to the results of the SWOT analysis, we establish that the researched market has a number of strengths and opportunities, primarily related to such market

factors as: the growing demand for IT technologies and solutions in the field of security and the growing number of objects that require a variety of protection, including due to the growth of the real estate market and the level of crime as a result of the economic recession in the country, the presence of unoccupied market niches and the potential for growth and expansion into international markets, the presence of a sufficient number of small and medium-sized firms, as well as integrators capable of providing a wide range of services for the maximum satisfaction of the end consumer .

In combination with favorable legislative initiatives aimed at improving existing standards and rules for the provision and execution of works in the field of security and a high probability of further successful implementation in the process of harmonization of current and European experience thanks to the activities and significant role of public organizations and associations, the specified market and its individual segments look particularly attractive from the point of view of attractiveness of doing business.

At the same time, the presence of weaknesses and external threats, such as low purchasing power, problems with the availability of financial resources, growing competition from Asian manufacturers and international giants, a number of bureaucratic problems with licensing, can certainly become a significant obstacle for a business that lacks strategic guidelines and does not take advantage of strategic partnerships. Taking into account the main requirements of the market for final products/services in the field of security, it can be concluded that in the epicenter of the primary attention of the management of business structures are such categories as:

- expenses - their minimization/optimization in order to form a better price offer;
- quality related, first of all, to the reliability of the functioning of security systems - informational, financial or economic;
- comprehensiveness of services and functionality of final products.

Taking into account the above aspects of the market research of technical means of economic security of legal entities and individuals of Ukraine, it is possible to identify the main market requirements for key players of the market of technical means of economic security of legal entities and individuals, the ability to comply with which will obviously play the role of catalysts for achieving market success. These include:

→ efficiency;

→ competitive price;

→ quality;

→ order fulfillment speed;

→ integration of solutions with the capabilities of the most modern information technologies.

Thus, while a thorough analysis of existing concepts of realizing the strategic potential of business and, in particular, strategic alternatives of manufacturers of complex technical systems of the market of technical means of economic security of legal entities and individuals of Ukraine , reflected in the second section of this work, proves the exceptional value of the chain concept supplies in a theoretical plan, the conclusions we obtained regarding the key catalysts for achieving market success by business in the researched area confirm the validity of the conclusions already made at a more practical level.

At the same time, the final proof of the priority of building on the basis of the mentioned concept a modern strategic paradigm of business in the market of technical means of economic security of legal entities and individuals on the example of manufacturers of complex technical systems requires a more detailed acquaintance with the practical activities of such entities and especially with their internal problems, development which is possible due to strategic partnership and integration into a chain association of suppliers, manufacturers and consumers.

4.2 . Evaluation of internal and external logistics processes of enterprises - manufacturers in the chains of creation of complex technical systems of the market of technical means of economic security of legal entities and individuals

In international practice, in order to identify the objective state of the enterprise, it is suggested to investigate [68]: information about the characteristic features, goals of activity, role and main characteristics of the organization; tasks, strategies, policies and plans of business activity of the organization; financial opportunities and results of financial activity; product sales system; production activity; innovative activity; workforce; management system and practical activity; overall efficiency.

One of the main tools for strategic analysis of the state of the enterprise and assessment of the effectiveness of the strategy by financial and non-financial indicators at the same time is the balanced system of BSC indicators (English: Balanced Scorecard), which is designed to provide answers to the four most important questions for the enterprise [85; 90]: how the company is evaluated by customers (aspect of the client), which business processes can provide the company with exceptional competitive advantages (internal economic aspect), how it is possible to achieve further improvement of the position of the company (aspect of innovation and learning), how shareholders evaluate the company (financial aspect). Analysis of strategic zones of management, market business niches of enterprises is also carried out with the help of [39; 105]: D. Abell's three-dimensional matrix (a three-dimensional matrix is built according to the parameters: consumer demand for the product, product consumers, the technology that is the basis of the consumer product. Each cube of the matrix defines a certain sector of the market for a certain product) and Zwicky's morphological matrix (characteristics are indicated vertically , which determine the aspect of consideration of a specific problem, and each row of the matrix contains options for solving the problem according to the specified feature. This matrix allows you to identify the most attractive market niche).

Therefore, on the example of the activities of the manufacturers of the market of technical means of economic safety of legal entities and individuals, engaged in the segment "technical means of fire and man-made safety (TZPTB) and fire surveillance"

and starting from the available financial information, we will try to conduct a strategic analysis of internal and external the state of these subjects in order to identify their strengths and weaknesses, strengthen and neutralize them, respectively, which is possible thanks to strategic partnership and integration into the chain of creation of complex technical systems.

The business entities selected for analysis are: "Electroprylad " LLC, "SKB Electronmash" LLC, "Altosan" LLC.

Research and production enterprise "Electroprylad" was founded in 1993 in the city of Lviv. Starting from 1997, the equipment for voice notification of people about a fire was certified in Ukraine, and in 1998 - in Russia. Today, it is the only domestic manufacturer and exporter of equipment complexes for public notification of fire and other emergency situations.

The complex of speech notification of people about a fire is a multifunctional device, the main functions of which are: transmission of messages about the occurrence of a fire in both manual and automatic modes, transmission of messages through a microphone, making a search connection, broadcasting music programs, the possibility of autonomous operation by absence of voltage, etc. Currently, fire alarm and evacuation systems are an integral element in the construction of most modern buildings (structures) of various purposes.

In general, about 10 brands are represented on the Ukrainian market of voice fire warning equipment. This manufacturer owns the trademark VELLEZ .

NVP "Electroprylad" is also a manufacturer of sound control systems and communication systems for railway stations, stadiums, recreation areas, gas stations, conference halls, complexes for holding conference calls using analog and digital communication channels. The products of the "Electroprylad" NVP are distinguished by their ease of use. All products produced by the "Electroprylad" NVP (more than 100 items) comply with European standards EN 54, and have valid certificates of conformity. The most famous objects in Ukraine, which are equipped with VELLEZ brand equipment , are: Palace "Ukraine", National Philharmonic, National Bank of Ukraine, State Tax Administration, Ministry of Finance of Ukraine, Accounts Chamber of Ukraine, Premises

of the Cabinet of Ministers of Ukraine, Constitutional Court of Ukraine, Administration of the President of Ukraine, St. Michael's and Assumption Cathedrals in Kyiv, "Ukraine" department store, Slavy Park, district offices of the Ministry of Internal Affairs, academies, universities (for example, the assembly hall of the main building of Lviv Polytechnic University), schools, supermarkets, shops; "Kyiv Passenger" railway station, Kyiv metro stations, the airport in the city of Mariupol, the stadium "Ukraine" in the city of Lviv [76].

Among the intermediary enterprises with which only Lviv LLP NVP "Electroprylad" cooperates, there are more than a thousand counterparties (information from the sales department).

Another domestic manufacturer selected for analysis, which operates in the segment "technical means of fire and man-made safety (TZPTB) and fire monitoring" is TDV "SKB Electronmash". The enterprise develops, implements, manufactures and sells technical means for building fire alarm systems, automatic fire extinguishing and smoke removal systems . This enterprise was founded in 1994 in Chernivtsi. The company owns a well-known domestic market brand of reception and control devices "VARTA", intelligent fire detectors of the "PREMIER" series, which have found their application in tens of thousands of objects of various purposes. The address system of fire alarm, automation and control "VARTA-ADRES" is distinguished by its special technology and competitiveness, which, according to its characteristics and capabilities, creates serious competition with analogues of the world's leading manufacturers.

The most famous facilities in Ukraine that are equipped with SKB Electronmash TDV equipment are: ArcelorMittal (Kryvyi Rih), Azovstal, Dnipro Metkombinat, Ukrtelecom, Ukrzaliznytsia, Severodonetsk Azot, as well as a number of sports buildings, residential and commercial real estate. Products are also exported to Moldova, France, Belarus, Kazakhstan, Romania. In 2005, the company received the ISO 9001:2000 international quality management system certificate, which is confirmed annually by an audit. At the moment, ISO 9001:2008 certificates issued by the company " BUREAU VERITAS » and DSTU ISO 9001:2009 UkrSEPRO.

"Altosan" LLC, which specializes in the production of aerosol fire extinguishing systems, as well as fire extinguishing control devices, is also included in the cohort of domestic manufacturers of the fire protection and fire monitoring segment. The history of "Altosan" LLC dates back to 1989, however, it was only in 1995 that aerosol fire extinguishing systems were promoted to the Ukrainian market. In 1998, using the best experience in the field of fire extinguishing, as well as on the basis of the study of the market and existing samples of fire automatics of imported and domestic production, a decision was made to start scientific developments. In 2000, the Alto 2000 complex entered the market. To date, Altosan LLC is successfully operating on the market of Ukraine, as well as entering the markets of other countries. The company's products are submitted for certification in several countries near and far abroad. Since 2009, the ISO 9001 system has been implemented.

"Altosan" LLC is also: a co-founder of the International Association "Fire Safety of Ukraine", a co-founder of the "Assistance of State Fire Protection" fund, a member of the technical committee for the implementation of EN 54 in Ukraine in the field of fire automation, a co-founder of the Ukrainian Union of Fire and Technogenic Safety . The generalized assortment of goods and services of the investigated manufacturers is given in the table. 4.4.

The technical analysis of the assortment positions of the investigated manufacturers allows us to conclude that the majority of them by degree of complexity belong to complex technical systems. All products are certified, service activities are licensed.

Table 4.4

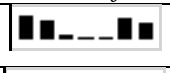
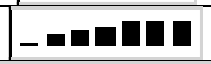
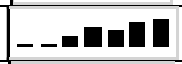
Assortment of goods and services of the investigated manufacturers

"Electroprylad" LLC	TDV "SKB Electronmash "	"Altosan" LLC
· Devices used in alarm systems · Devices used in medical institutions · Auxiliary devices are necessary for the functioning of alarm systems (such as timers, informers, etc.) · Monoblocks for free-standing and wall mounting · Solutions for speakerphone communication · Equipment used in the subway · Wired communication equipment · Loudspeakers · Amplifier mixers	· Non-addressable fire receiving and control devices (PPKP) - 13 items · Fire detectors, non-addressable (smoke, heat, combined, manual) - 16 items · "VARTA-ADRES" addressable fire alarm and control system - 9 items · Sets of equipment for fire alarm - 4 names · Explosion-proof equipment - 4 names · Fire extinguishing and smoke removal control devices (PPKPyU) - 13 names · Means of communication with the PCS (telephone communicators) - 2 names	· Fire receiving and control devices with control devices for automatic fire protection · "ALTO 2000" - 4 names · Fire-extinguishing aerosol generators of the "AGS" series · Reception and control devices of the fire department "ALTO PP" - 4 names
In total, more than 100 names of products	In total, more than 60 names of products	In total, about 10 names of products
Services		
	· Service of powder painting of metal products · Molding of plastic products	· Performing maintenance work · Execution of installation and debugging works · Designing. Concept development and full design cycle

The main competitors on the market for the production of components of fire protection systems are listed in Appendix K. We will analyze the indicators of the activities of LLP NVP "Electroprylad", TDV "SKB Electronmash" and LLP "Altosan" on the basis of information presented in the financial statements: the Report on financial results and the Balance Sheet (see Appendix L) and reduce them to tabular form, displaying their expanded form in Appendix M and abbreviated version in the table. 4.5, as well as to the graphic form (Fig. 4.4-4.12). Therefore, according to the results of the analysis of the property status, the Chernivtsi manufacturer of technical means for the construction of fire alarm systems, automatic fire extinguishing and smoke removal of TDV "SKB Electronmash" has the largest amount of assets among the enterprises under study (17,736 thousand hryvnias as of the beginning of 2017), for which it is characterized by the dominance of current assets, which make up more than 90% of the balance sheet during the entire analyzed period.

Table 4.5

The dynamics of the specific weight of the elements of the asset and liability of the balance sheet in their total, profitability and profitability indicators of the three investigated manufacturers of the market of technical means of economic security of legal entities and individuals for 2010-2016.

Manufacturing enterprises	*"Electroprylad" LLC*		*TDV "SKB Electronmash"*		*"Altosan" LLC*	
Evaluation indicators	*Visualization of dynamics*	*Assessment of dynamics*	*Visualization of dynamics*	*Assessment of dynamics*	*Visualization of dynamics*	*Assessment of dynamics*
Indicators of the specific weight of the assets and liabilities of the balance sheet in their total						
Fixed assets		negative		positive		positive
Current assets		negative		positive		positive
Equity		positive		positive		negative
Current liabilities		positive		positive		negative
Indicators of profitability and profitability						
1. Profitability of assets		positive		positive		negative
2. Operating profitability of sales		positive		positive		negative
3. The profitability ratio of the main activity		positive		positive		positive
4. Return on equity ratio		positive		positive		negative

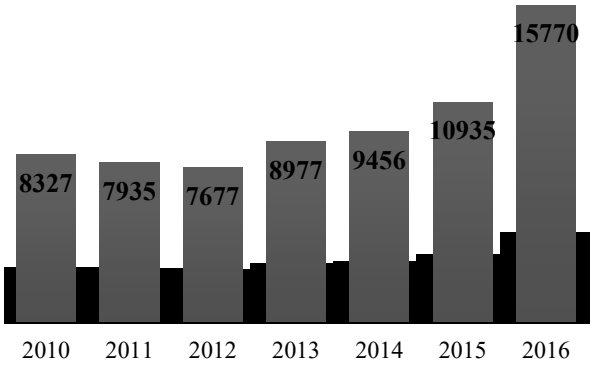


Fig. 4.4. Dynamics of assets of Electroprilad LLC NVP , thousand hryvnias.

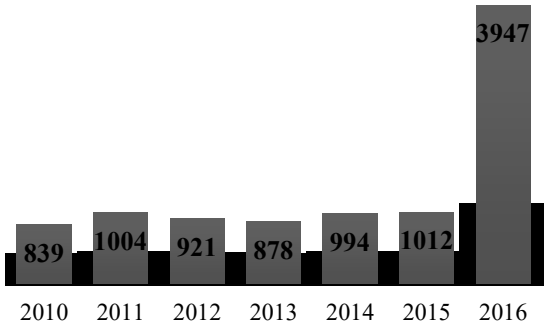


Fig. 4.5. Dynamics of production stocks of Electroprilad LLC NVP, thousand hryvnias.

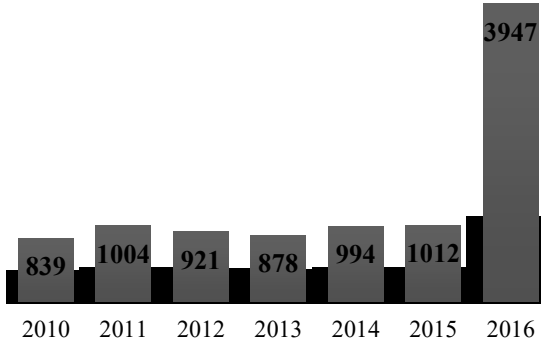


Fig. 4.6. Dynamics of fixed assets of Electroprilad LLC NVP, thousand hryvnias.

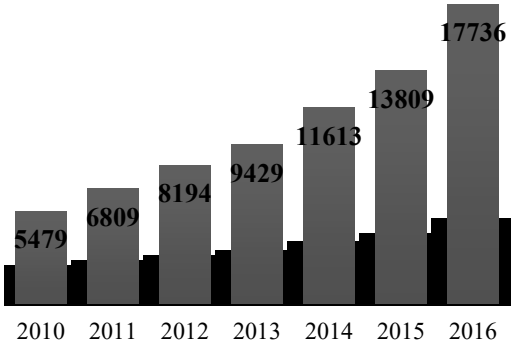


Fig. 4.7. Dynamics of assets of TDV "SKB Electronmash", thousand hryvnias.

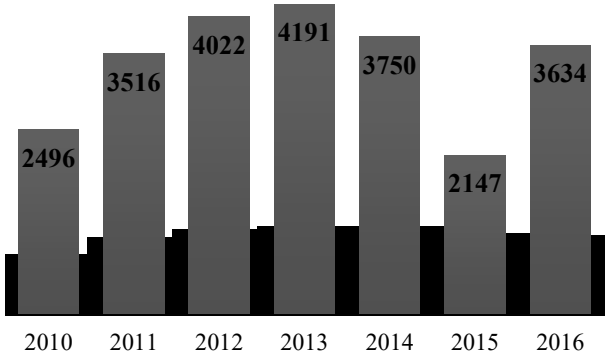


Fig. 4.8. Dynamics of production stocks of TDV "SKB Electronmash", thousand hryvnias.

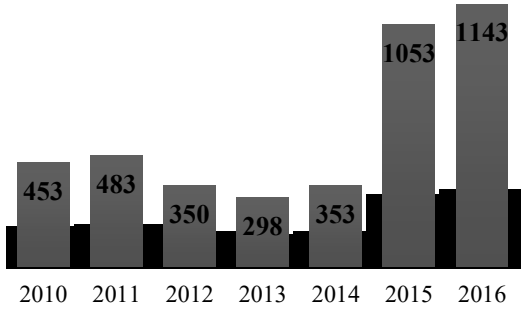


Fig. 4.9. Dynamics of fixed assets of TDV "SKB Electronmash", thousand hryvnias.

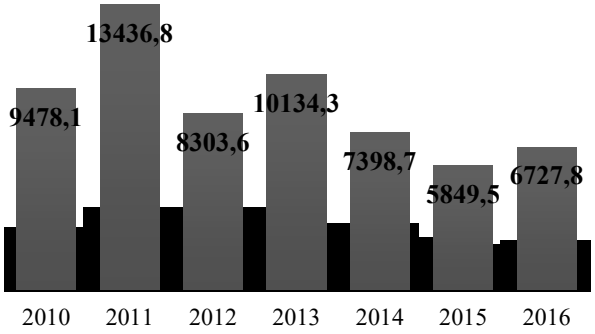


Fig. 4.10. Dynamics of assets of Altosan LLC, thousand hryvnias.

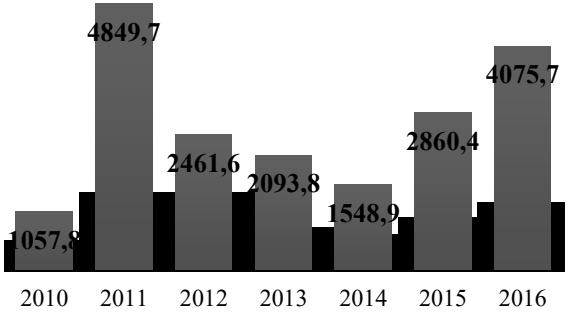


Fig. 4.11. Dynamics of production stocks of Altosan LLC, thousand hryvnias.

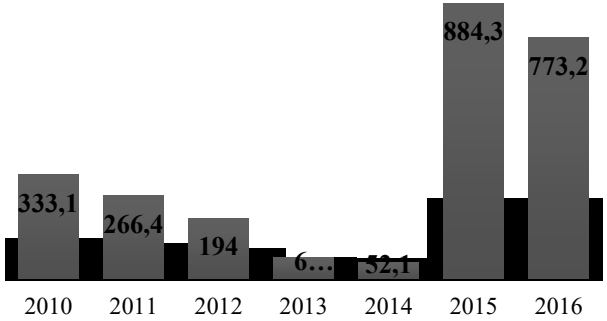


Fig. 4.12. Dynamics of fixed assets of "Altosan" LLC, thousand hryvnias

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These assets are provided own by means , testimony what is predominance in passive balance particles own capital , which makes up also more than 90% during researched period time _ As and for the rest investigated enterprises , for TDV « SKB Electronmash " characteristic is trend build-up values property means , which obviously shows _ _ about good ones market opportunities which _ contributed to their development in 2010-2016 _ _ despite on in as a whole complex economic climate in the country

As for the property structure of the rest of the enterprises, only Altosan LLP is characterized by a rapid tendency to decrease the share of own funds during the analyzed period - from 68% to 19% and an increase in the volume of current liabilities in terms of accounts payable for goods, works and services. which may threaten the risk of loss of solvency in the following periods, taking into account the fact that the majority of the company's liquid assets belong to production stocks - at the end of 2016, the specific weight of production stocks in the structure of the balance sheet was 61%. From the point of view of logistics, such a property structure is a serious object for finding solutions in the direction of optimizing their cost and volumes. The structure of the balance sheet of another company under investigation - the Lviv manufacturer of voice fire warning equipment of the NPP "Electroprylad" is characterized by a more even distribution of assets - during the entire period of time under investigation, the ratio between non-current and current assets is maintained at the level of 1:1 and is provided exclusively with own funds - a share of own of capital in the structure of liabilities of the balance sheet at the end of 2016 was 99%.

The results of the analysis of the key indicators of profitability and profitability make it possible to characterize the activities of two manufacturing enterprises, namely NVP "Electroprylad" and TDV "SKB Electronmash" as profitable and profitable in terms of such aspects as: use of assets, equity, conducting the main activity in general and operating in particular. At the same time, LLP "Altosan" is characterized by significantly worse performance results, demonstrating the presence of losses in 2010 and 2012. At the same time, despite improving the results of its activities during 2013-2016, the efficiency of the company's use of its assets, equity capital, as well as the operating profitability of sales are at a very low level, which obviously indicates a number of problems in the

operational and strategic activities of the company under study . A particularly valuable indicator of profitability, which makes it possible to assess the relationship between the operational and strategic activities of the enterprise, is the indicator of sales profitability. Thus, its average annual value for NVP "Electroprylad" and TDV "SKB Electronmash" is 7%, while for LLC "Altosan" it is 2% (we take into account the years when the company generated profits). Comparing these values with the average industry values (industry sector) (Table 4.6), as well as comparing other profitability indicators of the studied enterprises with the average industry values in developing countries, the EU and the USA (Table 4.7), it can be stated that the first two manufacturers , despite a set of restraining macroeconomic factors, proved to be able to operate effectively even in difficult economic conditions.

Table 4.6

Profitability of sales of enterprises of Ukraine by types of economic activity in 2010-2014, %

Indicators	Years				
	2010	2011	2012	2013	2014
Ukraine	0.34	1.36	0.84	-0.56	-14,11
agriculture, forestry and fisheries	14.56	16.50	16.68	9.19	9.99
industry	0.85	1.89	0.18	-0.29	-12.01
wholesale and retail trade, repair of motor vehicles and motorcycles	0.45	0.59	0.01	-0.80	-7.82

Note: source [17]

Table 4 . 7

Indicators of return on equity of enterprises in the "industry" sector in Ukraine, Europe, the USA and in developing countries in 2010-2014, %

Indicators	YEARS								
	2010	2011	2012	2013	2014	2014			
						Developing countries	Europe	USA	On average in the world
Industry of Ukraine	2.73	6.88	0.38	-0.58	-30.86	7.3	7.7	11.0	7.5

Note: source [17]

In particular, analyzing the complex of factors that affect the level of profitability of the enterprise (Fig. 4. 1 3), a more detailed analysis is required to study the effectiveness of the logistics activities of the outlined enterprises, since the vast majority of production and non-production factors that form the internal potential of the

effectiveness of modern enterprises, which to a large extent is under the influence of a set of logistical decisions that are purposefully or subconsciously adopted by key managers of production enterprises.

Fig. 4 . 1 3. Factors affecting the level of profitability of the enterprise

Note: source [11]

In this aspect, we will examine in more detail the indicators of business activity, the efficiency of using stocks and fixed assets of the analyzed enterprises, which are presented in an expanded form in Appendix Z and in a shortened version in the table. 4.8.

Analysis and comparison of indicators of business activity of the studied enterprises makes it possible to state:

First, the decline in the efficiency of the enterprises' use of their current assets (cash, stock of goods, production stocks, accounts receivable) at the end of the analyzed time period. At the same time, two enterprises - TDV "SKB Electronmash" and LLC "Altosan" are characterized by much worse indicators, which are characterized by the dominance of only two turnovers of current assets during the year, while the result of the management policy of current assets of LLC NVP "Electroprylad" is a predominance of six times the excess of revenue over the average balance of current asset stocks during 2010-2016. The main consequence of such a situation is the slowing down of the current activity of enterprises due to the growing need for financial resources for its implementation. In conditions of lack of access to cheap financial resources, this can also lead to an increase in the company's financial costs.

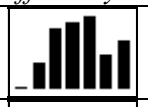
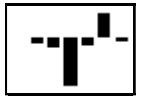
Secondly, detailing the sources of deterioration in the efficiency of the enterprises' use of their current assets, there is a significant drop in both the efficiency of inventory management and accounts receivable at all the investigated enterprises. At the same time, Elektroprylad LLC has a significantly better situation compared to other enterprises: the average inventory turnover of this enterprise is more than four times higher than the similar indicators of the rest of the enterprises over the past six years. On the other hand, LLP "Altosan" is also distinguished by the indicator of the duration of the turnover of receivables - at this company, this indicator exceeds 60 days, while the average duration of debt repayment by buyers at the rest of the companies is 12-13 days.

Table 4.8

Dynamics of indicators of business activity , efficiency of use of stocks and fixed assets of the three investigated manufacturers of the market of technical means of economic security of legal entities and individuals for 2010-2016.

Manufacturing enterprises	*"Electroprylad " LLC*			*TDV "SKB Electronmash "*			*"Altosan " LLC*		
Evaluation indicators	*Visualization of dynamics*	*Assessment of dynamics*	*Average value*	*Visualization of dynamics*	*Assessment of dynamics*	*Average value*	*Visualization of dynamics*	*Assessment of dynamics*	*Average value*
1	2	3	4	5	6	7	8	9	10
Indicators of business activity									
1. Turnover ratio of assets		negative	6		negative	2		negative	2
2. Stock turnover ratio		negative	17		positive	3		negative	4
3. Duration of DZ rotation		negative	12		negative	thirteen		positive	68
4. Turnover ratio of the fund (fund return)		positive	4		negative	31		negative	58
5. Short-circuit rotation duration		positive	thirteen		positive	17		positive	51
6. The coefficient of rotation of the VC		positive	3		negative	2		positive	4
Indicators of evaluation of the efficiency of use and the state of stocks									
Profitability of stocks,%		negative	127%		positive, in ost. period is negative	54%		uneven, in ost. period is negative	7%
Index of inventory turnover , days.		positive, except for the last period	17		positive, except for the last period	3		uneven, in ost. period is negative	4

Continuation of the table. 4 . 8

1	2	3	4	5	6	7	8	9	10
Duration of one turnover of material stocks in days		positive, except for the last period	23		negative, except for the last period	116		uneven, in ost. period is negative	114
Duration of the operating cycle, days		negative, except for the last period	35		positive, except for the last period	130		uneven, in ost. period is negative	182
Cost of stocks, thousand hryvnias.		difficult to assess	1371		difficult to assess	3394		difficult to assess	3189
Indicators of assessment of efficiency and state of use of fixed assets									
Return on fixed assets,%		positive	30%		positive	315%		negative	7%
Fund return of fixed assets		positive	4		negative	31		negative	58
Depreciation of fixed assets		positive	5%		positive	74%		positive	64%
Restoration/removal of fixed assets		negative	0%		negative	10%		in the station period is negative	-30%

First priority measures in this situations has to be : improvement politicians management stocks and receivables debt , a Namely : decrease Sumy production stocks to minimally permissible level which _ will provide continuity operational process ; stimulation sales and decrease Sumy stocks ready products and goods ; implementation measures of acceleration repayment accounts receivable debts .

Thirdly, evaluating the efficiency of the use of fixed assets of the studied enterprises, it is possible to observe the presence of negative dynamics for TDV "SKB Electronmash" and LLP "Altosan" during the last two years, while LLP NVP "Electroprylad" is characterized by an improvement in the index of return on capital. At the same time, in view of the insignificant specific weight of fixed assets in the total assets of TDV "SKB Electronmash" and LLP "Altosan", it is noticeable that the average value of the return on capital is significantly higher than the average value of LLP NVP "Electroprylad", which is characterized by a more balanced structure of assets . Therefore, such an excess should not be interpreted as an obvious advantage of these enterprises, especially taking into account the comparison of the coefficients of depreciation of fixed assets of the outlined enterprises: TDV "SKB Electronmash" and LLC "Altosan" are characterized by a high level of depreciation of the majority of fixed assets (average level, respectively, 74% and 64%), while the wear and tear of fixed assets of Electroprilad LLC NVP does not exceed 10%.

Therefore, in view of the obtained results, TDV "SKB Electronmash" and LLC "Altosan" should be recommended: to review the policy of managing fixed assets in the direction of ensuring full utilization of equipment, also a possible solution is to sell a part of unused fixed assets or a heavily worn part of them and purchase a new one , less energy-intensive and more powerful.

Fourthly, against the backdrop of the decline in the efficiency of liquid asset management, the tendency to shorten the period during which the company uses the funds of its suppliers and contractors - the duration of the accounts payable rotation - is characteristic of the companies under investigation. Despite the fact that some authors believe that accounts payable is a free resource, therefore, increasing the period of repayment of payables has a positive effect on the company's financial condition, given

possible financial complications (fines for late repayment of debts, lack of discount for payment (only at the time of delivery), markup for future deliveries, etc.), as well as the absence of a significant gap between the terms of repayment of payables and the terms of repayment of receivables in the studied enterprises, we will consider that such a trend is not negative, although from the point of view of logistics, it may require revision and optimization . It should also be noted that among the investigated enterprises, only Altosan LLP occupies a worse position compared to the rest of the enterprises, given the significant duration of receivables and payables (more than 50-60 days on average, while at the rest of the enterprises this time does not exceed 20 days), as well as for exceeding the terms of freezing funds from debtors compared to the terms of repayment of debts to suppliers. For this, it is especially important for enterprises to recommend measures aimed at the settlement of such gaps in order to reduce the time of receiving money for shipped products, which is especially important when there is an excessive amount of stocks, in which a significant part of the financial resources of the enterprise is concentrated.

Fifth, in addition to the above-mentioned aspects of the economic activity of the studied enterprises, which make it possible to assess the effectiveness of the management of their property assets, positive trends in the management of own funds have been established in general, associated with the growth of sales volumes, which account for each hryvnia involved from owners of funds. So, on average, the number of turnovers of own funds for the studied enterprises is the same and is equal to 2-4 turnovers per year. At the same time, only TDV "SKB Electronmash" is characterized by a downward trend during the analyzed period of time, which is associated with an excess of growth rates of equity capital (an average growth of 26%) over sales growth rates (an average growth of 7%).

We detail the conducted analysis of business activity by assessing the efficiency of use and the state of stocks. The analysis and comparison of indicators for the evaluation of the efficiency of use and the state of stocks of the investigated enterprises makes it possible to state:

Firstly, during the last year of 2016, there was a drop in the profitability of inventories, despite a characteristic rise among all the studied enterprises in 2015. Obviously, this is a consequence of both ineffective inventory management policy and caused by the impact on the final results of the irrationality of internal cost management, among which a prominent place belongs to administrative and other operating expenses, the growth of which determined the need to cover them with income from the main activities of the enterprises under study. Taking into account the fact that this indicator reflects the profitability of the use of productive assets, that is, those that participate in the production process, its value plays the role of an indicator of the efficiency of the entire production process at the enterprise, and therefore proves the primary need to review the selected operational strategy of production management in the direction its optimal alignment with current corporate goals. In the opposite case, enterprises will be under the influence of the risk of losing their market positions in the near future in case of deterioration or preservation of existing economic trends. Priority areas for improvement are obviously inventory management and adjustment of their volumes and structure to the production process.

Secondly, evaluating the duration of the operating cycle, which shows the time of transformation of the company's reserves into money, it can be observed its slight increase at the end of the analyzed period - 2016, with fluctuations during 2010-2016. At the same time, in addition to the dynamics, the assessment is also important time limits between the purchase of inventory and receipt of money for goods sold or services rendered. Thus, the fastest conversion of stocks into money is characteristic of the "Electroprilad" LLC NVP - only 35 days on average. Such an indicator is significantly better than even the average industry values and indicates the coordination of logistics processes in the sphere of supply - production - sales. The very fast turnover of receivables, which is an average of 12 days, and, on the whole, not a high value of the duration of rotation of material stocks - an average of 23 days, also play a significant role here. At the same time, the situation at two other enterprises is much more complicated. Thus, the duration of the operating cycle of TDV "SKB Electronmash" is 160 days on average, at TzOV "Altosan" - 182 days, of which the majority of time is concentrated in the sphere of supply -

production, while the logistics process in sales is relatively fast - 13 and 68 days on average, respectively. The latter confirms the relevance of improving logistics in the areas of supply and production of the two outlined enterprises, and especially revising their stock management policy in the direction of optimization.

Thirdly, when assessing the value of the stocks of enterprises, it should be emphasized that without detailed information on their structure, volumes and nomenclature and comparison with the production needs of enterprises, it is impossible to draw adequate conclusions, only by examining the dynamics of their value aspect reflected in financial statements. At the same time, even a simple comparison of the cost of inventories between enterprises, taking into account the obtained and previously analyzed results, allows you to see a close correlation between them. Thus, among the investigated enterprises, the best results in terms of the use of property assets, including of stocks (number of revolutions, duration of rotation, profitability, duration of the operating cycle) is demonstrated by LLP NVP "Electroprylad", characterized by the lowest value of stocks among other enterprises - only 1,371 thousand UAH. At the same time, the other two enterprises are characterized by significantly worse results and are similar to each other in a number of indicators of the use of their property assets, including reserves, as well as by the value of reserves over the past six years, which exceed the value of LLP NVP "Electroprylad" more than three times, amounting to UAH 3,394,000 on average. and UAH 3,189,000. in accordance.

The final stage is the analysis of performance evaluation indicators and the state of use of fixed assets. The analysis and comparison of indicators for assessing the efficiency of use and the state of use of fixed assets of the studied enterprises makes it possible to state: First, the profitability of fixed assets increases at LLP NVP "Electroprylad" and TDV "SKB Electronmash" and decreases at LLP "Altosan", testifying to problems at the latter and fairly good profitability of fixed assets in the first two enterprises. Secondly, enterprises differ in the degree of wear and tear of fixed assets. The most up-to-date equipment is owned by Electroprilad LLC - the degree of wear and tear is about 5%, while the company invested in updating its equipment in 2012-2013. At the same time, the use of very outdated equipment is characteristic of SKB Electronmash TDV - the

degree of wear and tear is 74 % and "Altosan" LLC - 64%. Having combined and compared the conclusions of the results of the assessment of indicators of business activity, efficiency and the state of use of stocks and fixed assets of the studied enterprises, it is appropriate to graphically display multidimensional data in the form of a two-dimensional diagram, which will reflect the strengths and weaknesses of each enterprise in the overall assessment of the analyzed groups of indicators (Fig. 4.14-4.16).

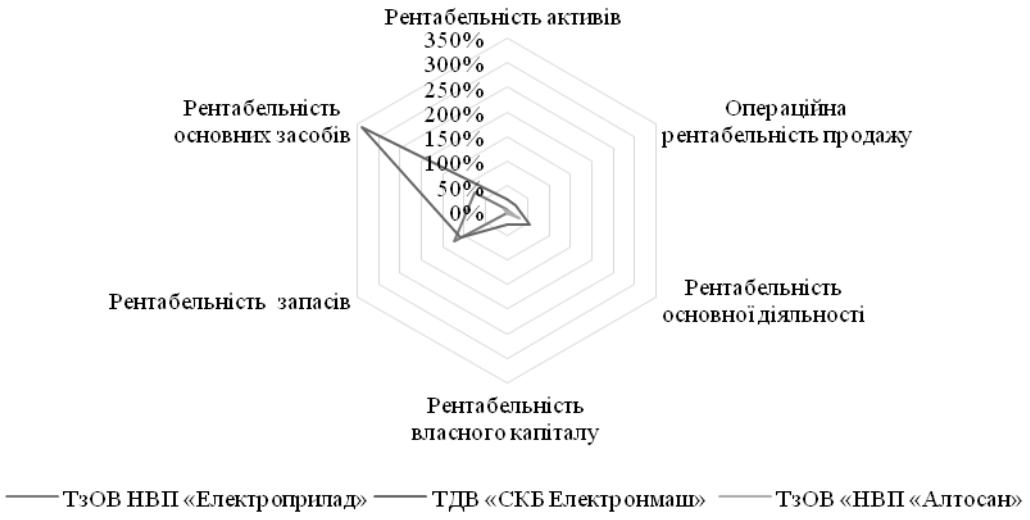


Fig. 4 . 1 4. Positioning of the studied manufacturers of the market of technical means of economic security of legal entities and individuals according to profitability indicators in 2016.

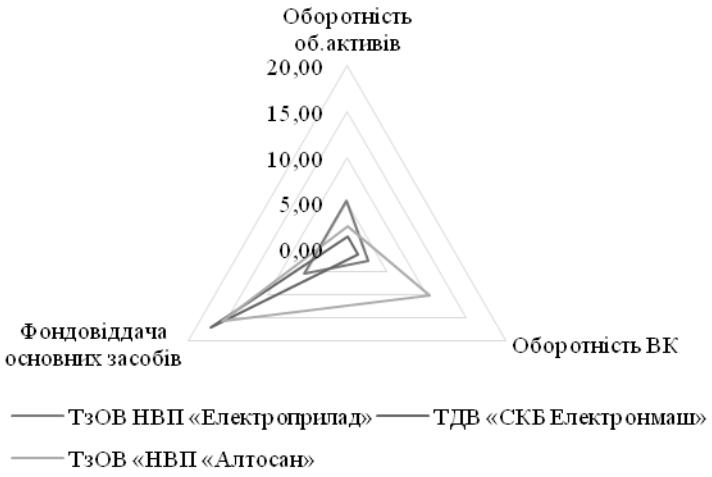


Fig. 4 . 1 5. Positioning of the investigated manufacturers of the market of technical means of economic security of legal entities and individuals according to turnover indicators in 2016.

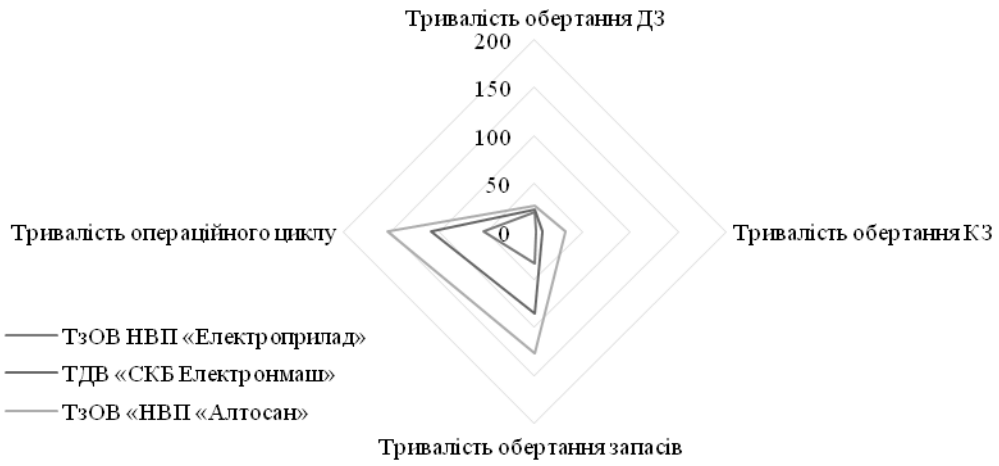


Fig. 4 . 1 6. Positioning of the investigated manufacturers of the market of technical means of economic security of legal entities and individuals according to indicators of the duration of the operating cycle and its components in 2016.

A visual representation of the position of the investigated manufacturers makes it possible to state that, by their nature, the problem areas of the investigated manufacturers are "logistical" and include:

→ inventory management (aspect of compliance of available volumes of production stocks with production needs, as well as volumes of stocks of finished products and goods with market demand) ;

→ management of relationships with clients (aspect of unpredictability/discontinuity of demand, timeliness of transactions, collection of receivables and its impact on the financial capacity of enterprises);

→ management of relations with suppliers and contractors (aspect of the timeliness of transactions, lack of synchronization of actions and confidence in future relations, postponement of debt repayment terms to creditors);

→ underutilization and obsolescence of equipment (aspect of energy consumption and economy of use).

Therefore, there is an obvious need to modify, first of all, the following functional strategies of the studied enterprises: production, logistics, marketing, financial in the direction of their optimal alignment with actual corporate goals [96], which are directly

dependent on the dominant strategic orientation: the concept of dominance of "efficiency ", the concept of dominance of "elasticity" or the concept of consensus between dominants "efficiency-elasticity". In the opposite case, enterprises will be under the influence of the risk of losing their market positions in the near term in case of deterioration or preservation of existing economic trends. On the other hand, the identification of these internal problems against the background of market requirements and opportunities convincingly proves the exceptional value of the concept of the chain of creation of complex technical systems for the studied manufacturers of the market of technical means of economic security of legal entities and individuals, which, in the case of correct and well-thought-out implementation, will serve as a catalyst for achieving them of market success (Table 4.9).

Table 4.9

The value of the concept of the chain of creation of complex technical systems for the researched manufacturers of the market of technical means of economic security of legal entities and individuals

Problem areas of the investigated enterprises	A method of neutralizing the effect of a problem area due to integration into an integrated chain of creation of complex technical systems
→ inventory management (the aspect of compliance of the available volumes of production stocks with production needs, as well as the volumes of stocks of finished products and goods with market demand);	Reliable forecasts Stabilization of demand - fewer deliveries, greater completeness Deepening of specialization Synchronization of supply-production-sales Transparency of actions Quick response to changes
→ management of relationships with clients (aspect of unpredictability/discontinuity of demand, timeliness of transactions, collection of receivables and its impact on the financial capacity of enterprises);	Reliable forecasts Stabilization of demand Long-term relations, partnership Transparency of actions Subordination to a single strategic orientation
→ management of relations with suppliers and contractors (aspect of the timeliness of transactions, lack of synchronization of actions and confidence in future relations, postponement of debt repayment terms to creditors);	Stabilization of demand Long-term relations, partnership Transparency of actions Synchronization of supply-production-sales Subordination to a single strategic orientation
→ underutilization and obsolescence of equipment (aspect of energy consumption and economy of use).	Synchronization of supply-production-sales Stabilization of demand Elimination of idle times, queues

Note: Own development

At the same time, the final proof of the priority of building on the basis of the mentioned concept a modern strategic paradigm of manufacturers in the market of technical means of economic security of legal entities and individuals of Ukraine requires, along with the identification of the peculiarities of the course of internal logistics processes, also taking into account the influence of external logistics processes.

One of the main factors of the company's successful activity in the modern market is the ability to predict the most likely scenario of the development of the situation, to react in time to possible changes, to prevent crisis phenomena, and all this in conditions of considerable uncertainty. Regarding the assessment of the impact of the external

environment on the operational strategy of the enterprise, the key importance belongs to the forecasting of demand, prices and sales volumes.

Interest in the most accurate and reliable data regarding the development of certain phenomena in social or economic relations caused the emergence of a large number of forecasting methods. Today, there are more than 150 different ways of predicting future phenomena, which can be conditionally divided into qualitative (expert) and quantitative (mathematical). Unlike subjective expert methods, mathematical methods are objective.

Taking into account the availability of a sufficient base of historical quantitative data on the retrospective values of the sales volumes of the investigated manufacturers of complex technical systems of the market of technical means of economic security of legal entities and individuals of Ukraine, it is possible to apply mathematical methods for determining the forecasted sales volumes, in particular, according to the linear Holt exponential smoothing model (model Holt) and growth curves [65, c . 336-337].

The equation, which is the first in the Holt model, is called the uncorrected model. It represents an exponentially smoothed series of the current level. To estimate the trend, we will use the second equation, and to make a forecast n periods ahead - the third equation. The forecast according to the Holt model is carried out taking into account the level of the trend slope and the current level. With this model, each indicator will have different smoothing parameters. The model is flexible, therefore, when tracking the level of the trend and its slope, you can choose their ratio [57]. The basic formula for calculating the predictive value here is as follows [65, c . 336] :

$$AF_{t+1} = F_{t+1} + T_{t+1} \quad (4.1)$$

where

$$F_{t+1} = \alpha D_{t+1} + (1-\alpha)F_t \quad (4.2)$$

$$T_{t+1} = \beta(F_{t+1} - F_t) + (1-\beta)T_t \quad (4.3)$$

T_{t+1} - trend value for the next period;

T_t - trend value for the current period;

β - parameter for smoothing the trend value.

At the same time, the forecast for n-periods ahead is determined by the formula:

$$AF_{1+n} = F_{t+1}^{last} + n \cdot T_{t+1}^{last} \quad (4.4)$$

where AF_{1+n} is the forecast by Holt's method for n periods;

F_{t+1}^{last} - exponentially smoothed value for the last period;

n - serial number of the period for which the forecast is prepared;

T_{t+1}^{last} - the trend for the last period.

The calculations of the predictive values according to the Holt model, as well as the verification of their reliability, are described in detail in Appendix H.

If there is a certain regularity in the dynamics of some economic phenomenon or process, then the tendency of this change can be established by selecting the required function $y(t) = f(t)$. Such an empirical function, called the growth curve, is considered an effective means of time series research and forecasting [65] .

In order to correctly choose the best growth curve for modeling an economic phenomenon, it is necessary to know the features of each type of curve. Polynomial, exponential and S - shaped growth curves are most often used in economics.

As part of this work, based on the determination criteria, which shows to what extent the regression explains the dispersion of the values of the resulting characteristic relative to the average and makes it possible to check the correspondence of the built regression model with the actual data, the search for the best curve will be carried out, according to which it will be possible to display the trend of changes in the sales volume of the studied manufacturers complex technical systems of the market of technical means of economic security of legal entities and individuals of Ukraine and the calculation of their forecast values. The selection criterion will be the largest value of the coefficient of determination from among the studied curves.

The plotted growth curves by the indicator of net income from the sale of goods, works, and services of the studied manufacturers are shown in Appendix P.

Having compared the forecasted sales volumes of manufacturers of complex technical systems of the market of technical means of economic security of legal entities and individuals of Ukraine obtained by means of mathematical evaluation, we will display them in a summary table (Table 4.10).

The analysis of the results of the mathematical assessment of the forecast values of the sales volume of the investigated manufacturers of complex technical systems on the market of technical means of economic security of legal entities and individuals of Ukraine gives a significant difference within the framework of the two applied methods - the Holt model and exponential smoothing.

Overall, while Holt's forecast model sales changes are close to actual values, the growth curves' forecast values appear clearly overestimated. Detailing the results obtained in relation to the investigated enterprises, it should be noted the tendency to maintain sales volumes in the following periods at the level of the last investigated year, 2016. for LLC "NVP "Altosan" - for this company, the forecast rate of change in sales volume is 0.99, while the actual rate is 0.98.

As for Electroprilad LLC and SKB Electronmash LLC, according to the Holt model, the rate of change is characterized by a significant decrease in 2017 (by 20-40%) and further growth in 2018. by 2-4%. This state of affairs is caused by significant fluctuations in the time series of these enterprises, while the activity of NVP "Altosan" LLP is more stable from the point of view of demand.

Table 4.10

The results of the mathematical evaluation of the forecast values of the sales volumes of the studied manufacturers of complex technical systems on the market of technical means of economic security of legal entities and individuals of Ukraine

Years	Actual values of net income from the sale of products (goods, works, services), thousand UAH.							Forecast according to the Holt model		Growth curve forecast
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2017
"Electroprylad" LLC										
Thousand UAH	17096	21050	20571	18460	17786	23815	35450	21133.29	21875.75	59208.08
The pace of change		1.23	0.98	0.90	0.96	1.34	1.49	0.6	1.04	1.7
Average annual rate of change	1.15									
TDV "SKB Electronmash"										
Thousand UAH	13566	14354	15212	13135	12026	15833	18942	14428.69	14676.44	28116.8
The pace of change		1.06	1.06	0.86	0.92	1.32	1.20	0.8	1.02	1.5
Average annual rate of change	1.07									
LLC "NVP "Altosan"										
Thousand UAH	12694.8	21066.6	17126.5	9330.2	6199.4	15197.4	13046.5	12837.67	12527.23	30643.06
The pace of change		1,659	0.813	0.545	0.664	2,451	0.858	0.98	0.98	2,3
Average annual rate of change	0.999									

Note: Own development

The obtained results of the analysis of the internal and external features of the flow of logistics processes at the researched companies that produce complex technical systems in the market of technical means of economic security of legal entities and individuals of Ukraine should be integrated into the process of developing a balanced system of indicators BSC (English Balanced Scorecard), which will make it possible to analyze existing strategic vectors of enterprise development, in order to determine in which direction it is necessary to improve. Unfortunately, getting an answer to such questions as how the company is evaluated by customers (aspect of the client) and how it is possible to achieve further improvement of the position of the company (aspect of innovation and learning) is a difficult task, based on the available internal information, but it can be done, relying mainly on to market requirements, characteristic of the field of production of complex technical systems of the market of technical means of economic security of legal entities and individuals. At the same time, the obtained results make it possible to get an answer to two of the four most important questions for enterprise management: which business processes can provide the enterprise with exceptional competitive advantages (internal economic aspect); how shareholders evaluate the enterprise (financial aspect) [95].

Therefore, let's create a table that will reflect the system of balanced indicators of the enterprises under study and will give an answer in which direction they need to improve (Table 4.11).

The analysis of the system of balanced indicators convincingly proves the need to modify the functional strategies of the studied enterprises from the point of view of achieving the strategic goals of the development of the specified enterprises. In this regard, the integration of manufacturers into an integrated chain of creation of complex technical systems has a unique value and potential due to the practically proven effects and benefits that open up to enterprises from the elimination of competition and cooperation within the framework of this voluntary and financially independent association of participants from various stages of creating an added cost of the final product.

Table 4.11

A system of balanced indicators of the investigated manufacturers of complex technical systems on the market of technical means of economic security of legal entities and individuals of Ukraine

"Electroprylad" LLC	
Strategic goals	Indicators
I. Financial and economic sphere	
Optimization of production stocks	Turnover of production stocks, duration of their rotation, profitability
Optimization of stocks of finished products	Turnover of stocks of finished products, duration of their rotation, profitability
Cost optimization	Cost, other operating expenses, administrative expenses, sales expenses
Increasing sales volumes	Growth rate of net income from sales, degree of renewal of fixed assets
II. Organization of business processes	
Quality improvement	The number of complaints, after-sales service costs, the share of repeated emergency repairs of equipment, reduction of design time
Productivity improvement	The number of employees per project, the ratio of actual labor costs to normative values
Increasing synchronization of actions with suppliers	Reliability, completeness, timeliness of deliveries
III. Customer relations	
Increasing the level of logistics service	Price, service, quality, speed, reliability of deliveries,

TDV "SKB Electronmash"	
Strategic goals	Indicators
I. Financial and economic sphere	
Optimization of production stocks	Turnover of production stocks, duration of their rotation, profitability
Optimization of stocks of finished products	Turnover of stocks of finished products, duration of their rotation, profitability
Reduction of receivables	Accounts receivable turnover, duration of its return
Increasing the efficiency of the use of fixed assets	Return on investment, degree of wear and tear
Cost optimization	Cost, other operating expenses, administrative expenses, sales expenses
Increasing sales volumes	Growth rate of net income from sales, degree of renewal of fixed assets
II. Organization of business processes	
Quality improvement	The number of complaints, after-sales service costs, the share of repeated emergency repairs of equipment, reduction of design time
Productivity improvement	The number of employees per project, the ratio of actual labor costs to normative values
Increasing synchronization of actions with suppliers	Reliability, completeness, timeliness of deliveries
III. Customer relations	
Increasing the level of logistics service	Price, service, quality, speed, reliability of

LLC "NVP "Altosan"	
Strategic goals	Indicators
I. Financial and economic sphere	
Optimization of production stocks	Turnover of production stocks, duration of their rotation, profitability
Optimization of stocks of finished products	Turnover of stocks of finished products, duration of their rotation, profitability
Reduction of receivables	Accounts receivable turnover, duration of its return
Increasing the efficiency of the use of fixed assets	Return on investment, degree of wear and tear
Elimination of a significant gap between the repayment terms of payables and receivables	Turnover of receivables and payables, duration of their repayment
Cost optimization	Cost, other operating expenses, administrative expenses, sales expenses
Increasing sales volumes	Growth rate of net income from sales, degree of renewal of fixed assets
II. Organization of business processes	
Quality improvement	The number of complaints, after-sales service costs, the share of repeated emergency repairs of equipment, reduction o
Productivity improvement	The number o project, the ratio of actual labor costs to normative values
Increasing synchronization of actions with suppliers	Reliability, complete timeliness of delive
III. Customer relations	
Increasing the level of logistics service	Price, service, quality, speed, reliability of deliveries,

"Electroprylad" LLC	
Strategic goals	Indicators
	number of complaints, duration of neutralization of problematic situations
Reduction of receivables	Accounts receivable turnover, duration of its return
Stabilization of demand	The growth rate of the volume of orders, the number of deliveries
IV. Innovation and development	
Implementation of the most modern information technologies	Amount of time for performing routine operations, establishing contacts with counterparties
Reduction of design time for new products	Time to design new products

TDV "SKB Electronmash"	
Strategic goals	Indicators
	deliveries, number of complaints, duration of neutralization of problematic situations
Reduction of receivables	Accounts receivable turnover, duration of its return
Stabilization of demand	The growth rate of the volume of orders, the number of deliveries
IV. Innovation and development	
Implementation of the most modern information technologies	Amount of time for performing routine operations, establishing contacts with counterparties
Reduction of design time for new products	Time to design new products

LLC "NVP "Altosan"	
Strategic goals	Indicators
	number of complaints, duration of neutralization of problematic situations
Reduction of receivables	Accounts receivable turnover, duration of its return
Stabilization of demand	The growth rate of the volume of orders, the number of deliveries
IV. Innovation and development	
Implementation of the most modern information technologies	Amount of time for performing routine operations, establishing contacts with counterparties
Reduction of design time for new products	Time to design new products

Note: Own development

SECTION 5
DEVELOPMENT AND IMPLEMENTATION OF THE DEVELOPMENT STRATEGY OF THE MANUFACTURER IN THE CHAIN OF CREATION OF COMPLEX TECHNICAL SYSTEMS

5.1. Formalization of the process of strategic adaptation of the production enterprise to integration into the chain of creation of complex technical systems

Despite the fact that over the last four decades, a huge volume of works devoted to the strategic aspects of the functioning of business structures has been developed, many attempts have been made to systematize the main influencing factors, tools, techniques, analytical techniques and means, the success of the implementation of a strategic initiative depends on their application [78], the percentage of companies that succeed remains low. According to D. Norton and R. Kaplan, which they published in 1990, only 10% of companies managed to successfully implement their strategy. The same percentage is typical for describing the success of companies after 2000: according to Fortune magazine research in 2006, less than 10% of successfully formulated strategies are effectively implemented. Taking into account the general economic condition of domestic business, there are reasons to claim that this indicator is not better in Ukraine [180].

Such statistics give rise to many questions, and force many scientists and practitioners to rethink the content of the strategy, its meaning and effective mechanisms of its implementation [80; 81].

Since the mid-1990s, one of the main trends in the space of strategic management is the growing interest in concepts that promote innovation in all its manifestations ("blue ocean strategy" by W. Chan Kim and Rene Mauborn, the concept of the eco-system by James F. Moore) and partnership (the concept of "cooperation" by Adam M. Brandenburger and Barry J. Neilbuff, the concept of the eco-system by James F. Moore), which, as a whole, are based on a conscious departure from "competition" in its traditional sense or its replacement by a more what forms of interaction with the environment:

cooperation, cooperation, integration. World practice proves that these two directions continue to be dominant even in the current conditions of directing the development of world industry to the level of " Industry 4.0 " and the unprecedented spread of information technologies in all spheres of human activity, which results in a departure from the unipolarity of both strategic and tactical orientations: combination of efficiency and elasticity, simultaneous differentiation and low costs, high quality and affordable price.

Given the low competitiveness of domestic business, including in the market of technical means of economic security of legal entities and individuals of Ukraine, there are numerous financial, technological and resource problems [93], it is possible to ascertain the lack of sufficient strategic potential for development, which necessitates the adaptation of the best business models, in particular, the concept of supply chain management, in their activity, and also actualizes the need to formalize the process of strategic adaptation of a separate production enterprise to integration into the chain of creation of complex technical systems on the market of technical means of economic security of legal entities and individuals of Ukraine.

To achieve the goal of the research, the following scientific tasks were defined: 1) to identify the motives of the integration of the production enterprise into the chain of creation of complex technical systems; 2) to investigate the influence of the integration strategy of the chain of creation of complex technical systems on the business strategy of the manufacturing enterprise; 3) to formalize the process of strategic adaptation of an individual enterprise to integration into the chain of creation of complex technical systems on the example of a market producer of technical means of economic security of legal entities and individuals of Ukraine.

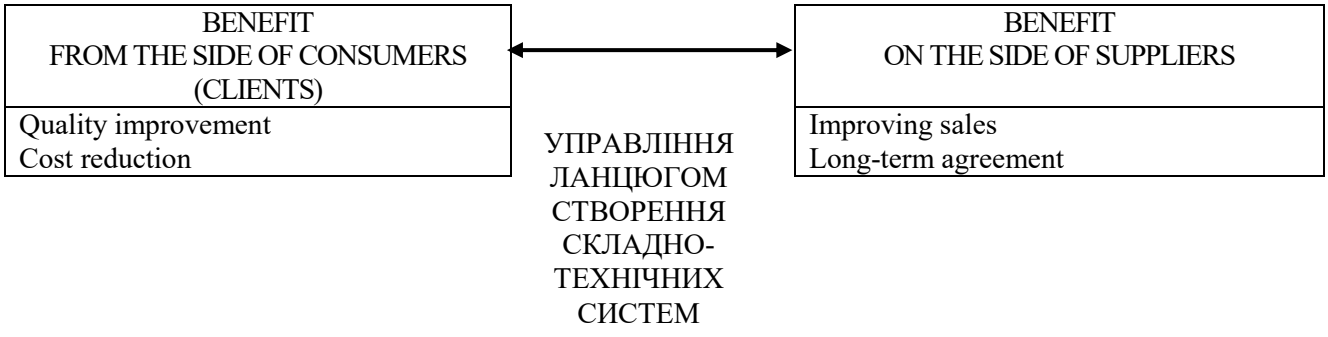
Having analyzed the fundamental works on the theory of supply chain management, it can be stated that the vast majority of sources develop provisions on the strategic development of the supply chain from the position of its key person - the integrator. At the same time, research aimed at the strategic adaptation of an individual participant to new business conditions, which requires a constant search for a compromise between the goals, tasks and business processes of a wide range of participants in the supply chain with the strategy of this supply chain, is clearly insufficient. The

consequence of the absence of a methodology for adapting the company's strategy to integration into the supply chain is not only a lack of understanding by domestic entrepreneurs of the potential benefits and threats of such integration, but also a hostile attitude towards it. The same situation is typical for the researched chain of creation of complex technical systems.

Taking into account the world experience of the operation of successful chains and the benefits associated with this new approach to business organization (Fig. 5.1) on the one hand, and taking into account a number of opportunities and threats characteristic of domestic enterprises, in particular, those operating in the technical market means of economic security of legal entities and individuals (see chapter 4, clause 4.1.), we will try to develop a methodology for the strategic adaptation of the manufacturer of complex technical systems to integration into the chain of their creation, which will involve harmonizing his strategy with the strategy of the chain from the point of view of the influence of this form strategic partnership on the competitiveness of these enterprises in the long term.

According to the purpose of this research, the object of which is, first of all, the strategic adaptation of an individual enterprise to the integration into the chain of creation of complex technical systems, which is based in turn on the coordination of its strategy with the strategy of this chain, it is obvious that the first step of such coordination should be identification of the main motives that will encourage enterprises to transition from a traditional management approach to the concept of a chain of creation of complex technical systems .

According to the generally accepted practice of adapting the supply chain to the business strategy of its participants [50; c . 78-120] the identification of the motives for such a transition should begin with identifying the main characteristics of the product that underlies the chain and understanding the specifics of the market it serves. Based on the specifics of products and the market of technical means of economic



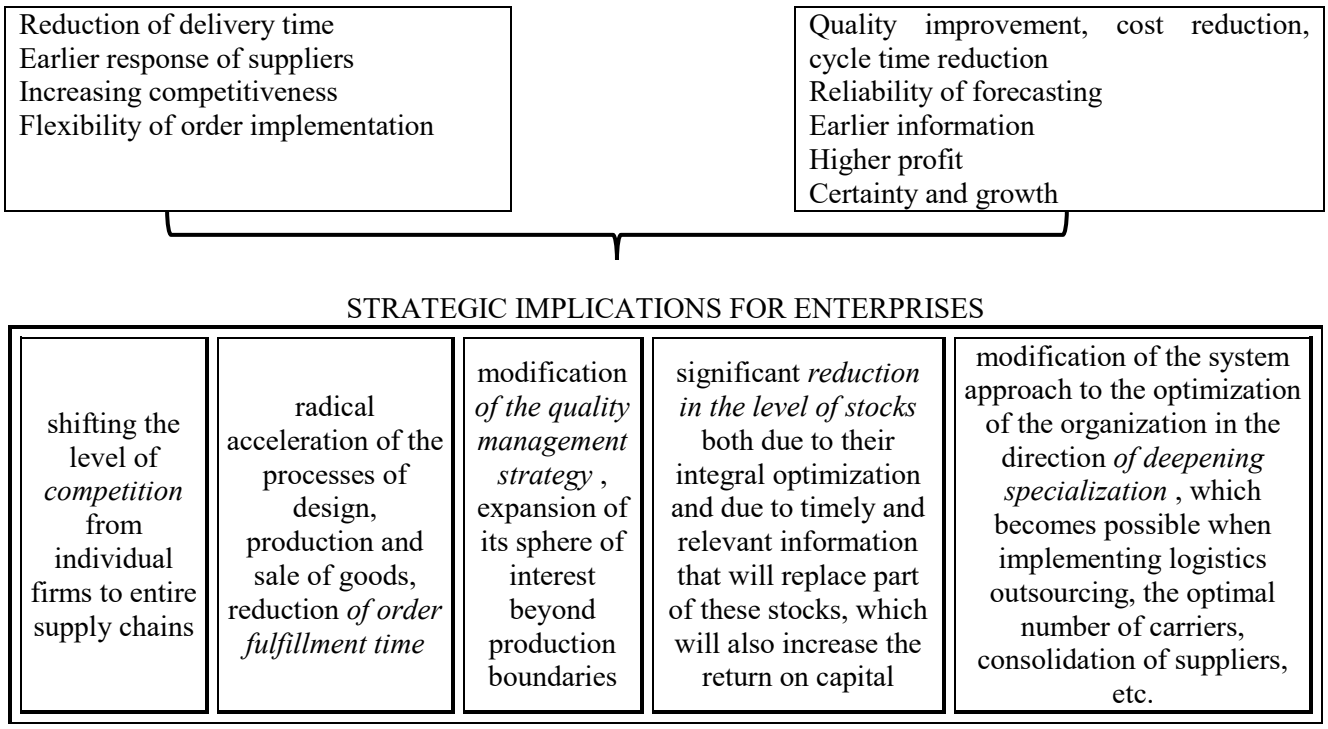


Fig. 5.1 . Potential management benefits

the chain of creation of complex technical systems

Note: adapted from [49, c . 137; 52 c . 203]

security of legal entities and individuals (which were discussed in detail in the second section of this work) on the one hand, as well as taking into account the potential benefits of implementing in practice the concept of managing the chain of creation of complex technical systems from the positions, in particular, of the manufacturing company, it is possible to identify the motives of such integration using such classic tools of strategic analysis as Porter's model, analysis of key success factors and SWOT analysis, as well as a number of alternative tools such as SOAR (abbreviation of Strengths , Opportunities , Aspirations and Results) - analysis of strengths, opportunities, aspirations and results, SOPA (abbreviation of English Strengths , Opportunities and Positive Action - analysis of strengths, opportunities and positive actions and SCOC - (abbreviation English Strength - Challenges - Opportunities - Challenges) - analysis of strengths and opportunities and their corresponding challenges. Although each of these tools has its advantages and disadvantages, their use can significantly complement the original SWOT analysis , taking into account, alongside strengths, the aspirations and interactions that exist between specific actions of the economic system, as well as future results and visions the state of the

environment as it "should be". In addition, we consider it expedient to apply, also, a parallel evaluation of the development potentials of future integration with other participants in the chain of creation of complex technical risk systems, which will accompany such interaction on the basis of risk management, identified with the help of the specified strategic tools. In particular, the construction of the "probability/impact" matrix (English Risk Impact / Probability Chart), which will make it possible to classify the risk according to the "high", "medium" and "low" categories, which will influence the final decisions in the field of strategic management aimed at integration into the chain of creation of complex technical systems [70; 87] .

illustrate the stated provisions on the basis of a preliminary analysis of the strategic effects of partnership, which may take place in the integrated chain of creation of complex technical systems on the market of technical means of economic security of legal entities and individuals of Ukraine from the position of manufacturers of components and finished products. At the first step, we build a matrix of SWOT analysis of the potential of the integration of a manufacturing enterprise into the chain of creation of complex technical systems , guided for this by the information of the system of balanced indicators of manufacturers of complex technical systems, compiled in the second section on the basis of a comprehensive analysis of the capabilities of the internal and external logistics processes of the investigated enterprises (Fig. 5.2).

The analysis of the composite matrix makes it possible to reflect the potential vision of possible benefits and threats of the future integration of the production enterprise, first of all, into the integrated chain of creation of complex technical systems , which must necessarily be compared with the classic SWOT analysis of the strengths and weaknesses of the enterprise itself, which intends to integrate with a higher order structure. This will make it possible to assess the presence of possible conflicts, their strength and the consequences of potential interaction with partners on a long-term basis, through the mechanism of coordination and synchronization of actions in the chain.

Strengths	**Weak sides**

Stabilization of business conditions due to the establishment of long-term relations with counterparties Profitability/productivity growth potential due to: concentration of efforts on key competencies; increase in the scale of production; rationalization, including production rhythms; speeding up decision-making at the operational level; reduction of transaction costs due to favorable conditions for concluding contracts with partners; increasing updating of sales forecasts and stock replenishment plans consolidation of orders; Informational and technical support from the integrator Avoidance of liquidation , bankruptcy Preservation of financial independence and control over all processes	Higher requirements for delivery conditions: flexibility, quality, timeliness Imposition of conditions of cooperation with specific suppliers by the chain integrator Reduction of freedom of action A higher level of capital raising compared to independent actions	*Internal environment*
Opportunities	**Threats**	
Modernization of ways of conducting activities - increasing elasticity (flexibility) , searching for know-how in the field of organizational solutions in the chain Updating the range of products and production processes Reducing costs in the field of research and development A high level of involvement of suppliers in the process of developing new products in the chain Implementation by the integrator of appropriate development programs for the manufacturer and its suppliers Diversification of risks	Uncertainty of market conditions, prices, exchange rates, taxes, customs barriers, money market Increasing competition from potential participants (producers) of the chain Problems in establishing communication and coordination between chain participants The risk of choosing inappropriate ones suppliers and concluding long-term contracts with them Electronic data exchange systems connecting buyers and suppliers are underdeveloped or absent	*Environment*

Fig. 5.2. Matrix of SWOT analysis of the potential of integration of the production enterprise into the chain of creation of complex technical systems

Note: Own development

For example, in the process of such a comparison, it is advisable to supplement the quadrant of the previous matrix "strengths of the integration of a manufacturing enterprise into the creation of complex technical systems" with internal limitations or "challenges" of the enterprise that seeks to integrate within the limits of using an alternative tool - the SCOC analysis matrix , to which can be attributed to:

- ✓ limited production capacity;
- ✓ limited financial capacity (integration may require the company to raise capital at a higher level compared to independent actions);
- ✓ high level of wastage and improper management system at the enterprise;
- ✓ low product quality, non-compliance by the company with quality standards;
- ✓ low level of automation and computerization of business processes;
- ✓ lack of motivation in integration among the company's employees;
- ✓ the risk of choosing inappropriate suppliers and concluding long-term contracts with them, etc.

Such a comparison will make it possible to update the matrix of SWOT analysis of the potential of the integration of a manufacturing enterprise in the creation of complex technical systems, making it suitable for the next step - assessing the risks of integration according to the sample (Fig. 5.3, 5.4), which is expedient to use for positioning each quadrant of the SWOT matrix -analysis .

Completion of the specified steps will not only make it possible to make an informed decision, but can also become the basis for developing, alongside the integration strategy of the enterprise, aimed at determining long-term operational goals, methods, techniques and tools for their achievement, and, in particular, also the prospects of integrating the business structure among others rational economic alternatives of activity for a certain period of time, taking into account changes in the external environment and internal capabilities and characteristics (organizational, economic, legal) in order to ensure economic growth, adapt to the market and obtain a synergistic effect [188, c . 199],

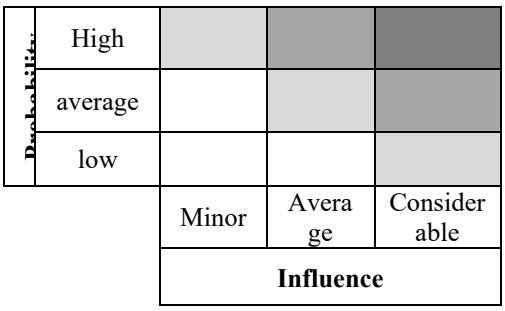


Fig. 5.3. Simplified risk assessment matrix

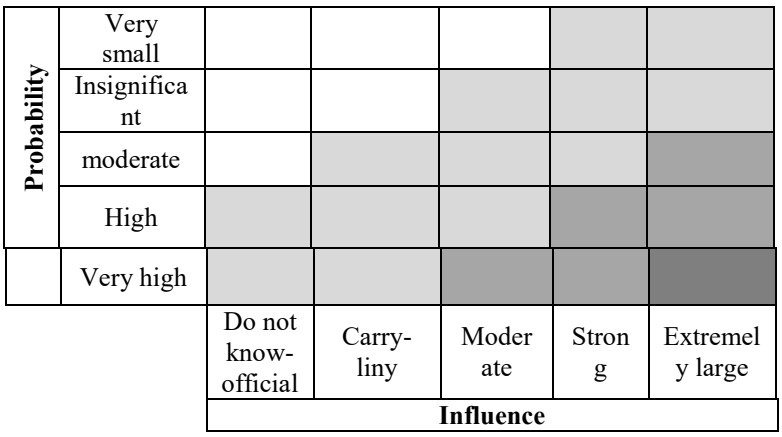


Fig. 5.4. Extended risk assessment matrix

where

acceptable level of risk;

the average level of risk, which should be further analyzed for the expediency of accepting or rejecting this or that decision;

a high level of risk that requires appropriate preventive measures;

an extremely high level of risk for which the decision should be rejected.

as well as a risk management strategy aimed at controlling and monitoring risks in order to make the most optimal decisions for the enterprise at any level of management.

In the context of identifying the motives of the integration of the manufacturing enterprise into the chain of creation of complex technical systems of the market of technical means of economic security of legal entities and individuals, we also suggest using an alternative strategic tool - SCOC analysis, in which, along with taking into account the strengths and opportunities of such integration, the impact of immediate threats is visualized of their successful achievement, which exist from the external and internal environment (Fig. 5.5) [180].

Since the decision on the expediency of forming a strategic partnership is made under certain conditions, namely [62, c . 126-132; 115] :

– the enterprise does not have the necessary competencies to achieve the established strategic goals;

– acquiring such competences on one's own is impossible (or significantly complicated);

STRENGTHS	CHALLENGES

Stabilization of business conditions due to the establishment of long-term relations with counterparties Profitability/productivity growth potential due to: concentration of efforts on key competencies; increase in the scale of production; rationalization, including production rhythms; speeding up decision-making at the operational level; reduction of transaction costs due to preferential terms of concluding contracts with partners; increasing updating of sales forecasts and stock replenishment plans consolidation of orders; Informational and technical support from the integrator Avoidance of liquidation , bankruptcy Preservation of financial independence and control over all processes	Limited production capacity A higher level of capital raising compared to independent actions High level of wastage and improper management system Low product quality, non-compliance with standards Low level of automation and computerization of business processes Lack of motivation in integration among employees The risk of choosing inappropriate suppliers and concluding long-term contracts with them	*Internal environment*
OPPORTUNITIES	CHALLENGES	
Modernization of ways of conducting activities - increasing elasticity (flexibility), finding know-how in the field of organizational solutions in the chain Updating the range of products and production processes A high level of involvement of suppliers in the process of developing new products in the chain Implementation by the integrator of appropriate development programs for the manufacturer and its suppliers Reducing costs in the field of research and development Diversification of risks	Uncertainty of market conditions, prices, exchange rates, taxes, customs barriers, money market Increasing competition from potential participants (producers) of the chain Problems in establishing communication and coordination between chain participants Electronic data exchange systems connecting buyers and suppliers are underdeveloped or absent Imposition of conditions of cooperation with specific suppliers by the chain integrator Reduction of freedom of action	*Environment*

Fig. 5.5. SCOC matrix - analysis of the potential of integration of a production enterprise into the chain of creation of complex technical systems

Note: Own development

– there are other enterprises (organizations, specialists) on the market that have the competencies necessary for the further development of the enterprise;

– the management of the enterprise and the team are ready to adequately perceive changes and contribute to the establishment of rational relations with a potential partner.

Therefore, the analysis of the composite matrix makes it possible to reflect the vision of the potential of the integration of the manufacturing enterprise into the chain of creation of complex technical systems from the angle of internal benefits, which are usually generated in the chains of creation of complex technical systems and are the strengths of such integration, as well as external opportunities that can potentially be achieved in the case of successful implementation of the manufacturer's business strategy into the chain's integration strategy against the background of a set of constraints from the external and internal environment, which, acting in combination or separately, can significantly prevent the company from obtaining positive effects from integration.

We believe that in order to obtain a more complete picture of opportunities and threats, each element of the quadrants of the SCOC analysis matrix should be analyzed from the angle of probability (riskiness) of achievement, and the final result compared with the results of a parallel analysis of alternative strategic tools and necessarily with a classic SWOT analysis strengths and weaknesses of the enterprise that intends to integrate with the structure of a higher order. This will make it possible to assess the presence of possible conflicts, their strength and the consequences of potential interaction with partners on a long-term basis, through the mechanism of coordination and synchronization of actions in the chain of creation of complex technical systems .

On the basis of the proposed scheme for identifying the motives of the enterprise's integration into the chain of creation of complex technical systems, it is possible not only to get an answer to the general question "why is integration necessary?", but also to create a basis for making a decision about its untimeliness or, on the contrary, urgency. In the latter case, the need to develop a new business strategy of the enterprise in the environment of partnership and interaction within the chain is actualized, because the initial sign of strategic partnerships is the creation of a long-term competitive advantage for their participants, which determines [62, c . 126-132]:

– availability of a common strategy to achieve a specific goal;

– specific contribution of each participant to the partnership and specific reinforcement (for each - its own);

– the share of responsibility of each participant in the field of resources, financing and risk.

The experience of the world's leading companies makes it possible to outline general (typical) principles and approaches to the implementation of integrated supply chain management (Fig. 5.6).

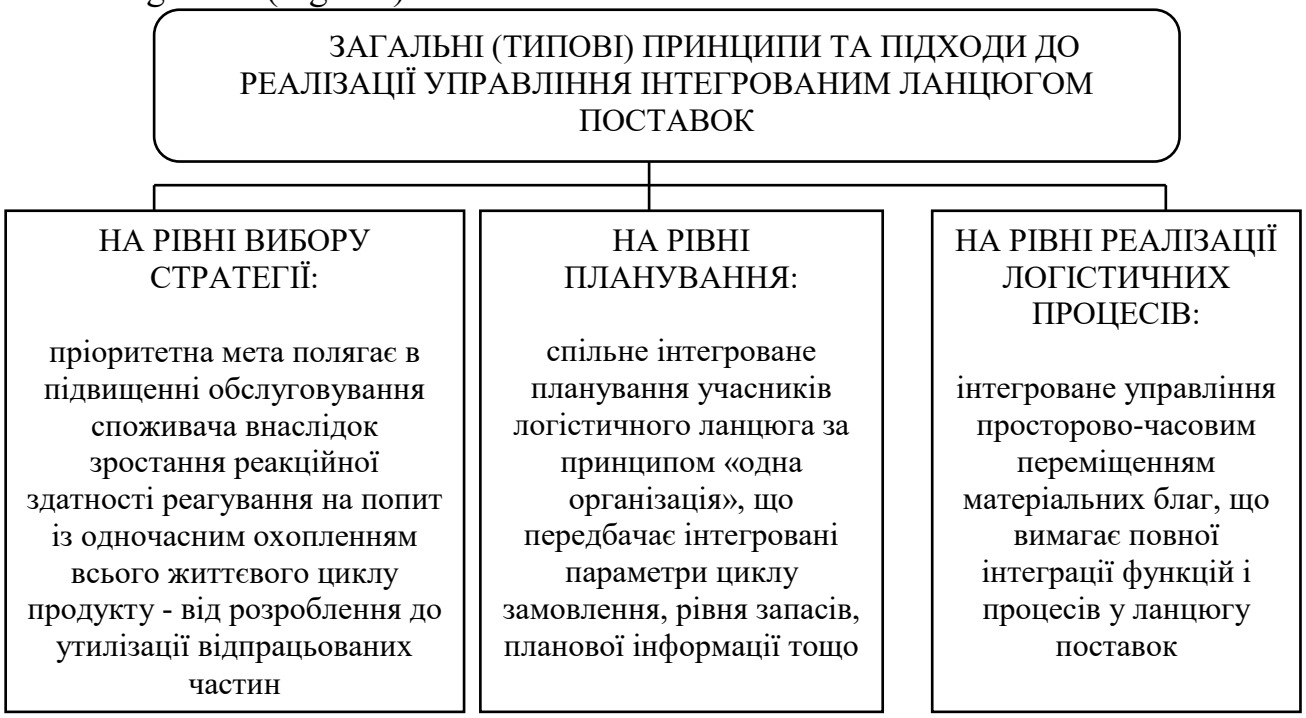


Fig. 5.6. General (typical) principles and approaches to the implementation of integrated supply chain management

Note: source [48 , c . 137]

The implementation of the presented principles and approaches to the management of an integrated supply chain, which in its conceptual and institutional nature is identical to the chain of creation of complex technical systems, requires full integration of functions and processes between its participants and links. At the strategic level, the set of decisions that determine the integrative functional-management types of interactions of enterprises with other enterprises is called an integration strategy (1 2 ; 1 6 ; 2 6). In the most general definition, that proposed [188, c . 197-205] integration strategy is a managerial approach to determining long-term operational goals, methods, techniques and tools for their achievement, and, in particular, the prospects of integrating the

business structure among other rational economic alternatives of activity for a certain period of time, taking into account changes in the external environment and internal capabilities and characteristics (organizational, economic, legal) with the aim of ensuring economic growth, adaptation to the market and obtaining a synergistic effect.

Since the chain of creation of complex technical systems is an integrative structure by its nature and content, based on the voluntary association of enterprises and organizations in the chain of value creation, as a result of which the environment of the functioning of enterprises is formed or changed, the strategy of the chain of creation of complex technical systems on the levels of the leader-integrator can also be called integrative.

Using the generalized scheme of the internal elements of the integration strategy [188, c . 197-205] , which at the same time, in our opinion, is devoid of practical value due to the lack of coordination of these elements with each other, it is advisable to improve it by establishing connections between the components shown in the diagram and detailing them (Fig. 5.7).

The construction of this scheme is based on a project approach (English Project Management), which, according to leading experts [138], has the greatest value in view of: the uncertainty of the market environment and the ever-increasing corresponding risks, the uniqueness of a specific market environment, the possibility of taking into account all internal constraints, the clear fixation of deadlines and expected results at the beginning of the project, the need to create an effective team from the very beginning, taking into account the priorities of other important projects, as well as the traditional preservation of complete independence and autonomy of all participants in the chain of creating complex technical systems , each of which can operate in other industries, in another place and in another country, which exacerbates the conflict of their interests and makes the assumption of full alignment of long-term goals of all companies participating in the chain very risky.

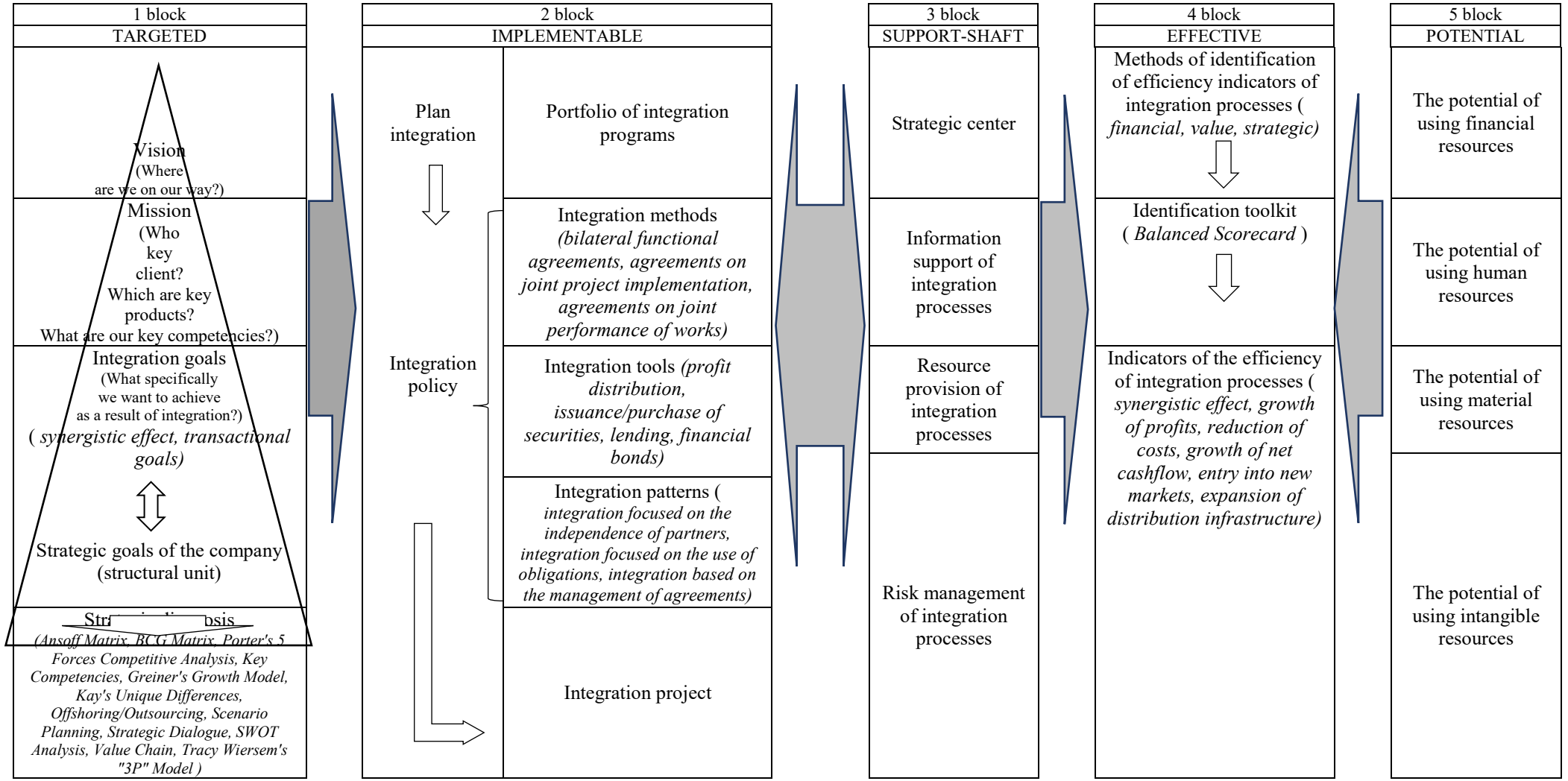


Fig. 5.7. Internal elements of the integration strategy of the integrated chain of creation of complex technical systems

Note: improved on the basis of [6; 62, c . 129; 63; 121; 188, c . 197-205]

In accordance with this approach, one achieves not only an understanding of "where" and "how better" to move, which represents the first "target" block of internal elements of the integration strategy, but thanks to the formation of absolutely specific, well-argued and integrated portfolios of programs and projects, which in turn are visualized in to the second "implementation" block, with appropriate resources, responsible managers, which reflects the third "supporting" block of elements, the strategic initiative is brought to the logical implementation and control of the achieved results, which reflect the elements of the fourth "resultative" block. At the same time, the elements of the fifth "potential" block are sources of potential opportunities for growth and achieving new goals in accordance with changes in the market environment. To summarize, one of the experts in the field of strategic decisions [138] can quote: "..., without a project approach, the strategy of most organizations remains on paper or, at best, the percentage of its implementation will not exceed the mentioned 10%."

Choosing the basis of the operation of the chain of creation of complex technical systems as a sequence of joint projects implemented over time, where the specific parameters of each project are determined in accordance with each specific case in accordance with the principles of project management , the action of the so-called "parallel engineering" or parallel design is also possible (Fig. 5.8), which is usually used in the field of designing new products, when the actions that take place at different stages partially overlap, which leads to a decrease in the total time of product development .

Concurrent engineering helps reduce development time by forcing project teams to agree on the most important features of a product or service early in development, during the concept, design, and development stages. Such characteristics are: cost, size, materials, target markets, etc. They set clear guidelines and frameworks for further action.

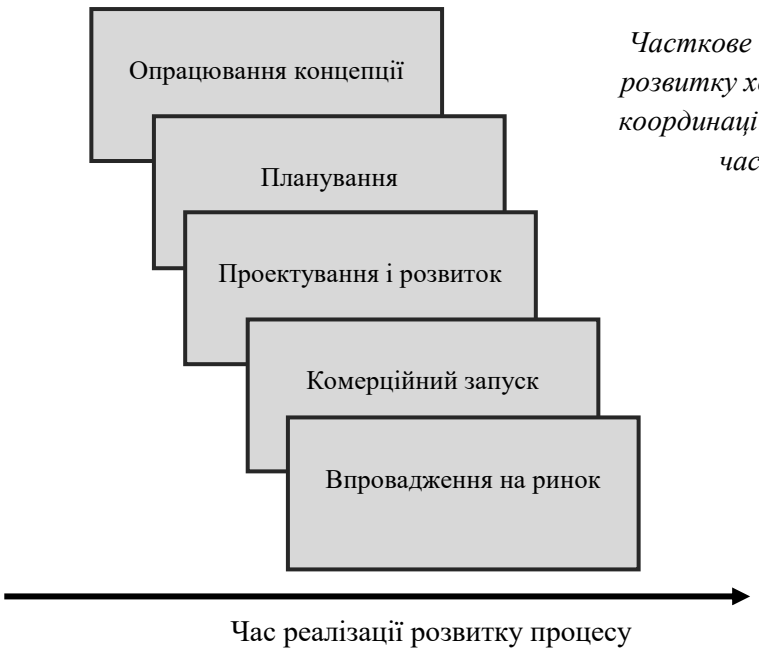


Fig. 5.8. Action of "parallel engineering "

Note: source [50]

Engineers can begin prototyping before finalizing product specifications only if agreement is reached on the most important product specifications.

Drawing a parallel between the value chain and the supply chain, it is important to take into account the cyclical development of these structures, which in general can be reduced to three stages [45, c . 132] :

– construction of the value chain (supply) - Porter's model (1st stage);

– deconstruction (analysis) - identification of contradictions, disorganizing elements, redundant processes that do not add value (2nd stage);

– reconstruction (synthesis) - creation of a new value (supply) chain (3rd stage).

"The following statement can be taken as an axiom: the design of the supply chain must correspond to the chosen overall strategy and be subject to reconstruction + reconstruction processes every time in case of a change or modification of this strategy" [45; 127] . Therefore, in our opinion, "parallel engineering" has a significant potential in strategic management, allowing not only to accelerate the process of integration changes,

but also to filter out "failed" strategies, regarding which it was not possible to reach a consensus between the participants of the chain and/or its integrator.

5.2. The influence of the integration strategy of the chain of creation of complex technical systems on the business strategy of the manufacturing enterprise

According to the definition of one of the classics of strategic analysis - M. Porter [193, c . 61-78] the essence of strategy is to choose one of two options: to act differently or to do differently than competitors. With regard to the strategy of the chain of creation of complex technical systems, this raises a lot of questions, to which, although there is no unequivocal answer, at the same time, there are views of both theorists and practitioners. For example, scientists Presutti and Mauhnini [194, c . 32-38] note: "... there is a big difference between what the management of the entire supply chain is guided by and what their corporate bosses are guided by - this is a discrepancy between their strategic vision and the ways of its implementation. Bridging this gap presents some opportunities for supply chain managers. At the same time, supply chain professionals will need to develop a new set of strategic management competencies if they are to succeed in this direction…" From this statement, two critical points can be highlighted that undermine the ability of supply chains and their participants to achieve competitive advantages [100]:

1) lack of connection between the corporate strategy of the supply chain (English Supply Chain Strategy , SCS) and the strategies of its business units;

2) lack of strategic orientations and opportunities for supply chain managers and their participants to act in concert.

On the one hand, the intentions of corporate leaders are often unclear. For example, if it is planned to implement a cost reduction program at the corporate level (Corporate Level), then obviously similar programs are expected at the level of business units, such as, for example, joint supply. At the same time, the main suppliers are often consolidated among themselves, and the purchased components are standardized as much as possible. In this case, the alignment of corporate (strategic) levels affects the scheme of activity of all business units at the network level (English: Network Level) (for example,

consolidation of the supplier base), levels of individual business units (English Business Level) (for example, standardization of components), as well as on the functional level (for example, the search and acquisition process itself) [168, c . 256-276].

On the other hand, what will the strategic competencies of managers of the chain of creation of complex technical systems look like ? If they have a truly strategic nature, then the strategy of such a chain will be maximally aimed either at achieving efficiency or at the ability to quickly respond to changing customer needs, outbound logistics and support, i.e. elasticity [141, c . 27-51]. They should also participate in market positioning, since it is characteristic of chains to adapt to the characteristics of demand for the goods underlying them [163, c . 105-160]. And such functions as acquisition, distribution or logistics should work more strategically [7; 21; 22; 107; 127; 136; 157]. For example, the strategic impact of resources and capabilities in the operational supply chain on marketing and promotional activities should be considered in the light of a resource vision . view _ RBV) [143, c . 99-120]. At the same time, relationships with suppliers, logistics service providers and customers, as well as other supply partners should be considered as a potential competitive advantage in the sense of a relational point of view (eng . Relational - Based view _ RelBV) [161, c . 60-79] or industrial marketing and joint procurement organization [163].

Therefore, supply chain management is more and more reflected as a concept of a strategic, integration level, as pointed out, in particular, by the Council of Supply Chain Management Professionals (CSCMP), 189, c . 1-25]: “…it is the systematic, strategic coordination of traditional business functions within a specific company and across companies within a supply chain, with the goal of improving the long-term performance of individual companies and the supply chain as a whole… The purpose of SCS is to create a strategic, differentiated advantage that arises on the basis of added value provided to end consumers". In this aspect, the conclusions of E. Hofman [168, c . 256-276], who, taking into account all four levels of strategy and three vectors of their mutual coordination, formulated theoretical provisions on identifying the impact of supply chain strategy on each strategic level:

(1) the influence of the supply chain strategy on the network level (SCS - NL): the object of analysis is a supply network covering different companies. Before formulating the strategy of the network (chain) of supply, it is necessary to identify each link, each participant, which, therefore, can be interpreted as a "quasi-integrated" business unit. This step allows you to "reconcile" the members of this level. But with such cross-organizational alignment, the question arises as to which component of strategy companies should support, and which of them should be adapted and synchronized. As Diffie and Stank note [159, c . 30]: "This does not mean that the strategy of each firm should be the same." It can be assumed that a quasi-integrated (network) firm is the basis of partial integration, which combines economically independent activities within the supply chain without causing full legal consolidation. Ideally, subsidiaries operate as one company if they belong to a particular network;

(2) the impact of supply chain strategy on the corporate level (SCS - CL): the object of analysis is usually a diversified company or a company with more than one business unit. SCS - CL demonstrates how synergy effects, and therefore value, can be created through the combination and coordination of several business activities, as well as interaction with important participants [148, c . 360-371]. That is, the number of supply chains in this case will depend on the level of diversification of portfolios of business areas. Obviously, in this case, it is important to define those processes and resources that should be combined in one supply chain (for example, at the entrance to the chain), regardless of their place in the value chain and those that can work autonomously (for example, at the exit from the circuit). The more similar business areas are (by products, customers, used resources, localization, etc.), the faster centralized control is preferred in order to achieve economies of scale [203, c . 27-45];

(3) the impact of the supply chain strategy on the business level (SCS - BuL): the object of analysis is an individual firm. Emphasis is often placed on the group of consumers (by regional, quantitative, structural, etc. criteria), the product (whether it is functional or innovative), market tactics (offensive or defensive approach). For example, the degree and importance of the configuration of the supply chain will depend in this case on the number and needs of customers, as well as on the regional distribution [158,

c . 243-261]. According to Fisher [163, c . 105-160], an economically efficient supply chain should be created in the case of functional products, and an elastic one in the case of innovative ones.

(4) the influence of the supply chain strategy on the functional level (SCS - FL): the object of analysis is strategic measures in the sphere of supply, production, sales, as well as other functions, such as marketing, IT or research and development [197, c . 21-42]. In addition to the vertical alignment of all functional areas using SCS - BuL and SCS - CL , strategic measures of influence on the functional area must be horizontally aligned with each other [211, c . 35-41]. In particular, the influence of SCS - FL according to Chopra and Meindl [152, c . 29] can be defined as follows: "Supply strategy determines the nature of purchasing raw materials, transporting materials to and from the company, manufacturing a product or operation to provide a service and distribute the product to the consumer along with any subsequent service. From a value chain perspective, supply strategy determines which operations, distribution and service will do particularly well."

A review of literary sources makes it possible to state that the lowest level of influence of the supply chain strategy, that is, the functional level, has the largest arsenal of various solutions. An exemplary example is the reference SCOR model (Supply Chain Operations Reference), which describes the supply chain through five interrelated processes: planning, supply, production, sales and returns. Sharing the opinion of E. Hoffman [168, c . 256-276] . At the same time, as there is a small number of theoretical works that quite deeply reveal possible solutions at the higher strategic levels - business and corporate, there are practically no solutions focused on the disclosure and identification of the influence of the supply chain strategy on the network level (according to the research of E. Hoffman - only two works out of forty articles published in scientific and business journals with ratings not lower than category B) [168, c . 256-276]. The author considers the most important reason for this situation to be the "weak" theoretical justification of the concept of "network", into which different authors sometimes put a very different meaning (in many scientific works, the authors draw parallels between "network" and "supply chain", between "network" and "virtual organization", as well as "virtual alliance", etc.).

Thus, the available theoretical basis makes it possible to thoroughly investigate how the supply chain strategy from the point of view of the corporate level affects the business and functional strategies of its business participants. Perception of the supply chain strategy from the point of view of the corporate level makes it possible to form a conceptual model designed for structural coherent analysis in the field of research of the influence of the chain strategy of creating complex technical systems on the strategic alternatives of the functioning of its participants within the framework of three strategic levels of management. Agreeing with the numerous conclusions of foreign and domestic authors regarding the nature of poor conceptual models, we can state that such a model should be integrative in nature and content. It is thanks to integration that it is possible to achieve a high degree of interrelatedness and mutual coordination of interests, operations and processes within such complex structures.

In general, three aspects of this integration are distinguished [50; 79] :

→ information integration - exchange of information and knowledge between partners regarding, for example, inventory status, demand forecasts, production schedules, promotion plans;

→ coordination - delegating actions and decisions to the member of the supply chain who is in the best position. Thus, replenishment of stocks of a component may become the task of a supplier who was previously a supplier of finished products;

→ organization of relationships - exchange of performance indicators, effective communication channels, alignment of incentives, equal distribution of benefits and risks from integration into the supply chain.

For each of the three dimensions of supply chain integration, you can cite the example of Dell (Fig. 5.9).

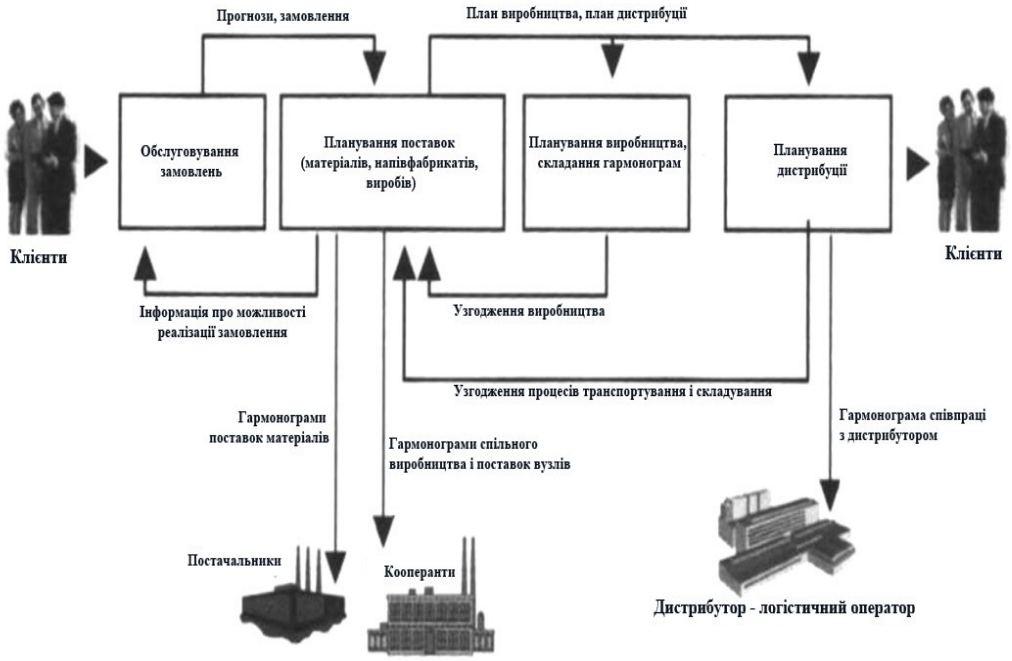


Fig. 5.9. Integration of action planning of partners and internal organizational divisions of supply chain enterprises

Note: source [50]

The process of integration in the supply chain includes many directions : - integration of planning and coordination of actions at the strategic, tactical and operational levels; - integration of actions and coordination of functional plans of production, sales, logistics, finance, marketing; - integration of activities in the supply chain - from supply, through production, to distribution to the target market; - integration of planning with the results of control plans. So, in general, the development of this strategy is the most difficult task of strategic management. It is necessary to determine the combination and scope of types of activities, make a so-called portfolio of types of business, choose markets, determine the main priorities, formulate a key ideology, select and assign managers to key positions [125]. Therefore, as the first step in the formation of the integration strategy of the chain of creation of complex technical systems, it is advisable to choose the development of inter-organizational connections and the establishment of contours for the creation and coordination of the chain, which, in fact, will set the direction of the strategic orientation of all its participants. To choose the

strategic orientation of the chain of creation of complex technical systems, it is possible to use, for example, the Fisher matrix (Fig. 5.10).

		Product type	
		Functional	**Innovative**
Criteria for selecting products	*Nature of demand*	intended	unpredictable
	Product life cycle	more than 2 years	from 3 months to 1 year
	Margin level	5-20%	20-60%
	Variability of the product	low (10–20 items in a category)	high (often a million options in a category)
	The average cost of errors in the production time forecast	10%	40-100%
	Average stock level	1-2%	10-40%
	The average markdown of goods at the end of the season (% of the price)	0%	10-20%
	The time required to order products	from 6 months to 1 year	from 1 day to 2 weeks
Strategy chain supplies	**Effective**	h	–
	Responsible[8]	–	h

Fig. 5.10. Matrix for choosing a supply chain based on the product it offers on the market (M. Fisher)

Note: source [163]

The second step is the coordination of the interrelationships of the integration strategy of the chain of creation of complex technical systems with the business strategies of the participants, which requires outlining the requirements of the corporate strategy and adapting the strategies of the participants to these requirements based on the selection of a strategy from the portfolio of strategies according to the criterion of conformity selected in the first step management concepts: efficiency, elasticity or their combination. The configuration of the participant's business portfolio and the determination of key areas of

[8]M. Fisher uses the term "responsibility" (eng. responsiviness), not "elastic" (eng. agile). At the same time, a careful analysis of the meaning he puts into this term allows us to assert that to a large extent it means, first of all, the chain's ability to quickly respond to consumer requests, which corresponds to the target orientation of the currently popular concept of elasticity.

diversification will directly affect the scale and productivity of the entire chain. The third step involves setting up the interaction of business strategies with the corporate strategy of the chain of creation of complex technical systems by configuring strategies at the functional level. Influence can be exercised indirectly through strategic processes at the business level, that is, competitive decisions that outline the functional level through the prism of a traditional scheme or through the reference SCOR model.

Within this model, different methods of coordinating strategies can be used: vertical coordination - between different hierarchical levels, as well as horizontal - between participants of the same level. Based on the basic principles of integrated management of supply chains, taking into account the most relevant types of strategies of manufacturing enterprises within the framework of consideration of such strategic guidelines as "efficiency" and "elasticity", it is possible to form a portfolio of strategies of a manufacturing enterprise in the market of technical means of economic security of legal entities and individuals [102]. According to the tasks and goals of a specific project, which are respectively tied to the priority strategic orientation: "efficiency", "elasticity" or "efficiency with simultaneous elasticity", in which the production enterprise will be involved as a participant in the chain of creation of complex technical systems, it will make a choice from the portfolio of a specific strategy, which, in turn, will determine the criteria by which all further important functional strategies will be implemented, which should be considered in the context of the chain of creation of complex technical systems through the prism of the SCOR model of business processes with an emphasis on priority tasks in view of the specificity of the product, which is the basis of this chain (Fig. 5.11).

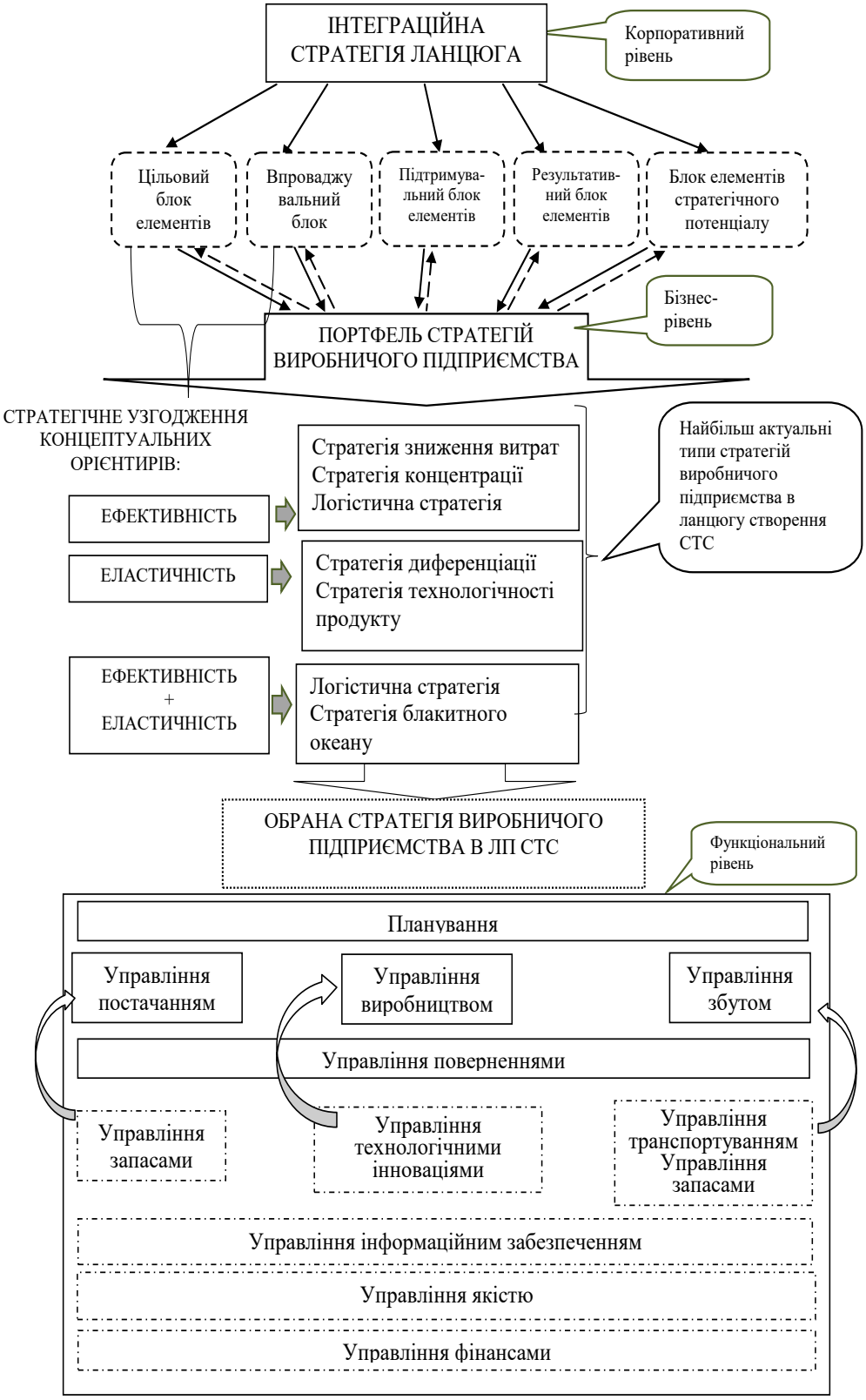


Fig. 5.11. The influence of the integration strategy of the chain of creation of complex technical systems on the business strategy of the manufacturing enterprise

Note: Own development

Visualizing the choice of a specific strategy by a manufacturing enterprise in the chain of creation of complex technical systems from a portfolio of strategies, it is appropriate to modify the well-known matrix of I. Ansoff, in which the classic criteria "goods-market" should be replaced by the criteria "strategic orientation of the chain-strategic orientation of the manufacturing enterprise » (Fig. 5.12).

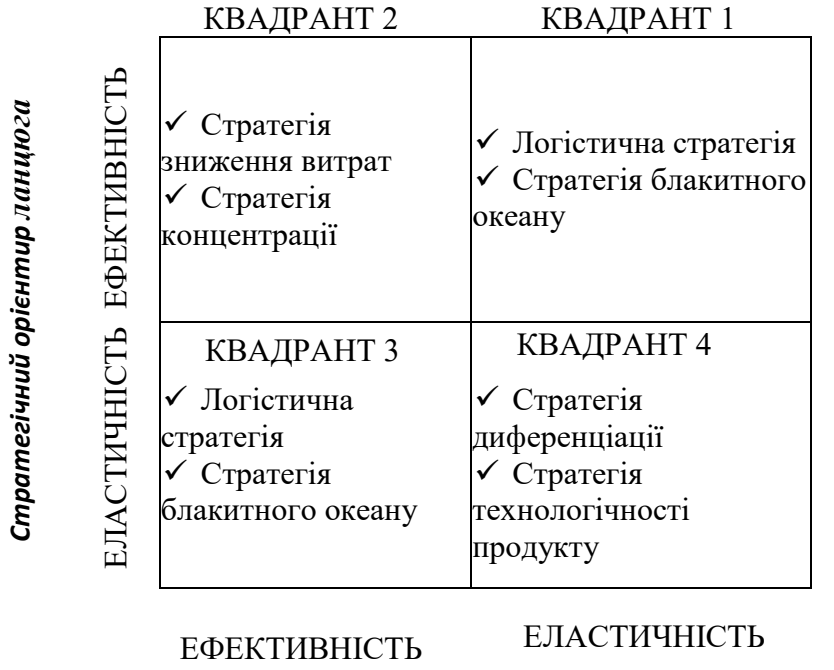


Fig. 5.12 . The matrix for choosing a business strategy from the portfolio of strategies of a manufacturing enterprise in the chain of creating complex technical systems

Note: Own development

Thus, the use of the recommended matrix illustrates the company's choice of one or another strategy.

The first and third quadrants of the recommended matrix characterize the strategic coordination of two opposite conceptual orientations of the chain of creation of complex technical systems and its participant - the priority of the criterion of elasticity for the chain at the same time the activity of its participant is focused on ensuring high efficiency of production processes and vice versa. In such a situation, it is expedient for the participating enterprise to choose one of the alternative business strategies: logistics strategy or "blue ocean strategy". The second quadrant characterizes the strategic

coordination of two coincident conceptual guidelines of the chain and its participant in the field of prioritization of efficiency criteria, the result of which is the choice of one of the alternative options of business strategies by the manufacturing enterprise: cost reduction strategy, concentration strategy. The fourth quadrant characterizes the strategic coordination of two coincident conceptual guidelines of the chain of creation of complex technical systems and its participant in the field of prioritization of elasticity criteria, the result of which is the choice by the manufacturing enterprise of one of two alternative options for business strategies: a strategy of differentiation or a strategy of product manufacturability.

Regarding the formation of a strategy at the functional level of the chain of creation of complex technical systems , it should be noted here that, in general, any functional strategy (that is, a strategy for the development of a separate functional subsystem) should be developed taking into account the following factors:

→ the role performed by a certain function and the essence of activity in relation to this function, as well as the direction of influence of the specified function on the main purpose of the existence of the enterprise (mission) and the achievement of the enterprise's goals;

→ the nature of the impact (negative or positive) of the performance of work from each function on the development (decline) of the enterprise; boundaries of functions and areas of "crossing interests"; advantages and disadvantages in the development of individual functions, strengths and weaknesses in their interaction;

→ the presence or absence of an approach that narrows functionality when solving general problems of the enterprise;

→ interdependence and balance between the competence of specialists who perform their work duties in accordance with the function, their moral qualities and the peculiarity of the development of the enterprise.

For example, specifying the strategy of managing technological innovations through the prism of decisions on which its implementation will depend, it should be emphasized that, from the point of view of managing the chains of creation of complex

technical systems, it is important to reduce the number of product components, simplify projects and create products from publicly available components.

At the same time, people involved in design, supply and production operate independently of each other and have different goals, so it is necessary to make some effort to coordinate their actions. Designers are primarily concerned with meeting customer expectations. Supply departments are interested in purchasing goods at the lowest prices from pre-selected best suppliers. In turn, the production staff is primarily interested in the ease of assembly of final products and large production batches. Thus, in the chain of creation of complex technical systems , for which design decisions play a very important role, it will be valuable to create multidisciplinary project groups, which will include representatives of the outlined three groups. The consequence will be the synchronization of both direct and tangential decisions of the strategy of managing technological innovations/changes in the chain.

The decomposition of the influence of the integration strategy of the chain of creation of complex technical systems on the business strategy of the manufacturing enterprise can be carried out on the basis of the tree of the structure and alternatives of the enterprise strategies by modifying the tree of the structure and alternatives of the enterprise strategies, which is proposed in the work [62, c . 323] (Fig. 5.13).

Therefore, the integration strategy is presented in the format of the so-called "metaframe", which sets the target orientation of the chain of creation of complex technical systems , determines the value orientations, principles and levers of management of the voluntary association of enterprises in the chain of value creation, which are indispensable components of all its structural units (from the level of general corporate management to individual business units and their functional and operational divisions of the organization of specific business processes).

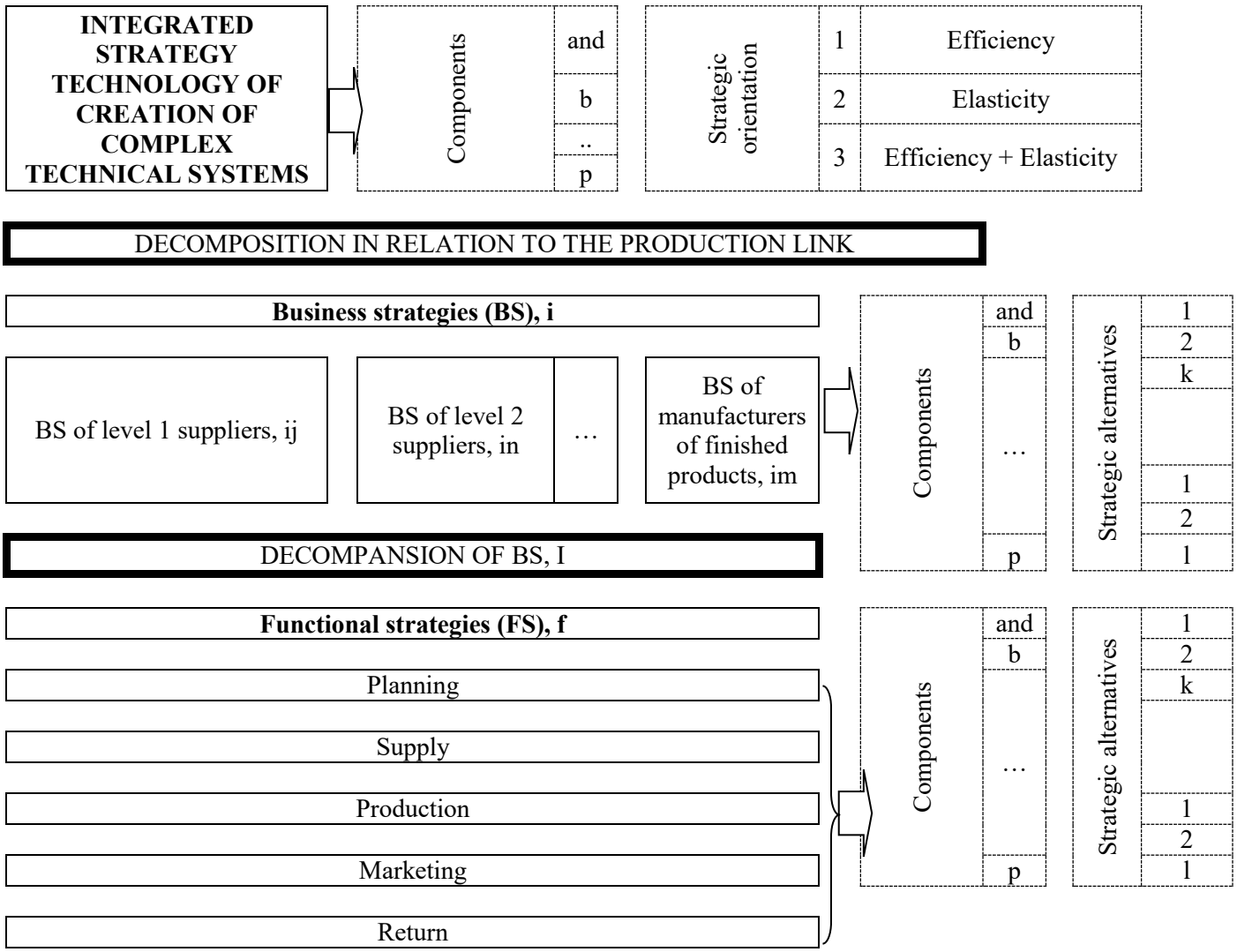


Fig. 5.13. Tree of the structure and alternatives of the strategies of the production enterprise-participant in the chain of creation of complex technical systems

Note: Own development

This integration strategy defines the logic of the business behavior of the participating enterprises based on the declared values, the implementation of which rests on these enterprises within their business strategies, which, in turn, determine the way in which each business unit can achieve a competitive advantage in the relevant market on implementation of those value guidelines that are the basis of this chain.

The business strategy should provide for the unification of the enterprise's corporate and business goals, aiming at the implementation of new value guidelines that are laid at the basis of the chain, and in its content as a logical model ("pattern") of the enterprise's business development on the basis of new strategic partnerships within the

framework of the chain, it should cover and take into account all basic business processes at the enterprise and in its external environment, opportunities for potential growth.

We will illustrate the influence of the integration strategy of the chain of creation of complex technical systems on the business strategy of a manufacturing enterprise using the example of the production strategy of an enterprise participating in the chain of creation of complex technical systems in the market of technical means of economic security of legal entities and individuals, which traditionally covers the spheres of management directly of production, stocks , supply process and quality [88 ; 10 1]. Within the limits of two polar strategic goals - "efficiency" and "elasticity" it is possible to form a set of characteristic guidelines of the company's production strategy (Table 5.1).

Table 5.1

Characteristic orientations of the production strategy in terms of the strategic goal of the chain of creation of complex technical systems set by the project

COMPONENTS OF PRODUCTION STRATEGY	CHARACTERISTIC LANDMARKS OF THE PRODUCTION STRATEGY OF THE ENTERPRISE WITH RESPECT TO THE STRATEGIC OBJECTIVE SET FORTH BY THE PROJECT	
	EFFICIENCY	ELASTICITY
Production management	· A small reserve of production capacity · Narrow specialization · Production/subject cooperation is aimed at reducing cost and increasing productivity	· A significant reserve of production capacity · Flexible production process · Production/subject cooperation is aimed at a high level of product differentiation at an accepted level of costs and productivity
Inventory management	· Low inventory · A narrow range of products	· High level of stocks · A wide range of products
Supply management	· Cooperation with a small number of suppliers or a "single supplier" strategy · Large batches of orders · Creation of strategic purchasing centers · Strengthening strategic alliances and alliances with suppliers	· Cooperation with a large number of suppliers ("multi-supplier purchasing" strategy) · Small batches of orders · Development of electronic supply/procurement (E-procurement)
	· cross supply strategy · strategy "supply from two sources"	
Quality management	· Achieving quality through means of control, quality monitoring, development of quality management systems · Emphasis on consumer parameters of the product	· Achieving quality through management, not controls · Emphasis on product availability and variety

Source: own development

The use of a similar set of characteristic guidelines for each type of functional strategies of an enterprise participating in the chain of creation of complex technical

systems in terms of the strategic goal set by the project, in our opinion, will have high practical value, first of all, for managers of operational and operational levels when making numerous decisions, connected both with the need to coordinate them with decisions of a higher level, and directly in situations of choosing several alternative options for actions to filter out those that contradict the main goal of the chain. Let's display the tree of the structure and alternatives of the strategies of the manufacturing enterprise-participant in the chain of creation of complex technical systems in the case of the strategic orientation of the chain on efficiency (Fig. 5.14).

Thus, the formation of an integration strategy of a chain of complex technical systems based on the principles of a project approach, firstly, makes it possible to carry out a strategic coordination of the conceptual guidelines for the development of both the chain and an individual enterprise, and secondly, in accordance with the given strategic goals of a specific project, makes it possible to form a portfolio of strategies of a manufacturing enterprise, thirdly, by choosing a specific strategy from a portfolio of strategies in accordance with the given strategic goal of a specific project, it is possible to adjust the key parameters of further operational decisions within each of the functional strategies of the enterprise. In combination with the formation of appropriate sets of characteristic guidelines for each type of functional strategies of the company-participant in the chain of creation of complex technical systems in terms of the strategic goal set by the project, the expected effect is the formalization of the process of strategic adaptation of an individual manufacturer of complex technical systems to integration into the chain of their creation.

At the same time, for the practical implementation of the stated theoretical provisions regarding the formalization of the process of strategic adaptation of a manufacturing enterprise to integration into the chain of creation of complex technical systems, it is also necessary to develop the corresponding methodology of this process, suitable for implementation, first of all, by manufacturing enterprises - participants.

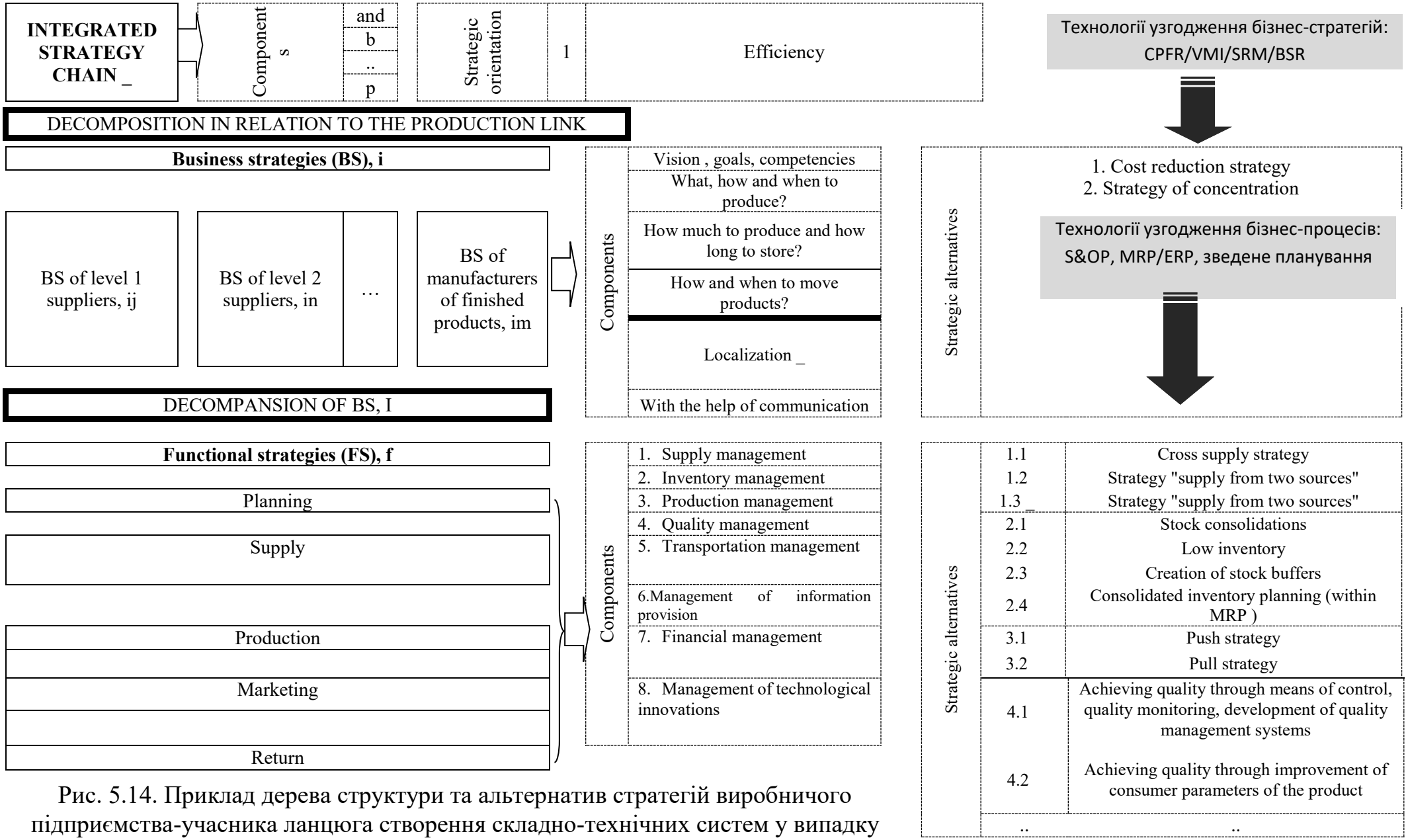


Рис. 5.14. Приклад дерева структури та альтернатив стратегій виробничого підприємства-учасника ланцюга створення складно-технічних систем у випадку стратегічної зорієнтованості ланцюга на ефективність

Примітка: власна розробка

It should be noted that the main methodological errors and shortcomings in the strategic management of domestic enterprises include: 1. Simplification of the strategic planning process, inadequate market research, and ignoring essential factors. 2. Lack of clear time frames and terms for the tasks of strategy development and implementation. 3. Neglecting the allocation of company resources and programming of financial results. 4. Use of outdated methods and tools of strategic management [6 4] .

Taking into account the above, as well as on the basis of a multi-aspect analysis of existing progressive methodological technologies for the implementation of large projects, it can be stated that the concept of "parallel engineering" and project management have the most significant potential in strategic management, which are particularly relevant in the direction of finding or developing a methodology for formalizing the process of strategic adaptation is the study of the most advanced techniques in the field of project management.

Over the past few decades, project management has become a very important field of management, as more and more enterprises in today's dynamic market fulfill their orders through a project, especially in the field of manufacturing various kinds of complex technical systems.

Analysis of specialized literature indicates the presence of numerous project management methodologies [187, c . 230; 79] . Project management methodology is a structured set of instructions for project planning and implementation. The most famous and popular project management methodologies are PRINCE 2, Ten Ś tep and the PMI project knowledge management standard , which, as a whole, correspond to three levels of methodology development used by domestic enterprises: the first is focused on functions, the second on processes, the third on knowledge [173 , c . 4]. Each of these levels has limitations and shortcomings, which the fourth level of methodology development, based on components, aims to overcome.

The component methodology is based on the fact that the project manager can choose the elements (components) he needs, for example, the scope and time management procedure, and discard other procedures. This type of methodology consists in providing the project manager with a set of components at his disposal, which will contain the

procedure, knowledge and other components necessary for the planning and implementation of the project, which enables the implementation of the principles and target orientation of the concept of "parallel engineering" [187, c . 231].

In this paper, the author will try to demonstrate the application of the IDEF3 technique to the mapping of the processes of the modular method of project management of the strategic integration of the manufacturing enterprise into the chain of creation of complex technical systems. The proposed methodology is transparent and understandable even for people who do not know the technology of the cartographic process.

In general, mapping or mapping of project management processes is necessary for effective project planning and implementation. This is a graphical representation of a process or a set of processes together with their interrelationships . Mapping allows you to graphically display all activities carried out at the enterprise to achieve specific results.

Process mapping takes place in two main stages. First of all, all the processes that take place during the planning and implementation of the project should be defined. This requires fixation [199, c . 76-77] :

- goals of the process;
- the beginning of the process;
- completion of the process;
- entering the process;
- leaving the process;
- suppliers of technological processes;
- recipients of the process;
- measurement of processes (indicators);
- process structures (process maps, technological maps, process description).

The next step is to group the identified processes into groups. Within the framework of the modular methodology of managing large projects based on the concept of the critical chain , three groups of modules (strategic, tactical and operational) are distinguished.

In the literature on this issue, you can find many different ways of displaying processes [187, c . 231] .

The most popular and one of the oldest methods of displaying processes is a block diagram. A flowchart is a tool used to represent the sequence of actions of a particular algorithm. It is implemented in the form of a diagram in which a procedure, system or computer program is presented in the form of geometric shapes, arrows that are connected to each other according to the sequence of operations that are performed within the framework of some activity [202, c . 566-569]. The block diagram is characterized by: (1) simple rules of construction, (2) flexibility of entries, and (3) ease of control over the correctness of the algorithm. There is also a diagram of the data and control flows most commonly used in business process modeling in the IT industry.

Another process mapping method is BPMN (Business Process Modeling Notation), which graphically represents the notation of processes in the company. The advantage of this method is the possibility of mapping all business processes regardless of the industry. In addition to these methods, there is a family of IDEF technologies for mapping different processes in an enterprise. In the 70s of the twentieth century, the US Department of Defense developed a standard IDEF (Integration Definition Language) process [17 5 , c . 26-33]. The IDEF standard was used as a tool for creating computer programs that support manufacturing processes. It was then adopted as a process mapping tool in service and manufacturing companies. IDEF standards are also used for so-called "Business Engineering", including reengineering and business process reengineering.

In total, there are 15 different methods of the IDEF family, of which the IDEF3 and IDEF0 methods are the most popular. The IDEF0 method is used to create a "function model". It is based on a structured graphic representation of functions, activities, operations occurring in a business or other system. At the same time, the IDEF3 method is designed for complex modeling 175, c . 26] . It contains a description of the mechanisms that allow collecting all the data suitable for describing the process. To date, this is one of the most promising methods of formalized description of the process of managing large and small projects.

There are two ways of modeling according to IDEF3: (1) a description of the process, which illustrates how the process is actually carried out, and (2) the change status of the object . It is very easy to use. The initial part of the IDEF3 schema process is the

UOB block (*Unit of Behavior Box*), which consists of one action (function) and the "GO TO" and "Go to" blocks. UOB blocks are connected by different types of arrows. There is a relationship: (1) priority (normal arrow cursor), (2) relationship (dashed cursor control arrow), and (3) changing objects (with two arrow cursors). The method also distinguishes five nodes or branches of the process.

In addition to the graphical description, the IDEF3 method allows you to describe the process in detail according to a certain form containing all the necessary information about the process. It contains the following information: (1) UOB block number, (2) process / action / task name, (3) object description, (4) restrictions and (5) process / action / task description (Table 5 .2).

Table 5 .2

Modified process description form according to the IDEF3 method

Process / module / task map	UOB number
The name of the process / module / task	
The goal of the process:	
Scope:	
Responsible persons:	
Sequence description:	
Monitoring:	
Related documents:	
List of documents:	
Additional information, definitions, terminology:	

Note: source [175, c. 237]

So, let's illustrate the application of the IDEF3 method to display the processes of modular management of a project of strategic integration of a manufacturing enterprise into the chain of creation of complex technical systems, which is based on the modular methodology of managing large projects for the implementation of complex, unique, strategic production and service projects.

The general methodology consists of 48 modules, which are presented in Table 5.3 . Each main group of modules (strategic, tactical and operational) will consist of 16 modules. These modules will sequentially divide the process and sub-processes identified at the stages of implementation of the researched project. In the described methodology, five phases of project management are distinguished [186, c . 628]: pre-project stage, planning stage, implementation stage, project completion and operation stage. In addition,

three project management process modules were developed to cover all aspects of project management.

Table 5.3 _

The composition of project management modules for the strategic integration of a manufacturing enterprise in the chain of creation of complex technical systems within the framework of the IDEF3 methodology

A group of modules	Module	A group of modules	Module	A group of modules	Module
Strategic level	S.D.1	Tactical level	T.D.1	Operations nth level	O.D.1
	S. Ch. 1		Part 1		O.Ch.1
	S.V.1		T.V.1		O.V.1
	S.D.2		T.D.2		O.D.2
	S. Ch. 2		Part 2		O.Ch.2
	S.V.2		T.V.2		O.V.2
	S.D.3		T.D.3		O.D.3
	S. Ch. 3		Part 3		O. Ch. 3
	S.V.3		T.V.3		O.V.3
	S.D.4		T.D.4		O.D.4
	S. Ch. 4		Part 4		O. Ch. 4
	S.V.4		T.V.4		O.V.4
	S.D.5		T.D.5		O.D.5
	S. Ch. 5		Part 5		O. Ch. 5
	S.V.5		T.V.5		O.V.5
	Control over the strategic management of the project		Control over the tactical management of the project		Control over the operational management of the project

Legend:

1. Management level: C - strategic level; T - tactical level; O - operational level;
2. Project parameters: D - control range; Ch - time (duration); B - costs.
3. Project management stage 1 - pre-project stage; 2 - planning stage; 3 - stage of implementation; 4 - stage of completion; 5 - stage of operation.
4. Modules.

Note: elaborated on the basis of [187, c . 238-239] .

Thanks to the application of the IDEF3 technique for mapping modules, processes and sub-processes, it is possible to create a model of the entire methodology of modular management of such a large project as the strategic integration of a manufacturing enterprise in the chain of creation of complex technical systems from the moment the project life cycle is launched. However, this is only the first step of the mentioned methodology. Further steps of the methodology require deep detailing and may include many new solutions in such areas as: (1) creating a project team, (2) estimating the duration of tasks, (3) building a project schedule, (3) defining time buffers, (4)

determining the method of monitoring the project and (5) evaluating the effectiveness of the project, therefore, within the scope of this work, we present only a fragment of the reflection phase of the planning methodology in the modular management of large projects, based on the concept of the critical chain (Fig. 5.15).

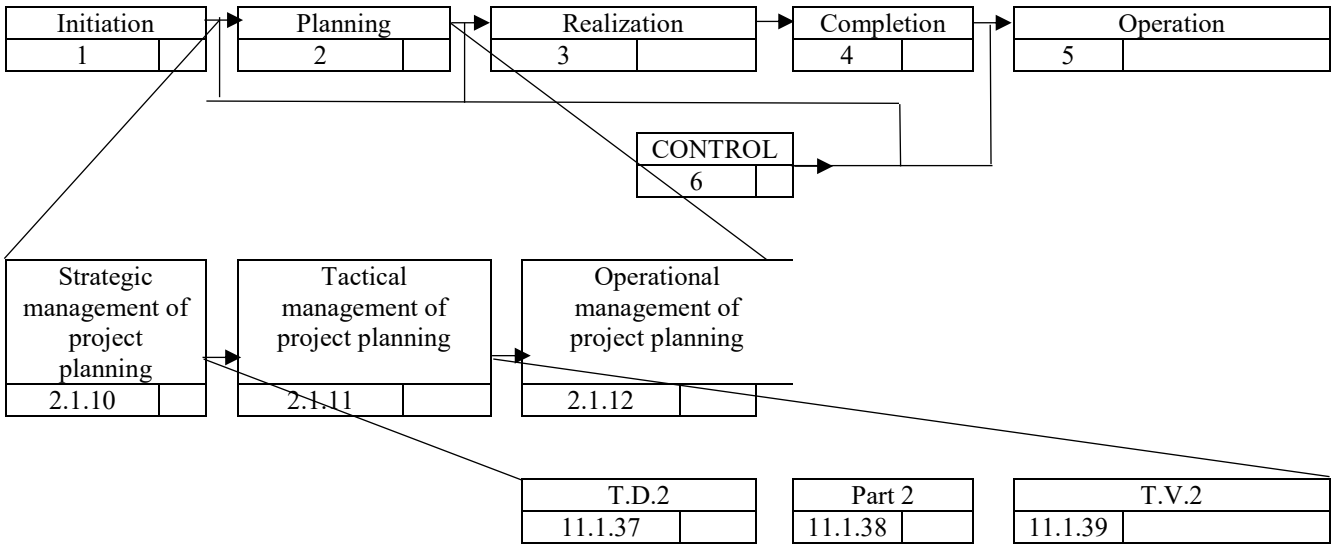


Fig. 5.15 . Decomposition of the planning phase of the project of strategic integration of the production enterprise in the chain of creation of complex technical systems within the IDEF3 methodology

Note: elaborated on the basis of [187, c . 238-239]

The following figure shows the decomposition of the planning phase of a large project according to the modular methodology into three groups of modules: (1) strategic project planning, (2) tactical project management, and (3) operational management of project planning. Then the tactical planning group management modules are divided into three modules: (1) "T.D.2" - a module within the scope of the project, (2) "T.Ch.2" - a module for the duration of the project and (3) " T.V.2" - a module for the cost of the project. Each group of modules is divided into modules, processes, subprocesses. At the same time, each module corresponds to the format of the form given by us above.

When creating maps of modules, processes and sub-processes according to the specified methodology, the principle from general to specific is applied. For example, the "T.Ch.2" module, which is part of tactical project management, can be detailed through

four consecutive processes: (1) working out the structure of works for initiating the integration of a production enterprise into the chain of creation of complex technical systems, (2) estimating the duration of individual tasks, (3) construction of the schedule of various stages of the project / sub-projects and (4) transfer of the schedule for approval (Fig. 5.16).

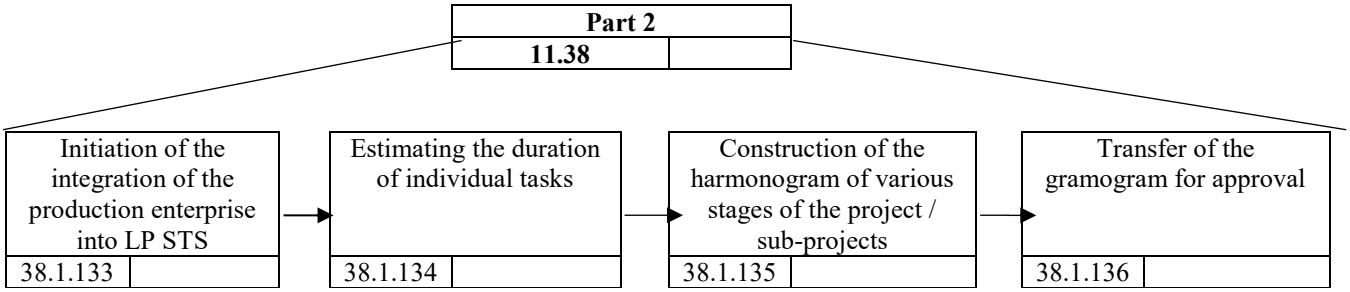
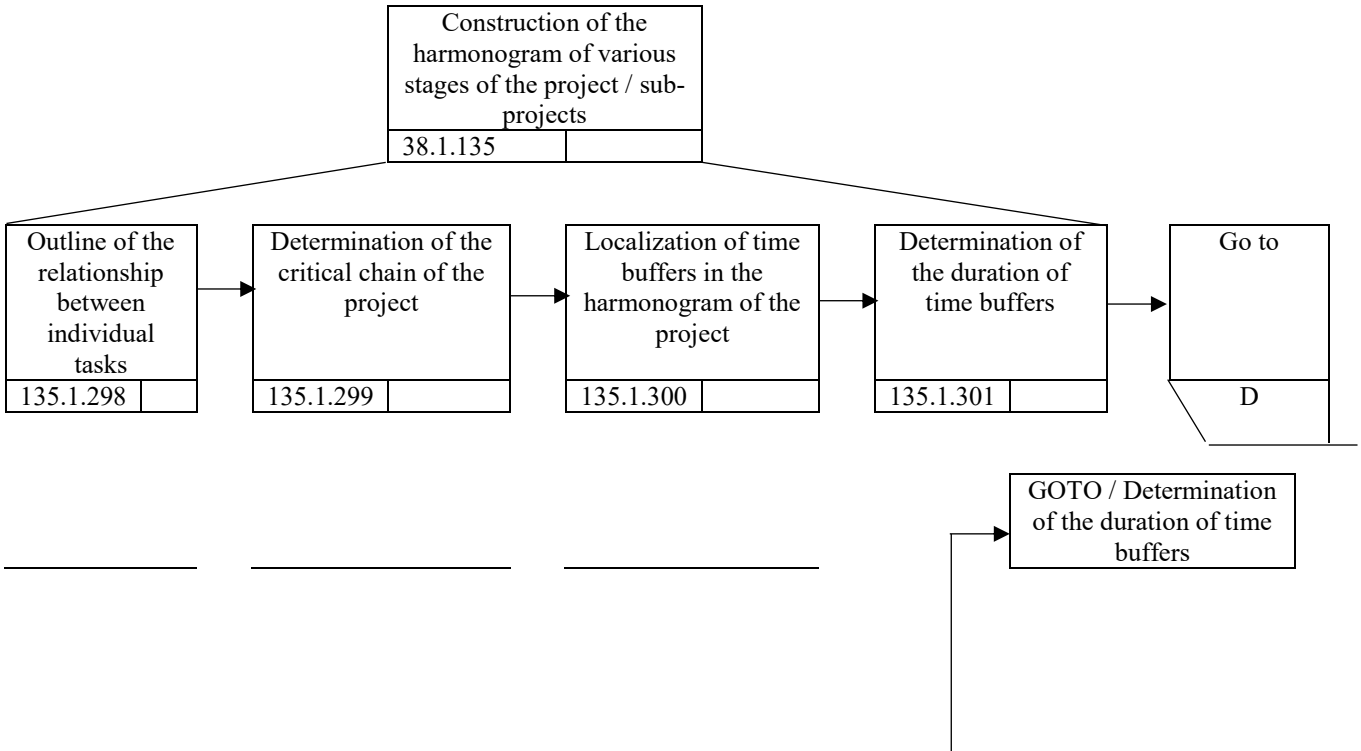


Fig. 5.16 . Decomposition of the module T.Ch.2

Note: elaborated on the basis of [187, c . 238-239] .

of the identified processes in the "T.Ch.2" module (Fig. 5.17). The degree of detailing of information on modules, processes and sub-processes included in the project depends on the level of detailing of the UBO blocks. This allows you to focus on a certain part of a module, process or sub-process and show exactly the sequence of actions. Maps created in accordance with IDEF3 allow very accurate visualization of the relationship between one process and another, and also allow, without too much effort, to easily understand the process of managing a large project, both for the project manager and for employees at lower levels.



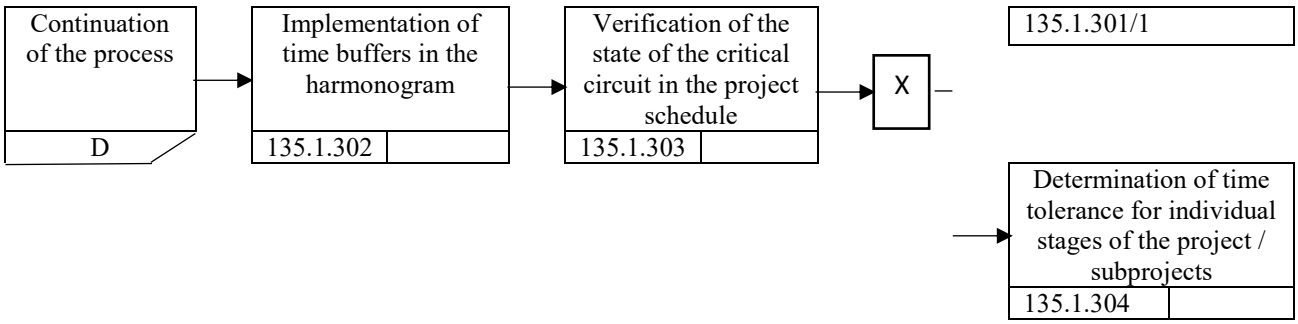


Fig. 5.17 . Decomposition of the process of building a harmonogram of various stages of the project/sub-projects of the module Part 2

Note: elaborated on the basis of [1 87 , c . 238-239] .

Thus, the presented example of using the IDEF3 technique illustrates its suitability and relevance for displaying any business processes, in particular, related to the management of large projects in the field of creating complex products, which are complex technical systems in the form of transparent models (maps) . These maps allow you to accurately show the relationship of various modules, processes and sub-processes included in the project. Therefore, such a methodology is effective, transparent and makes it possible to formalize the procedure that should be followed when planning and implementing large projects at different levels of management.

The universal nature of IDEF3 methods allows you to display simple and complex business processes such as production and project management. Due to the small number of nodes and blocks used to build maps using the IDEF3 technique, the transparency of the processes is ensured, first of all. Each node and block is precisely defined, which means that the processes displayed by this method can be easily interpreted. At the same time, a process description form (form) is created for each map, which contains the following information about the process: (1) process, (2) scope, (3) person responsible for the process (4), process description, (5) method process control, (6) tolerance, (7) documentation related to the process, (8) list of records created during project implementation, and (9) additional information, i.e., definitions and terminology to facilitate understanding of the described process.

5.3. Innovative and spatial mechanisms for ensuring the implementation of the enterprise development strategy

Since, one of the key consequences of enterprise management from the point of view of the chain of creation of complex technical systems is that the focus is on the setting of interaction with all counterparties, and not only internal processes, based on [50, c . 41-42] it is possible to summarize the key areas of such integration:

→ information integration - exchange of information and knowledge between partners regarding, for example, inventory status, demand forecasts, production schedules, promotion plans;

→ coordination - delegating actions and decisions to the member of the supply chain who is in the best position. Thus, replenishing the stock of a component may become the task of a supplier who was previously a supplier of finished products.

→ organization of relationships - exchange of performance indicators, effective communication channels, alignment of incentives, and equal distribution of benefits and risks from integration into the supply chain;

→ integration of planning and coordination of actions at the strategic, tactical and operational levels;

→ integration of actions and coordination of functional plans of production, sales, logistics, finance, marketing;

→ integration of activities in the supply chain - from supply, through production, to distribution to the target market;

→ integration of planning with the results of control plans.

Understanding the directions of integration of enterprises within the framework of the concept of the supply chain makes it possible to single out the following as the basic elements of the development of the integration strategy of a manufacturing enterprise in the chain of creation of complex technical systems (Table 5.4).

A more detailed consideration of the competence, resource and organizational support of each of the basic elements of the development of the integration strategy of a manufacturing enterprise in the chain of creation of complex technical systems makes it

possible to reveal the primary role of ICT in the modern management environment of the production of high-tech products, especially when it comes to the market of technical means of economic security of legal and individuals.

As part of the evolution of the information society to the knowledge society, this means that modern organizations are considered as intelligent organizations (synonym - intellectual organization) [209, c . 45], i.e. learners who have the ability to create, capture, organize and exchange knowledge and use it to improve efficiency and competitiveness in the world market.

This means that the implementation of the most important attributes of such organizations, to which the authors [177, c . 145; 198, c . 45] include:

• speed and flexibility of operation;

• the ability to observe the environment;

• the ability to diagnose market signals at an early stage and respond to changes in the environment;

• the ability to quickly implement new solutions based on knowledge, and thus achieve economic advantages;

Table 5.4

Basic elements of the development of the integration strategy of the production enterprise in the chain of creation of complex technical systems

Basic elements of the development of the integration strategy of the production enterprise in the chain of creation of complex technical systems	Targeted action of the basic element	Specifying the target direction of action of the basic element	Organizational/Competence/Resource support for the operation of basic elements
1	2	3	4
Coordination of cooperation with suppliers	Ensuring the availability of materials or goods at the required time, place, required quantity, quality and assortment	· Achieving the expected level of quality of the final product and the level of service of production and sales processes. · Achieving rhythmic, stable and optimal use of resources. · Cost reduction.	1. Creation of a supply center 2. Creation of a formalized information system in the chain of production/subject cooperation 3. Application of SRM (Supplier relationship management) 4. Integration of WMS systems
Integration of information	Quick and well-founded decision-making based on available, up-to-date and transparent information and knowledge	Exchange of information, projects, database, knowledge, experience between partners regarding, for example, inventory status, demand forecasts, production schedules, promotion plans.	1. Creation of a formalized information system 2. EDI relationship between all participants 3. Creation of conditions for frequent, informal exchange of information - organization of meetings, thematic conferences, survey of partners
Joint planning with suppliers and integrator	Coordination of functional plans of production, sales, logistics, finance, marketing of suppliers and integrator	· Reduction / avoidance of the Bullwhip effect. · Cost reduction. · Stock optimization. · Elimination of financial conflicts.	1. Using CPFR technology 2. Cooperation of functional divisions of the enterprise with functional divisions of the integrator (production, marketing, logistics, financial)

Note: Own development

Therefore, in the context of resource provision of the basic elements of the development of the integration strategy of the production enterprise in the chain of creation of complex technical systems the identification of innovative and spatial mechanisms for ensuring the implementation of the development strategy of

manufacturers of complex technical systems in the ICT environment becomes of primary importance .

According to leading experts in the field of implementing innovative ICT in the business sphere [27; 33; 43; 201], the technology known by the acronym SMAC (eng. Social, Mobile, Analytics, Cloud) has a significant potential for solving a number of specific problems in highly dynamic modern market conditions and demanding demand. It is this technology that Vincen Kellen - vice chancellor for academic planning, analytics and technology at the University of Kentucky recognizes as "a driving innovation in many, if not most, enterprises", as evidenced by his scientific articles in the world-renowned magazine in the field of IT - Cutter IT Journal.

SMAC (Social, Mobile, Analytics, Cloud) as a social, mobile, analytical and cloud environment is a set of new technologies that are rapidly replacing the main messaging and communication services in an action similar to the functioning of network infrastructure and ERP. Their use creates a new dimension in the existence of business models, under which organizations become more cooperative, communicative, productive in real time than it was before.

Let's consider the main differences of SMAC from existing models of information provision of the corporate sector. The vast majority of modern information support systems are characterized by the fact that business information is usually stored in a centralized database and processed using the appropriate client server model, i.e. by connecting, for example, to one of the following systems: SCM , ERP or CRM . This requires some additional effort by the employee, who, as a rule, should learn to use this system in order to understand the specifics of work processes, operations and the interface in general.

Unlike traditional models, SMAC is based primarily on the integration of analytics tools and a variety of social and collaborative processes, each of which can be accessed via mobile devices. Through the use of powerful data visualization tools and individual ISVs , which are developed according to industry templates, it is possible to improve both the process of acquiring the necessary skills of users of this environment, and to accelerate the access of managers to the latest and most relevant business information. Yes, the

social component of SMAC helps people find their colleagues with whom they can collaborate; mobile - provides access to other data sources and clouds; the cloud component contains information and applications that people use; the analytical component allows people to make sense of this data.

The broad idea of SMAC is that social networks such as Facebook and Twitter can be used to build brands and attract customers; big data analytics can be used to analyze large volumes of data; cloud computing provides a shared resource; and mobile applications provide access to services on the go.

The attractiveness and urgent relevance of the implementation of SMAC in the chains of creation of complex technical systems are evidenced by the recently conducted studies of Global Index Cloud Cisco : in 2018, half of the world's population will have access to the Internet and more than 53% of this population will use a data storage service in the "cloud" [155, c . 77].

The growing volume of information used in an intelligent organization goes hand in hand with its increasing importance. Already Peter Drucker noted that the traditional factors of production: land, labor, capital are losing importance in favor of a key resource - the creative functioning of the organization of knowledge. These are intangible resources associated with human activity, the use of which can be the basis for obtaining a competitive advantage. Knowledge can be considered as information embedded in the organizational context and the ability to use it effectively in the work of the organization. This means that knowledge resources are data about customers, products, environmental processes, etc. in the form of formalized (documents, databases) and non-codified (mental labor workers) [140, c . thirteen].

The dynamic development of ICT and a pragmatic approach to management in the era of the information society led to the perception of the time paradigm at the same level as the cost paradigm . Reduction of time intervals in cyberspace by abstracting from geographical boundaries is currently dominant in achieving unprecedented acceleration of business processes within global chains [140, c . 15].

This aspect refers, first of all, to the digital transformation of business, which means replacing the existing approach to the client with a complex process of transition to new

ways of functioning using the latest digital technologies based on the SMAC environment . However, it should be remembered that the role of digital technologies in this process is to provide the necessary changes and open the organization to new opportunities. Therefore, they should be a tool, not a goal of transformation. The client and his needs should be the center of this process, as the main driving force of the functioning of manufacturers and service providers. Therefore, as the author rightly points out [140, c . 15] "digital transformation has ceased to be a way of gaining a competitive advantage and has become a decisive factor in staying on the market."

Let's take a closer look at what this innovative technology is based on. SMAC is based on the following fundamental four components [200]:

1. Social component - social networks break the barriers of information flow between people and become platforms, thanks to which the rapid exchange of knowledge is sometimes more effective. Communication on social media platforms is replacing communication via phone or email. This phenomenon also occurs in the field of business, where the rapid exchange of information is extremely important. The use of social networks enables better interaction with customers, thanks to which the company responds more quickly to problems and creates a knowledge base based on user preferences and user behavior.

2. Mobile component - devices such as smartphones, tablets or laptops have become the main tool of the modern employee's work. They have also increased the ability to reach customers using mobile devices anytime, anywhere. The growing popularity of mobile phones has already forced many companies to develop online marketing channels and provide customers with a mobile shopping experience.

3. Analytical component - understanding customer behavior and preferences is one of the biggest advantages of using analytical tools. From the collected data, analyzed on the basis of complex algorithms, entrepreneurs are able to develop customer loyalty, improve marketing campaigns, optimize their product development processes and provide services that meet customer preferences. By understanding user preferences, businesses have the ability to include, among other things, content that meets their

expectations. Therefore, the use of analytical tools in conducting business consists in making the right decisions based on current and aggregated information.

4. Cloud component - cloud technologies offer tools for efficient collection and processing of data on network servers, which translates into effective management of the organization. The use of tools available in the cloud allows you to reduce the costs of managing ICT systems, breaking geographical barriers and having access to data at any time and place. The cloud is the factor that connects the other elements that make up the SMAC solution .

In practice, there are numerous examples that show that expectations and real benefits in the use of ICT solutions are not fulfilled. The reason for such an impact may be the lack of an appropriate level of integration between the implemented systems. The key to success using SMAC technology is the combination of the four mentioned technologies, which, interacting with each other, allow to achieve synergistic effects. None of these four technologies can give the full effect. Synergies are created simultaneously by all components of SMAC , allowing for the creation of new revenue-generating services, deepening customer relationships, and improving organizational efficiency.

Thanks to the development of cloud and mobile technologies, the transition from closed communication systems to social media platforms is possible [144, c . 45]. Social channels enable the rapid creation and sharing of content, wider distribution of information, and improve collaboration and interaction with customers. Mobile technologies allow easy access to information through a constant Internet connection. Data analysis is used to optimize customer relationship management and increase the effectiveness of sales channels. While the cloud increases their flexibility, scalability, reduces costs.

Traditionally understood ERP systems as solutions that integrate the organization's information infrastructure are no longer able to cope with new market challenges. Although, their main functionality was expanded by a customer relationship management system (CRM - Customer Relationship Management), a supplier relationship management system (SRM - supplier relationship management), a supply chain

management system (SCM - supply chain management) and a product life cycle management system (PLM - product life cycle management), currently the SMAC system , thanks to their properties, allow companies to make a real breakthrough in the level of efficiency of managing information flows that permeate all their business processes.

According to forecasts of the world leader in the market of IT publications, research and specialized events - IDC , in the next two years, 80% of organizations will initiate global digital transformation projects in the field of knowledge management systems based on SMAC , of which 50% of costs will be related to ICT - solutions of the third platform [195, c . 37].

As for the use of SMAC solutions , the statistical data of Polish business entities obtained during the study [140, c . 19-20] make it possible to identify generally global trends in this regard, namely [195, c . 37]:

• cloud technologies - used in 18% of organizations (planned use - 38% of respondents);

• mobile component - used in 29% of organizations (planned use - 15% of respondents);

• analytical component - used in 9% of organizations (planned use - 16% of respondents);

• social media - used by 45% of organizations (planned use - 55% of respondents).

Thus, in chains of creation of complex technical systems, the use of SMAC technologies can become a critical resource factor that will give impetus to all interactions and transactions, supplying all participants with relevant, relevant and timely information, forming a new level of cooperation both within each participant and as a whole within the chain, helping to quickly make quality and informed decisions based on a better understanding of the needs and expectations of its target audience.

In order to specify the action of SMAC technologies in the strategy of a manufacturing enterprise - a participant in the chain of creation of complex technical systems, it is possible to identify the main three directions of obtaining positive effects:

- 1 direction: improving the interaction of manufacturers with the integrator as the final link in the chain of creation of complex technical systems, which has direct contacts with a wide network of customers. Thanks to the mobility of SMAC solutions, customer coverage is improved, thanks to analytics, the understanding of customer needs is improved, thanks to the use of social networks, communication with customers becomes more effective, thanks to the use of cloud solutions, data processing costs are reduced. As a result, the awareness and mobility of final solution providers and the cost of iterations with the integrator increase.
- Direction 2: improving interaction between manufacturers and suppliers. The use of powerful analytical tools, the large-scale implementation of cloud and mobile SMAC technologies when making numerous operational decisions based on actual consumer requests, makes it possible to reduce both the time and cost of transactions, eliminate loss centers, increase the synchronization of actions within the chain, speed up the number of transactions and procedures that do not bring added value, speed up the document flow.
- Direction 3: better management of information flows within the enterprise at all its levels.

Another key aspect of successful chain management of the creation of complex technical systems, which is emphasized by most authors, is the high degree of synchronization of actions of all its participants achieved in the chain, which increases the importance of coordination and partnership along all participants [50; 148; 153; 154; 158; 163; 173; 189; 204]. The authors include [50] well-known ways of establishing coordination in such structures: modern information technologies for exchanging information and synchronizing data between participants in supply chains (for example, the same encryption of goods moving in the chain, joining companies to the Global Data Synchronization Network (English Global Data Synchronization Network , GDSN), unified classification of products), use of CPFR (eng. Collaborative Planning, Forecasting and Replenishment), SRM (eng. Supplier relationship management) and CRM (Customer Relationship Management) technologies.

The importance of coordination of decisions and actions in the chain of creation of complex technical systems and with the activities of all functional divisions of the company and its partners in the chain is difficult to overestimate. It affects both new product development strategies and planning of production capacities and processes. Below we will consider the concept of long-term inter- and inter-organizational coordination, which is implemented using a process called "sales and operations planning" (Sales and Operations Planning, S&OP) (another name is aggregate planning).

Sales and operations planning (hereinafter S&OP) is a business process that provides tactical planning and coordination of tactical decisions and actions in the supply chain in the medium term (usually within the next 4-12 months) [148, c. 475].

This concept was developed in the 1980s by Richard (Dick) Ling of the Oliver Wight Company, a global consulting and training company that has been involved in SCM for a long time. In particular, they describe this process as follows: “S&OP is a process initiated by management and senior level that consists of monthly evaluation of forecasts of revenue, demand and financial results. The purpose of S&OP is to reach a consensus within the framework of a single operational plan, which outlines the method of distribution of the most important resources of the enterprise - personnel, production facilities, materials, time and money, which will contribute to the most effective satisfaction of market needs and increase profits" [50, c. 529] .

Sales and operations planning is planning aimed primarily at creating the most effective tactical plans [50, c . 532]:

➲S & OP shows how an organization should use its tactical potential to meet expected demand. Examples of tactical resources are labor (including shifts), inventory, and even the availability of subcontractors.

➲S & OP balances the different needs and constraints of partners in the chain. For example, in S & OP it is necessary to take into account not only the demand from customers, but also the production capacity of suppliers, manufacturers and logistics companies that work together in the supply of products or services to end users. The result is a plan that is not only enforceable, but also balances cost, deliverables, quality, and flexibility.

➲S & OP is used as a mechanism for coordinating actions between partners in the chain. The end result of the S & OP process consensus is reached between all stakeholders - employees of the sales department, operations and finance department, as well as with the most important suppliers and transport companies, which enables the implementation of the plan, as well as the adoption of the most effective decisions by each participant, with the confidence that the actions performed are well aligned with the efforts other partners. A well-designed S & OP plan should clearly define what should and should not be done.

➲S & OP develops enterprise plans in a form that is acceptable to all participants. Employees of the financial department, as a rule, are focused on cash flows, financial ratios and profitability indicators. Marketing department managers focus on sales volumes and market segments, while operations managers focus on activities related to specific products or services that the company produces (provides). At the same time, the S & OP process allows you to create such plans that will be clear to all partners and can become the basis for creating current functional block plans. So, as a rule, S & OP is based on the basis of the annual plan of operations (English: Annual Operations Plan , AOR), which reflects the company's annual goals in terms of sales and supplies. In turn, S & OP details these results in a monthly display [185]. The general view of the monthly decision-making process in S & OP is shown in Fig. 5.18.

Managers who choose and plan sales and operations must consider costs and other indicators. Example:

☞ What impact will the implementation of the plan have on partners in the chain (for example, on the most important suppliers or carriers)?

☞ How does the plan affect the formation of cash flows? Some plans may assume a profit at the end of the plan period with the possibility of negative flows for several months.

☞ Do the chain partners and the company implementing the plan have enough warehouse space to store the planned stocks?

☞ Will the plan affect employment and what will the changes be? How will the implemented plan affect the degree of employee satisfaction and will it lead to an increase in their work productivity?

☞ Is the plan flexible? Can it be easily adjusted to changing conditions?

Fig. 5.18. Overview of monthly S & OP process

Note: source [50, c . 533] .

These are only a small number of questions that should be considered when choosing a plan , but the answers to them also provide an opportunity to draw important conclusions .

In order for these plans to be implemented, the heads of the main functional units must be included in this process. This can take months and sometimes even years. In particular, Richard (Dick) Ling describes the implementation of S & OP as a three-step process [50, c . 557-559] :

1. Laying the foundation.
2. Integration and process improvement.
3. Obtaining competitive advantages.

Laying the foundation . At this step, the enterprise stimulates the involvement of managers and creates the infrastructure necessary for effective planning of sales and operations. The most important tasks of this step are: informing stakeholders about the benefits of S & OP , identifying the appropriate products or services for which this planning will be applied, and creating information systems that will evaluate the planned indicators and perform the necessary calculations. Ling notes that even though this stage typically lasts six to nine months, many businesses never make it to the second step. The main reason is "they expect the process to work immediately and do not try to use comprehensive information for each period".

Integration and process improvement. As part of this step, S & OP must be integrated with the normal (traditional) planning procedures used in the organization. Managers must adapt to regularly update the plan and - more importantly - to make important decisions based on S & OP related to demand and resources. In addition, management must also seek ways to continuously improve sales and operations planning processes. Ling notes: "Since the implementation of this type of process cannot immediately cause changes in the organizational structure of the enterprise, this step, as a rule, consists of continuous improvement and implementation of organizational changes."

Obtaining competitive advantages . Some businesses eventually reach a point where the sales and operations planning process becomes a source of competitive advantage or core competency. The arrival of this moment can be evidenced by:

- ☞ the existence of an integrated demand planning process using forecasting models;
- ☞ planning and control of continuous improvement, which is an integral part of the process of planning sales and operations;
- ☞ the ability to start planning changes in non-current assets at any time;

☞ regular analysis of various scenarios of the development of events, and access thanks to computer networks to S&OP databases provides easy access to the necessary S&OP information.

Decisions about changes in non-current assets are usually made as part of strategic planning. Even so, S & OP provides the first "warning signals" that inform management when long-term production capacity should be changed. Management can use this information and develop an appropriate investment plan based on it.

In addition, most organizations that apply S & OP for any period of time, provided a developed database and decision-making tools, significantly simplify the work of senior management. These tools make it possible to analyze different options for the development of events that take into account changes in sales forecasts or even values of planned indicators. The result is a more reliable plan of sales and operations.

CONCLUSIONS

The monograph presents a theoretical generalization and a new solution to a scientific-practical task - substantiation of theoretical-methodical and applied provisions regarding the formation of a strategy for the development of manufacturing enterprises in the chain of creation of complex technical systems . The results of the conducted research allow us to draw the following conclusions of a theoretical and methodological content and of a practical nature:

1. The method of identifying key determinants of the development of chains of creation of complex technical systems has been improved, which involves a preliminary multi-criteria comparison of simple and complex technical systems in the context of managing their chains of creation. This enables engineers and managers to identify areas of critical success factors and areas of typical constraints.

2. A system of strategic factors for the integration of manufacturing enterprises into the chain of creation of complex technical systems was developed, which enabled managers to identify strategic alternatives of manufacturers in chains depending on their strategic orientation ("efficiency", "elasticity", a combination of "elasticity and efficiency"), which in the era of global informatization lay the foundations for the formalization of the process of strategic adaptation of a manufacturing enterprise in the chain of creation of complex technical systems and, in particular, to determine the interdependencies between the strategic potential of the chain of creation of complex technical systems and the business strategies of its participants.

3. On the basis of a thorough analysis of the market of technical means of economic security of legal entities and individuals of Ukraine, the structure of product segmentation features of this market was further developed by introducing an additional feature of segmentation regarding the structure of the chain of creation of such complex technical systems, on the basis of which two types of chains of creation of complex technical systems (short and full) and identified significant differences in relation to the management system, as well as probable benefits and threats for their participants . The characteristic structure of the short and full chains of the creation of complex technical

systems in the studied environment was identified, their main participants were identified, and the processes taking place in the main market segments of technical means of economic security of legal entities and individuals of Ukraine were structured.

4. The key factors in the development of the market of technical means of economic security of legal entities and individuals were identified based on the separation of spheres and the nature of the influence, which made it possible to group them into three groups: caused by the activity of the regulatory bodies of this market, caused by the economic/social policy of the state, caused by the action of the market. The consideration of these factors by economists and marketers is essential in the process of developing and implementing the development strategy of the manufacturer of ready-made complex technical systems in the chain of creation of such products, and also allows to carry out a perspective analysis and assessment of the activity of his activity based on a set of indicators of property and financial condition. In particular, based on the results of an analytical study of the activities of the manufacturers of complex technical systems selected for the analysis in 2010-2016, the need to modify, first of all, the following functional strategies of the studied enterprises: production, logistics, marketing, financial in the direction of their optimal coordination with current corporate goals that are directly dependent on the dominant strategic orientation: "efficiency", "elasticity" or the consensus between the dominant "efficiency-elasticity".

5. The method of identifying motives for the integration of a manufacturing enterprise into the chain of creation of complex technical systems has been improved, which, in contrast to the existing ones, which mainly involve the direct establishment of priorities, is based on the assessment of the strategic effects of partnership and involves the following steps: a) matrix comparison of the results of the SWOT analysis in the conditions of autonomous and partnership functioning; b) additional assessment of limitations and risks using SCOC analysis; c) integrated interpretation of the comparison of SWOT and SCOC analysis results . On the basis of the proposed scheme of identification of the motives of the enterprise's integration into the chain of creation of complex technical systems, a foundation is created for making a decision about the lateness or urgency of integration.

6. The mechanism for evaluating the influence of the integration strategy of the chain of creation of complex technical systems on the modification of the business strategy and functional strategies of the participants of such a chain has been improved. The proposed mechanism is based on the iterative adaptation of the business strategies of the chain participants to the chosen strategic orientation of the chain of creation of complex technical systems (downward direction), on the subsequent synthesis of the adapted business strategies of the chain participants (upward direction) and on the configuration within them of the corresponding functional strategies (downward direction direction).

7. The concept of adapting a manufacturing enterprise to the conditions of functioning in the chain of creation of complex technical systems of the market of technical means of economic security of legal entities and individuals based on the identification of special priorities and key factors of their development is substantiated, which allows managers and technologists to update and use the optimal relationship between special priorities of the chain of creation and key factors of the participants of such a chain, as well as identify the need for resource provision and space-time coordination of actions.

8. In the context of resource provision of the basic elements of the development of the integration strategy of a manufacturing enterprise in the chain of creation of complex technical systems, the mechanism of creating resource provision and spatio-temporal coordination of actions regarding the implementation of strategies for the development of enterprises in the chain of creation of complex technical systems , based on the use of technology known as by the acronym SMAC (English Social , Mobile , Analytics , Cloud) and the directions of obtaining positive effects of its application are identified, namely: improving the interaction of manufacturers with the integrator as the final link in the chain of creation of complex technical systems , improving the interaction of manufacturers with suppliers, improving the management of information flows within the enterprise at all its levels

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APPLICATIONS

Table A1

Supply chain leaders and their business and product specialization

Place in the rating	Supply chain	Type of supply chain	Supply chain specialization	Supply chain product
1	2	3	4	5
	Leaders of 2014			
1	Apple	Manufacturers' supply chain	Production of IT products	IT products (modern electronics, mobile communication, software and online services)
2	McDonald's	Supply chain of consumer goods	Catering	Food
3	Amazon	Supply chain of consumer goods	Internet trade	Consumer goods
4	Unilever	Supply chain of consumer goods	Production	Consumer goods
5	Procter & Gamble	Supply chain of consumer goods	Production	Hygiene products
6	Samsung Electronics	Manufacturers' supply chain	Production of IT products	IT products (modern electronics, mobile communication, software and online services)
7	Cisco	Manufacturers' supply chain	Production of IT products	IT products (network equipment intended for the maintenance of remote access networks, security services, data storage networks, routing and switching, as well as for the needs of the commercial market of IP communications and the corporate market)
8	Intel	Manufacturers' supply chain	Production of IT products	IT products (semiconductor elements and devices)
9	Colgate-Palmolive	Supply chain of consumer goods	Production	Hygiene products
10	Coca-Cola	Supply chain of consumer goods	Production	Drinks
11	Inditex	Supply chain of consumer goods	Trade	Clothing
12	Nike	Supply chain of consumer goods	Production	Clothing
thirteen	H&M	Supply chain of consumer goods	Trade	Clothing
14	Walmart	Supply chain of consumer goods	Trade	Consumer goods
15	PepsiCo	Supply chain of consumer goods	Production	Drinks
16	Lenovo Group	Manufacturers' supply chain	Production	IT products (personal computing systems and access devices, system integration, service support a outsourcing services, as well as printing devices image output devices)

Continuation of the table. A1

1	2	3	4	5

17	Starbucks	Supply chain of consumer goods	Catering	Food
18	3M	Manufacturers' supply chain	Production	Consumer goods and industrial goods (Abrasive, glue, laminate, passive fire protection products, dental products, car care products (polishes, shampoos), electronic microcircuits and optical films)
19	Qualcomm	Manufacturers' supply chain	Development and research	IT products (tools wireless)
20	Seagate Technology	Manufacturers' supply chain	Production of IT products	IT products (hard drives and information storage solutions)
21	Kimberly-Clark	Supply chain of consumer goods	Production	Hygiene products
22	Johnson & Johnson	Supply chain of consumer goods	Production	Hygiene products
23	Caterpillar	Manufacturers' supply chain	Production	Machinery and equipment for construction
24	Cummins	Manufacturers' supply chain	Production	Diesel engines for tractors, buses, armored vehicles and self-propelled vessels
25	Nestlé	Supply chain of consumer goods	Production	Food
	Leaders of 2015			
1	Amazon	Supply chain of consumer goods	Internet trade	Consumer goods
2	McDonald's	Supply chain of consumer goods	Catering	Food
3	Unilever	Supply chain of consumer goods	Production	Consumer goods
4	Intel	Manufacturers' supply chain	Production of IT products	IT products (semiconductor elements and devices)
5	Inditex	Supply chain of consumer goods	Trade	Clothing
6	Cisco Systems	Manufacturers' supply chain	Production of IT products	IT products (network equipment designed for the maintenance of remote access networks, security services, data storage networks, routing and switching, as well as for the needs
				commercial market of IP communications and corporate market)
7	H&M	Supply chain of consumer goods	Trade	Clothing
8	SamsungElectronics	Manufacturers' supply chain	Production of IT products	IT products (modern electronics, software and onli services)
9	Colgate-	Supply chain of consumer goods	Production	Hygiene products

Continuation of the table. A1

1	2	3	4	5
	Palmolive			
10	Nike	Supply chain of consumer goods	Production	Clothing

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11	Coca-Cola	Supply chain of consumer goods	Production	Drinks
12	Starbucks	Supply chain of consumer goods	Catering	Food
thirteen	Walmart	Supply chain of consumer goods	Trade	Consumer goods
14	3M	Manufacturers' supply chain	Production	Consumer goods and industrial goods (Abrasive, glue, laminate, passive fire protection products, dental products, car care products (polishes, shampoos), electronic microcircuits and optical films)
15	PepsiCo	Supply chain of consumer goods	Production	Drinks
16	Seagate Technology	Manufacturers' supply chain	Production	IT products (hard drives and information storage solutions)
17	Nestlé	Supply chain of consumer goods	Production	Food
18	Lenovo Group	Manufacturers' supply chain	Production	IT products (personal computing systems and access devices, system integration, service support and outsourcing services, as well as printing devices and image output devices)
19	Qualcomm	Manufacturers' supply chain	Development and research	IT products (tools wireless)
20	Kimberly-Clark	Supply chain of consumer goods	Production	Hygiene products
21	Johnson & Johnson	Supply chain of consumer goods	Production	Hygiene products
22	L'Oréal	Supply chain of consumer goods	Production	Makeup
23	Cummins	Manufacturers' supply chain	Production	Diesel engines for tractors, buses,
				armored vehicles and self-propelled vessels
24	Toyota	Supply chain of consumer goods	Production	Cars
25	HomeDepot	Manufacturers' supply chain	Trade	Construction products and household goods
	Leaders of 2016			
1	Unilever	Supply chain of consumer goods	Production	Consumer goods
2	McDonald's	Supply chain of consumer goods	Catering	Food

Continuation of the table. A1

1	2	3	4	5
3	Amazon	Supply chain of consumer goods	Internet trade	Consumer goods
4	Intel	Manufacturers' supply chain	Production of IT products	IT products (semiconductor elements and devices)
5	H&M	Supply chain of consumer goods	Trade	Clothing

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6	Inditex	Supply chain of consumer goods	Trade	Clothing
7	Cisco Systems	Manufacturers' supply chain	Production of IT products	IT products (network equipment intended for the maintenance of remote access networks, security services, data storage networks, routing and switching, as well as for the needs of the commercial market of IP communications and the corporate market)
8	SamsungElectronics	Manufacturers' supply chain	Production of IT products	IT products (modern electronics, software and online services)
9	Coca-Cola	Supply chain of consumer goods	Production	Drinks
10	Nestlé	Supply chain of consumer goods	Production	Food
11	Nike	Supply chain of consumer goods	Production	Clothing
12	Starbucks	Supply chain of consumer goods	Catering	Food
thirteen	Colgate-Palmolive	Supply chain of consumer goods	Production	Hygiene products
14	3M	Manufacturers' supply chain	Production	Consumer goods and industrial goods (Abrasive, glue, laminate, passive fire protection products, dental products, car care products (polishes, shampoos), electronic microcircuits and optical films)
15	PepsiCo	Supply chain of consumer goods	Production	Drinks
16	Walmart	Supply chain of consumer goods	Trade	Consumer goods
17	Hewlett-Packard	Manufacturers' supply chain	Production	IT products (personal computing systems and access devices, system integration, service support and outsourcing services, as well as printing devices and image output devices)
18	Schneider Electric	Manufacturers' supply chain	Production	Equipment for energy sub-complexes of industrial peninsulas, objects of civil and residential construction, data centers
19	L'Oreal	Supply chain of consumer goods	Production	Makeup

Continuation of the table. A1

1	2	3	4	5
20	BASF	Manufacturers' supply chain	Production	Industrial and consumer products (plastic, paint, cosmetics, food additives, technical and construction chemicals, agrochemical plant protection products)
21	Johnson & Johnson	Supply chain of consumer goods	Production	Hygiene products
22	BMW	Supply chain of consumer goods	Production	Cars
23	GlaxoSmithKline	Manufacturers' supply chain	Production	Medical, pharmaceutical, microbiological products
24	Kimberly-Clark	Supply chain of consumer goods	Production	Hygiene products

25	Lenovo	Manufacturers' supply chain	Production	IT products (personal computing systems and access devices, system integration, service support and outsourcing services, as well as printing devices and image output devices)

Note: source [145-147]

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Appendix B

Table B1

Characteristics of security types

Type of security	Content
1	2
National security	a systematic category of law, political economy and political science, closely related to the categories of territorial unity and inviolability, aggression and coercion, economic independence and economic sovereignty, etc.
Political security	occupies a key place in the general system of providing security. A society's loss of political control or its inconsistency with the possibilities and interests of society inevitably leads to its degradation and death. Therefore, every nation needs a policy that ensures its existence and development in the modern world.
Sociocultural security	reflects security in its totality of spiritual-ideological, ethical, cultural conditions of people's life, that spiritual environment, without which neither a person nor a human community can exist.
Social security	a set of types of security determined by the structure of human activity and its spheres. It includes dangers that are widespread in society and threaten the life and health of people.
Economic security of the state	manifests itself in various components of national security. Namely, in the spheres: foreign policy, military and security of the state border of Ukraine, internal political, economic, scientific and technological, environmental, social, humanitarian and informational.
Man-made safety	a set of actions to ensure the design, construction and operation of complex technical devices in compliance with the necessary requirements for their trouble-free operation and compliance with environmental conditions.
Military security	a complex of non-military economic, political-diplomatic, intelligence, ideological, etc. measures. of a nature aimed at solving international and domestic conflicts, preventing them from developing into a confrontational, military-force confrontation.
Ecological safety	it is a state of protection of the vital interests of the individual, society and the state from potential or real threats created by the consequences of anthropogenic influence on the environment, as well as from natural disasters and catastrophes.
Informational security	it is the ability of the state, society, social group, and individual to preserve, with a certain probability, sufficient and protected information resources and information flows to support their vital activity and viability, sustainable functioning and development, to resist informational dangers and threats, negative informational influences on individual and social consciousness and psyche people, as well as on computer networks and other technical sources of information, to develop personal and group skills and abilities of safe behavior, to maintain constant readiness for adequate measures in information confrontation, no matter who it was imposed.

Continuation of the table. B1

1	2

Collective security	this is the collective protection of the state and societies from internal and external threats. Collective security includes a system of measures aimed at maintaining international peace, preventing war, providing collective resistance to aggression and collective assistance. This cooperation can be carried out within the UN, international organizations or on a regional basis, for example, as a security system within the Commonwealth of Independent States.
Regional security	this is the state of relations of the socio-territorial community of the population, which is formed in accordance with the administrative-territorial division of a country or a group of countries within them or between them into micro (settlement, district, region of the country), macro (country, group of countries) and intermediate (several populated points, districts, regions of the country, group of countries) levels at which part of the security of a more general system (national, international) is ensured.
Security of progress	this is the relationship of a person with the artificial formations produced by him, which allow him to fully and comprehensively reveal his capabilities, including at the same time technological, ethical and worldly dependence on means and processes created by him.
Fire safety of the object	the state of the facility, which excludes with a regulated probability the possibility of the occurrence and development of a fire and the impact of its dangerous factors on people, as well as the protection of material values is ensured.

Note: source [60]

Appendix B

Table B1

Parameters of division into five types of warning systems and management of evacuation of people in case of fire

Characteristics of CO and management of evacuation of people in case of fire	The presence of the specified characteristics in different types of SO				
	CO 1	CO 2	CO 3	CO 4	CO 5
Notification methods: - sound (call, toned signal, etc.);	+	+	*	*	*
- speech (recording and transmission of special texts);	-	-	+	+	+
- light: a) a flashing light signal;	*	*	-	-	-
b) "Exit" light indicators;	*	+	+	+	+
c) traffic direction light indicators;	-	*	*	+	+
d) light indicators of the direction of movement with inclusion separately for each zone.	-	*	*	*	+
2. Communication of the alert zone with the control room	-	-	*	+	+
3. Order of notification: - all at the same time;	*	+	-	-	-
- only in one room (part of the house);	*	*	*	-	-
- first the service personnel, and then all others according to a specially developed sequence.	-	*	+	+	+
4. Full automation of SO management and the possibility of various options for organizing evacuation from each alert zone	-	-	-	-	+
Note. Table 2.2 shows the following symbols: "+" is required "*" is recommended "-" is not required					

Note: source [20]

Appendix D

Table D1

The structure of the main producers of the SCS market of Ukraine in 2015

Producer	Partner in Ukraine	Status
Assmann Electronic (CKC Digitus Professional)	ERC	Distributor
	Megatrade	Distributor
Brand-Rex	Cross Micro	Distributor
Corning	KMS	Distributor
	TEKO	Distributor
Fibrain	Equipment for business	Distributor
IvyNET	Alliance Technologies	TM owner, distributor
Legrand	Legrand Ukraine	Representative
	IQ Trading	Distributor
	ERC	Distributor
Molex PN	MTI	Distributor
	Banking communication	Distributor
	South-contract	Distributor
Odeskabel	Odeskabel	Owner of TM Ok-NET
	Banking communication	Distributor
	IQ Trading	Distributor
	Neologian	Distributor
	Doncom	Distributor
	Vipastek	Distributor
	Romsat	Distributor
Panduit	Representation of Panduit	Representation
	Megatrade	Distributor
	BTC Kyiv	Distributor
	KMS	Distributor
Premium Line	Nets	Solution provider
	IQ Trading	Distributor
R&M	Synergia SA	Exclusive distributor
Siemon	UTTK	Distributor
Systimax	Romsat	Distributor
TE Connectivity	Banking communication	Distributor
	Megatrade	Distributor
	MUK	Distributor
Vinet	Alliance Technologies	TM owner, distributor

Note: source : [108]

Appendix E

Market analysis of auxiliary equipment for SCS

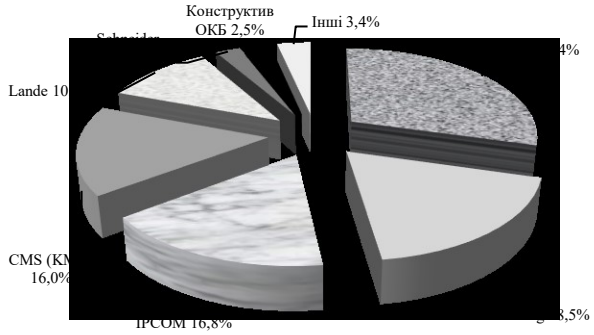

Fig. E.5. The structure of the assembly cabinets market in 2015.

Note: source : [108]

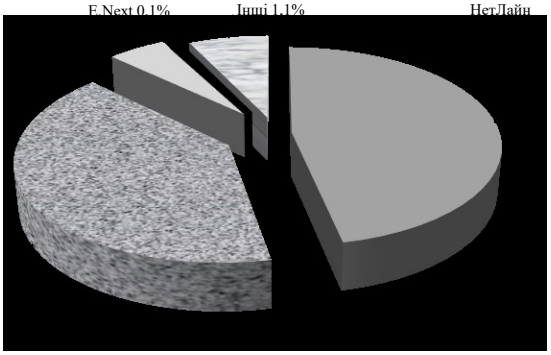

Fig. E.2. The structure of the corrugated plastic pipe market in 2015.

Note: source : [108]

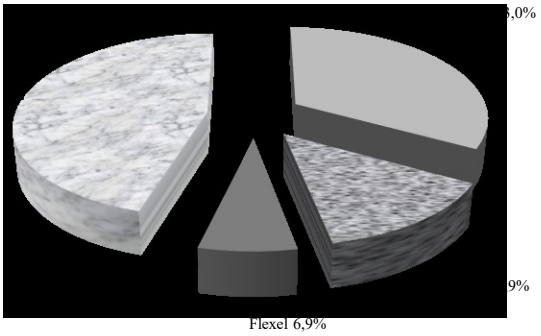

Fig. E.3. The structure of the market of sheet metal trays in 2015.

Note: source : [108]

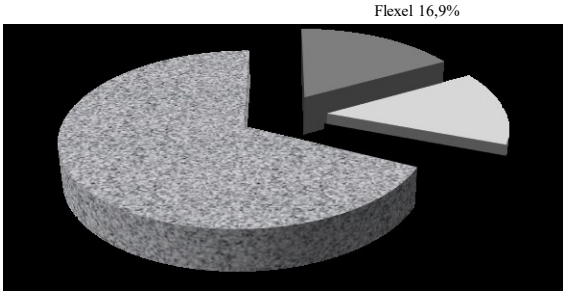

Fig. E.4. Market structure of mesh trays in 2015.

Note: source : [108]

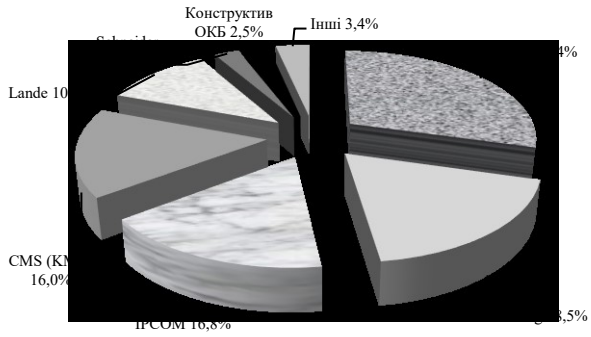

Fig. E.5. The structure of the assembly cabinets market in 2015.

Note: source : [108]

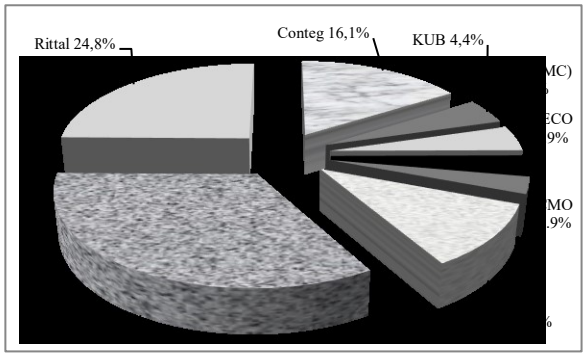

Fig. E.6. The structure of the server cabinets market in 2015.

Note: source : [108]

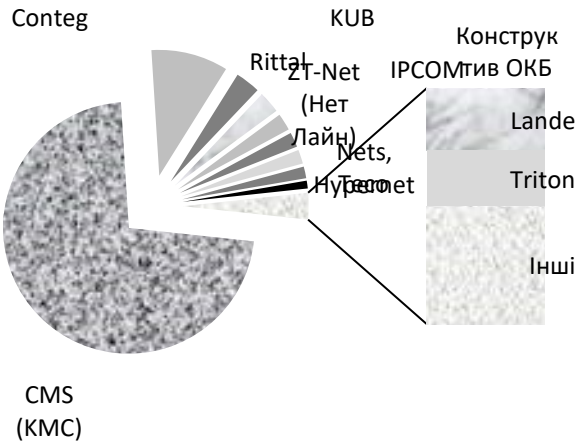

Fig. E.7. The structure of the wall cabinets market in 2015.

Note: source : [108]

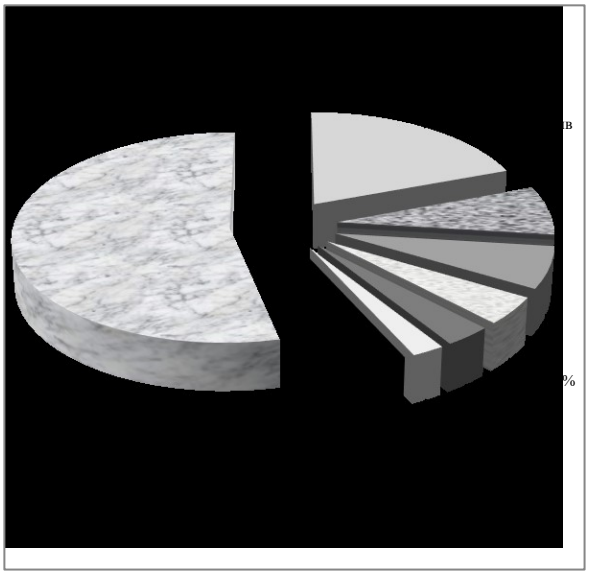

Fig. E.8. The structure of the two-frame rack market in 2015.

Note: source : [108]

Table Z1

Foreign and domestic manufacturers of the security market of Ukraine

Foreign companies													
A Astra ABB ABBYY Acer ACS ACTi Activision AddPac Adobe Systems Ajax Alcatel Allied Telesis AMP Anko Tech APC Apple Arcotel ARNY Ashampoo ASTRO ASUS ATcom ATIS ATOM Audax AVAYA Avidis Avigard AVTech Axis	**B** Baks Barcom Bellson BERG Bi-Zone Bosch Brateck Brother	**C** Cabelcon Cablesat Canon CISA Cisco CMS CNB CnM SECURE Commax CommScope Conteg Cor-X Crossover Crow CyberPower	**D** D-Link Dahua Dalgakiran Dallas Data Link DATIX DCG DELL Deluxe DigiTec Dipole Dori DreamBox DSC Dynamix	**E** E. Next Eaton Edge-Core Edimax El-Bi ElectrO ElectroHouse Electronics Line Electrum Elektro-Plast Elgama Elko-bis Elmes Electronic ERCON ERICO ETI EverFocus Evidence	**F** FinMark Flexa Forteza FortNet Foton Foxconn FoxGate Foxit FRANKISH Fujinon Fujitsu Funke	**G** GALMAR Gardi Garrett Geko Gembird General Electric GeoVision Germikom GEZE Gigabyte Gigaset Grandstream GreenVision Gromex	**H** Hager Hanlong HDL HikVision Hitachi Hitron Honeywell HP Huawei Hyundai Telecom	**I** IEK ILDVR Impreza Infinity Ingesso Install Intel InterVision Inverto Ipcom Iron Logic IRS Iskra ITV	**J** J. Pröpster Jablotron JEDIA JSB	**K** Kingda KLM Kocom Kopos Krone KTC	**L** Legrand LEM Lenovo LEO LIGHTMAN LG LG-Ericsson LifeSOS Lightwell LinkSys LogicFox LogicPower Logitech Longse LUXEON	**M** Marshall-Tufflex MAXUS Mepsan METAL VIS MGS Microsoft MikroTik Moeller Molex MSI Mustek	**N** Neotion NetLine NETS NetVision Nexans No Name
O OBO Bettermann OK-net Omax Omega ONV Openbox	**P** Panasonic Panduit Paradox Parallels Partisan PERCox Philips	**Q** QTUM	**R** R&M RAR Lab RCI REC Recovery Software RID	**S** Sabaj SALTO Samsung Satel SCaT SCHIRTEC	**T** Tamron Tantos Tecsar Tenda TERRA Texecom THM	**U** Ubiquiti UNIFIX Uniview USK	**V** VAGO Vellez Vestec VI-KO Viatec Vidicon	**W** Wibtek WinQuest WISI	**Y** Yealink Yeastar YLI Electronic	**Z** Z-Ben ZPAS ZyXEL			

Продовження табл. Ж1

OpenVox Optex OptiVision OPTOKON OSRAM	PicoCell Planet Pleolan Polycom Power Tech Powercom Pyronix		Roks Romsat Rosslare	Schneider Electric Schroff Seagate SELCO Sentrol Slinex Smart Security SMITH Sony Star Track Step4Net STOP-Net Strong STS Sturm Sunell Sunkwang Sven SWR Sylvania Symantec	TIGER TOA Tokina TP-LINK Triax Trilink Trinix Triton Twist Tyco Electronics		Vision Hi-Tech Vivotek Visit VLG Cable Voltaire						
Domestic companies													
AND Alai Antec Arton AsCoUkrEM	**B** Bilmax	**IN** Variant WENBEST VitaPara	**G** thunderbolt	**D** DCS	IS EMT Electronics	**WITH** ZZCM ZM	**AND** Intercable ITR IEC	**K** Kateh-Electro CODE Step-HT	**M** megohmmeter Mriya	**N** NICK NIVIT	**AT** ARIES Odeskabel OMyS Security and Safety	**P** Protag Start and setup Piezo sensor	**WITH** SB I Light Technologies SenCo CMT ST-Perimeter Guard
T TEKO Thermophyte T and races of Ukraine	**F** Form	**Ts** CMO	**E** Electron										

Note: compiled on the basis of available information on the Internet

Appendix C

Table C1

National system integrators of the technical security market of legal entities and individuals of Ukraine

No n/p	The company name	Characteristics of services	Location	Company website
1	2	3	4	5
1.	Cluster-plus is a *national system integrator*	Implementation of engineering systems and networks. The main areas of sales of goods and provision of services (solutions): • Informatization (computerization, data transmission, dispatching, cable structures); • Telecommunications (telephony, television, notification, video communication); • Security (video surveillance, security alarm, access control, perimeter security); • Electricity (power supply, lighting, grounding, lightning protection).	Kyiv	cluster-plus.ua
2.	VTP Transexpo	Complex construction engineering solutions: general contracting, system integration and design, installation and service maintenance of systems, namely: Access systems, video surveillance, automation and dispatching systems, grounding and lightning protection systems; gravity and mechanical smoke removal systems; fire extinguishing systems of all types and technologies; fire alarm, evacuation management and fire dispatching systems.	Kyiv	transexpo.ua
3.	"ValTech"	Development and implementation of complex engineering solutions in the field of IT technologies.	Kyiv	valtek.com.ua
4.	Company Synchron	A full range of services to support the IT infrastructure of the order. Solution: IT outsourcing , Internet, IP telephony, corporate lines, etc.	Kyiv	synchron.ua
5.	Ukrcenter SKS	Design and installation of local lines, computer lines, installation of SCS.	Kyiv	ukrcenterscs.com.ua
6.	LAN Service	Design and installation of local computer lines	Kyiv	lvs.net.ua
7.	Pro Comp	The entire range of services for installation, commissioning, start-up, service and post-warranty maintenance of information technology services based on the introduction of new information and security technologies.	Dnipropetrovsk	proficomp.dp.ua
8.	Infopulse	Software development,	Kyiv	infopulse.com.ua

Continuation of the table. C1

1	2	3	4	5
	Ukraine	IT infrastructure management, IT consulting, business process automation solutions (BI, CRM,		

		Integration Solutions, document management, portals)		
9.	Simplit[9]	IP telephony, virtualization, security, backup systems, video surveillance, 1C development, consulting, outsourcing.	Kyiv	simplit.com.ua
10.	RKI -Consulting	Complex solutions in the field of system integration: construction of engineering lines of buildings and structures, security systems, television, unified communications, audiovisual complexes, data transmission lines, data center, SCS, time registration, radio registration	Kyiv	rci-c.com
11.	Robot	Subscriber maintenance of computers, as well as maintenance of 1C, servers, PBX	Kyiv	r0bot.com.ua
12.	OptiVision	Professional integrator of visual and audio equipment for business. The offer consists of a wide range of high-tech solutions in various AV segments	Kyiv	optivision.com.ua
thir tee n.	Equipment for business	Complex IT projects, certified PC production and own distribution of leading manufacturers of computer, digital and office equipment	Lviv	tdb.ua
14.	Avalis	Design and implementation of complex IT projects. Server, desktop, network virtualization. Implementation of information processing and storage systems. Integration of IT security systems	Kyiv	avalis.com.ua
15.	Ipiland	Development and support of information technologies, as well as development of IT culture in Ukrainian and foreign companies	Kyiv	ipland.com.ua
16.	LC solutions	A full range of services for the implementation and maintenance of low-current systems	Kyiv	lcsolutions.com.ua
17.	Telesphere Integration	Construction of local settlement lines, Wi-Fi, VPN and information security systems	Kyiv	telesphere.net
18.	Data networks	Laying of cable systems at industrial facilities, office buildings and shopping centers	Kyiv	data-networks.com.ua

Note: compiled from: http :// catalog . and _ ua / catalog /446 and official websites of integrator companies

[9]Partners: D-Link, Astaro, Dell, Everest, Axis, Panasonic, VMware, Citrix.

Table K.1

Competitors on the market for the production of components component systems and fire protection

A component of the fire protection system		Ukrainian manufacturers components	Foreign manufacturers components
1		2	3
Fire alarm systems		1. LLC "ARGUS-INFORM" 61002, Kharkiv, st. Chubarya, 1, EDRPOU code 32567201 2. PE "ARTON" 58000, Chernivtsi, str. Prutska, 6, EDRPOU code 30150047 3. VKF " MARS " (Small enterprise) in the form of LLC, Odesa, str. Zooparkova, 25 4. "Meridian Scientific and Production Enterprise" LLC, 211-a, Gagarina Ave., Kharkiv, 61031 5. LLC "PROEKT JSC" 61145, Kharkiv, st. Klochkivska, 193, building 2 6. PE "RESERVE-1" m . Kharkiv , 61157 , in ul . October Revolution , 99, letter B-2	1. APOLLO Fire Detectors Limited » (Great Britain) 39 Brookside Road, Havant, Hampshire, PO9 1JR, UK 2. Gulf Security Technology Co., Ltd., China 80 Changjiang East Road, Economic&Technology Development Zone, Qinhuangdao, Hebei, China 3. "Novar GmbH a Honeywell Company" (Germany) Dieselstraße 2, 41469 Neuss, Germany
Fire extinguishing systems	Water and foam fire extinguishing systems	1. PrJSC "Institute "Spetsavtomatika" 91050, Luhansk, st. Uchebna, 4A 2. NVF "BRAND MASTER" LLC, Kyiv Region, p. Berezivka, st. Poleva, 1-V	1. " Eusebi " firm Impiantis . r . " _ (Italy) Via Mario Natalucci 6, Ancona, Italy
	Powder fire extinguishing systems	1. LLC "NVF "BRAND MASTER" Kyiv region, village Berezivka, st. Poleva, 1-V 2. Technopark Pozhtechnika LLC, Kharkiv, st. Pushkinska, 104-D	There is no information about foreign manufacturers
	Aerosol fire extinguishing systems	There is no information about domestic manufacturers	1. Shaanxi J&R FireFightingCo., Ltd. (China), No 65, Keji 2nd Road, GaoxinDistrict, Xi'an, Shaanxi 710075, China ADEXIM-TRADE LLC 2. CJSC "NPG Granit-Salamandra" (Russia)
	Gas fire extinguishing systems	1. NVF "BRAND MASTER" LLC, Kyiv Region, p. Berezivka, st. Poleva, 1-V 2. LLC "POZHTEKHNIKA UKRAINE" 03179, Kyiv, 123 Peremohy Ave.	1. Firm " EusebiImpiantis " . r . " _ (Italy) Via Mario Natalucci 6, Ancona , Italy
Fire alarm systems and evacuation management		1. LLP NVP "ELEKTROPRYLAD" 79019, Lviv, str. Zhovkivska, 30D	1. Novar GmbH a Honeywell Company (Germany) Dieselstraße 2, 41469 Neuss, Germany

Continuation of the table. K1

1	2	3
Smoke protection systems	1. LLC "SAVS Technologies" 03143, Kyiv, str. Akademika Zabolotny, 154 D	1. "Talleres Zitron SA" (Spain) Autovia AS-II, No. 2386 Poligono Roces 33392 Gijon (Asturias) Spain 2. Novenco A/S (Denmark) Industrivij, 22 Naestved, Denmark 3. LLC "NPF Turbocavitation Technologies" CJSC "Lada-Flect" (Russia) 445036, Russia, Samara Region, Tolyatti, str. Station , 110 4. REWA Sp. z oo" (Poland) Wola Rafałowska 212A, 36-017 BŁĘDOWATYCZYŃSKA, Poland 5. "Actulux A/S" (Denmark) Haandvaerkervej 2, DK 9560 Hadsund, Denmark
Indication equipment of centers for receiving alarm notifications	1. LLC "Protection and Security" 61002, Kharkiv, st. Chubarya, 10/12 2. "ARGUS-INFORM" LLC, Kharkiv, st. Tselinogradska, 22/39	There is no information about foreign manufacturers
Fire valves	1. LLC "Technological and experimental plant" 81100, Lviv region, Pustomytivsky district, Pustomyty city, str. Glynska, 54. 2. "Ventson" LLC, 08720, Kyiv region, Obukhivsky district, Ukrainka city, str. Promyslova, 27 3. VENT-SERVICE LLC, Kyiv Region, Yagotyn, 5, Silhosptekhniki St.	1. Firm "Siemens Schweiz AG Building Technologies Group Fire Safety&Security Products" (Switzerland), Gubelstrasse 22, CH-6301 Zug, Switzerland
Fire doors	1. Technopark Pozhtechnika LLC, 61023, Kharkiv, str. Pushkinska, 104 d. 2. PJSC "Woodworking plant No. 7", 04209, Kyiv, str. Bogatyrska, 9 3. "DIVI TRADE" LLC, Kyiv, str. 21 Degtyarivska Street, letter XIX	1. " Andreu Barberasl " company (Spain), 46988 Sevilla , Valencia
Fire doors with telescopic opening for elevator shafts	There is no information about domestic manufacturers	1. Firm "IZAMET 1991" OOD, Sofia, Promyshlennaya zona "Hara Iskyr", ul. 5007, No. 5, Republic of Bulgaria

Note: based on OS data "Certification Center for Materials and Products"

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Table L1

Report on the financial results of "Electroprylad" LLC NVP for the years 2010-2016

Article, thousand UAH.	Years						
	2010	2011	2012	2013	2014	2015	2016
Income (revenue) from the sale of products (goods, works, services)	19879	24728	24059	-	-	-	-
VAT	2783	3678	3488	-	-	-	-
Net income from the sale of products (goods, works, services)	17096	21050	20571	18460	17786	23815	35450
Cost of goods sold (goods, works, services)	14799	17292	16837	14909	14238	20340	26958
Gross : profit	2297	3758	3734	3551	3548	3475	8492
Other operating income	10	-	-	123	-	11	207
Administrative expenses	728	988	789	804	886	1065	1815
Selling expenses	626	711	534	509	603	483	547
Other operating expenses	237	385	323	347	788	119	435
Financial results from operating activities: profit	717	1674	2088	2014	1271	1819	5902
Other financial income	-	-	78	29	3	10	45
Financial result before taxation : profit	717	1674	2165	2043	1274	1829	5947
Expenses (income) from income tax	384	486	523	415	346	295	1071
Net financial result : profit	333	1188	1642	1628	928	1534	4876
Material costs	6798	10001	10065	8535	8189	10718	16877
salary expenses	3675	4522	5221	5438	4719	5777	8750
Deductions for social events	1362	1719	1817	2018	1501	2163	1895
Other operating expenses	525	615	1582	1445	788	1472	2692
Operating expenses	12360	16857	18685	17436	15197	20130	30214

Table L.2

Report on the financial results of TDV "SKB Electronmash" for 2010-2016

Article, thousand UAH.	Years						
	2010	2011	2012	2013	2014	2015	2016
Income (revenue) from the sale of products (goods, works, services)	15303	16388	17328	-	-	-	-
VAT	1723	2017	2099	-	-	-	-
Other deductions from income	14	17	17	-	-	-	-
Net income from the sale of products (goods, works, services)	13566	14354	15212	13135	12026	15833	18942
Cost of goods sold (goods, works, services)	10362	10238	10927	8898	9374	12990	12236
Gross : profit	3204	4116	4285	4237	2652	2843	6706
Other operating income	5107	4244	692	604	2282	4329	1962
Administrative expenses	2254	2267	2080	2152	2270	2644	3068
Selling expenses	495	508	445	392	300	388	461
Other operating expenses	5242	4284	462	463	297	858	328
Financial result from operating activities: profit	320	1301	1990	1834	2067	3282	4811
Other financial income	-	-	-	-	198	3	-
Financial expenses	56	65	55	40	2	2	4
Financial result before taxation : profit	264	1236	1935	1794	2263	3283	4807
Expenses (income) from income tax	216	317	437	388	449	635	930
Net financial result : profit	48	919	1498	1406	1814	2648	3877
Material costs	8806	9469	9202	6776	7143	9015	11088
salary expenses	2450	2806	3046	2866	2628	2772	3679
Deductions for social events	923	1039	1128	1046	961	972	774
Amortization	147	153	165	119	95	178	356
Other operating expenses	830	780	651	689	637	878	941
Operating expenses	13156	14247	14192	11496	11464	13815	16838

Table L.3

Report on the financial results of NVP Altosan LLP for 2010-2016

Article, thousand UAH.	Years						
	2010	2011	2012	2013	2014	2015	2016
Income (revenue) from the sale of products (goods, works, services)	15233.7	25279.9	20555.7	11196.5	-	-	-
Indirect taxes and other deductions from income	2538.9	4213.3	3429.2	1866.3	-	-	-
Net income from the sale of products (goods, works, services)	12694.8	21066.6	17126.5	9330.2	6199.4	15197.4	13046.5
Other operating income	2	3.8	16.3	33.9	291.6	82.8	365.3
Other income	-	-	-	-	-	-	1.3
Total net income	12696.8	21070.4	17142.8	9468.8	6491	15280.2	13413.1
Cost of goods sold (goods, works, services)	6415	16236.3	17649.5	8214.7	3924.4	11673.5	9925.6
Other operating expenses	6587.6	4463	1061.5	744	2444.7	2953.9	3429.0
Other expenses	-	-	0.8	85.5	3	-	-
Total costs	13002.6	20699.3	18711.8	9044.2	6372.1	14627.4	13354.6
Financial result before taxation :	-305.8	371.1	-1569	424.6	118.9	652.8	58.5
Income tax	138.5	200.3	172	124.7	54.3	117.5	10.5
Net financial result : profit	-444.3	170.8	-1741	299.9	64.6	535.3	48

Table L.4

Balance sheet of Electroprilad LLC for the years 2010-2016 (at the end of the reporting period)

Article, thousand UAH.	Years						
	2010	2011	2012	2013	2014	2015	2016
1	2	3	4	5	6	7	8
ASSETS							
I. Non-current assets							
Fixed assets							
residual value	4050	4050	4887	6497	6497	6497	6497
initial value	4346	4346	5183	6793	6793	6793	6793
wear and tear	296	296	296	296	296	296	296
All according to section I	4050	4050	4887	6497	6497	6497	6497
II. Current assets							
Reserves				878	994	1012	3947
Inventories	839	1004	921	878	994	1012	3947

Continuation of the table. L4

1	2	3	4	5	6	7	8
Accounts receivable for products, goods, works, services:							
net realizable value	290	175	143	101	359	587	1430
initial value	290	175	143				
Other current receivables	-	210	970	236	369	496	1345
Current financial investments			80	80			
Money and its equivalents:				683	534	2113	2321
in national currency	91	156	97				
in foreign currency	1868	2253	93				
Bank accounts				683	534	2113	2321
Other current assets	1189	85	487	502	703	230	230
All according to section II	4277	3885	2790	2480	2959	4438	9273
Balance	8327	7935	7677	8977	9456	10935	15770
PASSIVE							
I. Equity							
Registered (share) capital	100	100	100	100	100	100	100
Retained earnings (uncovered loss)	5902	6792	6684	8187	9115	10649	15525
That's all according to section I	6002	6892	6784	8287	9215	10749	15625
III. Current liabilities and provisions							
Promissory notes issued	760	-	-				
Current accounts payable for: goods, works, services	1447	769	803	589	104	117	91
Other current commitments	118	274	90	101	137	69	54
That's all according to section III	2325	1043	893	690	241	186	145
Balance	8327	7935	7677	8977	9456	10935	15770

Table L.5

Balance sheet of SKB Electronmash VAT for 2010-2016

Article, thousand UAH.	Years						
	2010	2011	2012	2013	2014	2015	2016
1	2	3	4	5	6	7	8
ASSETS							
I. Non-current assets							
Intangible assets							
initial value	2	2	2	2	2	2	2
accumulated depreciation	2	2	2	2	2	2	2
Fixed assets							
residual value	453	483	350	298	353	1053	1143
initial value	1569	1752	1769	1836	1986	2839	3285
wear and tear	1116	1269	1419	1538	1633	1786	2142
All according to section I	453	483	350	298	353	1053	1143
II. Current assets							
Reserves				4191	3750	2147	3634
Inventories	1268	1098	909	1083	1119	1381	1849
Unfinished production	39	19	59		6		195
Final product	1180	2395	3051	3095	2616	750	1576
Goods	9	4	3	thirteen	9	16	14
Accounts receivable for products, goods, works, services							
net realizable value	201	188	192	235	97	291	648
initial value	201	255	259				
reserve for doubtful debts		67	67				
Accounts receivable according to calculations: on issued advances	120	225	56	64	422	419	873
with a budget	-	3	5	91	29	1	49
including income tax				89			48
Other current receivables	38	66	126	48	23	4	6
Money and its equivalents:				4422	6737	9816	11297
in national currency	396	234	570				
including at the checkout	1						
in foreign currency	1759	1918	2756				
Other current assets	16	176	117	80	202	78	86
All according to section II	5026	6326	7844	9131	11260	12756	16593

Continuation of the table. L5

1	2	3	4	5	6	7	8
Balance	5479	6809	8194	9429	11613	13809	17736
PASSIVE							
I. Equity							
Registered (share) capital	130	130	130	130	130	130	130
Other additional capital	374	374	374	374	374	374	374
Reserve capital	2261	2261	2261	2261	2261	2261	2261
Retained earnings (uncovered loss)	1518	2713	4211	5617	7431	10079	13956
Withdrawn capital	3	8	8	thirteen	thirteen	thirteen	thirteen
That's all according to section I	4280	5470	6968	8369	10183	12831	16708
II. Ensuring the following costs and payments							
Provision of personnel payments	195	321	321				
Other security	45						
All according to section II	240	321	321				
III. Long-term liabilities							
Deferred tax liabilities	16						
Other long-term liabilities	91	68	36				
All according to section III	107	68	36				
And V. _ Current liabilities and provisions							
Current accounts payable for: goods, works, services	530	237	265	394	16	58	38
calculations with the budget	47	199	187	54	57	239	133
including income tax					57	154	
insurance calculations	3					2	3
payroll calculations	116			2		54	212
received advances	33	377	266	104	772	31	70
Current provisions				330	375	343	354
Other current commitments	123	137	151	176	210	251	218
That's all according to section IV	852	950	869	1060	1430	978	1028
Balance	5479	6809	8194	9429	11613	13809	17736

Table L.6

Balance sheet of LLC "NVP "Altosan" for the years 2010-2016

Article, thousand UAH.	Years						
	2010	2011	2012	2013	2014	2015	2016
1	2	3	4	5	6	7	8
ASSETS							
I. Non-current assets							
Fixed assets						884.3	773.2
residual value	333.1	266.4	194	67.2	52.1		
initial value	1205.2	1278.2	792.7	422.9	300.1	1062	1243
wear and tear	872.1	1011.8	598.7	355.7	248	177.7	469.8
Other non-current assets	2.1	1.0	1.5	1		16.7	16.7
All according to section I	335.2	267.4	195.5	68.2	52.1	901	789.9
II. Current assets							
Reserves					1548.9	2860.4	4075.7
Inventories	1057.8	4849.7	2461.6	2093.8			
Final product	231.1	1438.8	964.7	743.8	38.2	567.1	1227.1
Accounts receivable for products, goods, works, services					242.1	479.8	421.4
net realizable value	2306.4	1680.2	166.5	189.8			
initial value	2306.4	1680.2	166.5	189.8			
Accounts receivable according to calculations: on issued advances							
with a budget	2.4	9.2	4.2	192.2	122.6	0.7	0.1
including income tax					86.1		
Other current receivables	94.3	25.3	880.7	3223.9	2251.3	364.7	653.3
Money and its equivalents					2.7	646	79.6
in national currency	72.4	42.2	33.1	37.4			
in foreign currency	179.2	182.8	199				
Other current assets	427.3	1054.2	511.3	698.3	377	596.9	707.8
All according to section II	4370.9	9282.4	5221.1	7179.3	4544.6	4948.5	5937.9
III. Expenses of future periods	4772	3887	2887	2887	2802		
Balance	9478.1	13436.8	8303.6	10134.5	7398.7	5849.5	6727.8
PASSIVE							
I. Equity							
Registered (share) capital	0.4	0.4	0.4	0.4	0.4	1,2	1,2
Additional capital	95.3	95.3	95.3	95.3	95.3		

Continuation of the table. L6

1	2	3	4	5	6	7	8
Reserve capital	39.2	39.2	39.2	39.2	39.2		
Retained earnings (uncovered loss)	6265.9	6436.7	4695.7	4995.6	5060.2	1242	1290
That's all according to section I	6400.8	6571.6	4830.6	5130.5	5195.1	1243.2	1291.2
III. Current liabilities and provisions							
Current accounts payable for: goods, works, services	2913.1	6717	173.6	574.9	21.3	726.4	1122.7
calculations with the budget	80.9	34.2	84.1	179.3	96.7	360.1	53.7
including income tax					54.3	33.6	10.5
insurance calculations	27.4	31.1	51.7	36.1	4.3	8.1	
payroll calculations	38	54	97	61.8	8.2		
Other current commitments	17.9	28.9	3066.6	4151.8	2073.1	3511.7	4260.2
That's all according to section III	3077.3	6865.2	3473	5003.8	2203.6	4606.3	5436.6
Balance	9478.1	13436.8	8303.6	10134.3	7398.7	5849.5	6727.8

Table M.1

Dynamics of indicators of profitability, profitability and specific weight of the elements of assets and liabilities of the balance sheet in their general summary of the LLC NVP "Electroprylad" for 2010-2016.

Evaluation indicators	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*Visualization of dynamics*	*Assessment of dynamics*
Indicators of profitability and profitability									
1. Profitability of assets	4%	15%	21%	20%	10%	15%	37%		positive
2. Operating profitability of sales	2%	6%	8%	9%	5%	6%	14%		positive
3. Profitability of the main activity	16%	22%	22%	24%	25%	17%	32%		positive
4. Return on equity	6%	18%	24%	22%	11%	15%	37%		positive
Indicators of the specific weight of the assets and liabilities of the balance sheet in their total									
Fixed assets	49%	51%	64%	72%	69%	59%	41%		-
Current assets	51%	49%	36%	28%	31%	41%	59%		-
Equity	72%	87%	88%	92%	97%	98%	99%		-
Current liabilities	28%	thirteen%	12%	8%	3%	2%	1%		-

Table M.2

Dynamics of indicators of profitability, profitability and specific weight of the elements of assets and liabilities of the balance sheet in their total summation of TDV "SKB Electronmash" for 2010-2016.

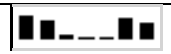
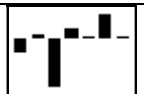
Evaluation indicators	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*Visualization of dynamics*	*Assessment of dynamics*
Indicators of profitability and profitability									
1. Profitability of assets	1%	15%	20%	16%	17%	21%	25%		positive
2. Operating profitability of sales	0%	6%	10%	11%	15%	17%	20%		positive
3. Profitability of the main activity	31%	40%	39%	48%	28%	22%	55%		positive
4. Return on equity	1%	19%	24%	18%	20%	23%	26%		positive
Indicators of the specific weight of the assets and liabilities of the balance sheet in their total									
Fixed assets	8.27%	7.09%	4.27%	3.16%	3.04%	7.63%	6.44%		
Current assets	91.73%	92.91%	95.73%	96.84%	97.36%	92.64%	93.98%		
Equity	78%	80%	85%	89%	88%	93%	94%		
Current liabilities	15%	14%	11%	11%	12%	8%	5%		

Table M.3

The dynamics of indicators of profitability, profitability and the specific weight of the elements of assets and liabilities of the balance sheet in their general summary of "Altosan" LLC for 2010-2016.

Evaluation indicators	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*Visualization of dynamics*	*Assessment of dynamics*
Indicators of profitability and profitability									
1. Profitability of assets	-5%	1%	-16%	3%	1%	8%	1%		negative
2. Operating profitability of sales	-3%	1%	-10%	3%	1%	4%	0%		negative
3. Profitability of the main activity	98%	30%	-3%	14%	58%	30%	31%		positive
4. Return on equity	-7%	3%	-31%	6%	1%	17%	4%		negative
Indicators of the specific weight of the assets and liabilities of the balance sheet in their total									
Fixed assets	4%	2%	2%	1%	1%	15.4%	11.7%		
Current assets	46%	69%	62%	70%	61%	85%	88%		
Expenses of future periods	50%	29%	35%	28%	38%	0%	0%		
Equity	68%	49%	58%	51%	70%	21%	19%		
Current liabilities	32%	51%	42%	49%	31%	79%	81%		

Appendix N

Calculation of the forecast values of the sales volumes of Electroprilad LLC NVP for 2017-2018.

Table H.1

Source data for forecasting sales volumes of Electroprilad LLC

Years	2010	2011	2012	2013	2014	2015	2016
Net income from the sale of products (goods, works, services), thousand hryvnias.	17096	21050	20571	18460	17786	23815	35450
The pace of change	-	1.23	0.98	0.90	0.96	1.34	1.49
Average annual rate of change	1.15						

Table H.2

Smoothing values of sales volumes of Electroprilad LLC NVP according to Holt's model, thousand hryvnias.

alpha		beta			
0.3		0.6			
Year		The actual demand value	Exponentially smoothed series, Ft	Trend value, Tt	Predictive value according to the Holt method, AF - for 1 period
2010		17096	19572,3333	0	
2011	1	21050	18829.43	-445.74	18383.69
2012	2	20571	19495.60	221.41	19717.01
2013	3	18460	19818.22	282.13	20100.36
2014	4	17786	19410.76	-131.63	19279.13
2015	5	23815	18923.33	-345.11	18578.22
2016	6	35450	20390.83	742.46	21133.29

The forecast value for 2017-2018 is determined by the formula:

$$AF_{t+n} = F_{t+1}^{last} + n \cdot T_{t+1}^{last}, \text{ (I.1)}$$

where AF_{t+n} is forecast by the Holt method for n periods;

F_{t+1}^{last} – exponentially smoothed value for the last period;

n – serial number of the period for which the forecast is prepared;

T_{t+1}^{last} – the trend for the last period.

Thus, in 2017, the volume of sales of "Electroprylad" LLC NVP according to Holt's model will be: 20,390.83 + 1x742.46=21,133.29 thousand hryvnias; in 2018: 20390.83 +21x742.46=21875.75 thousand UAH.

The reliability of the obtained results is checked by calculating the error indicators: FE , MAD and control indicator.

Table H.3

Verification of the reliability of the Holt model for calculating the forecast values of the sales volumes of Elektroprilad LLC

FE according to model 1*	**FE by model 2****	**FE module according to model 1**	**FE module according to model 2**	**Increasing FE 2**	**Increasing MAD 2**	**Benchmark**
2220.57	2666.31	2220.5667	2666,3067	2666.31	2666.3	1.00
1075.40	853.99	1075.3967	853.99067	3520,2973	427.0	8.24
-1358.22	-1640.36	1358,2223	1640,3561	1879.9412	546.8	3.44
-1624.76	-1493.13	1624.7556	1493,1291	386.81207	373.3	1.04
4891.67	5236.78	4891.6711	5236.7777	5623,5897	1047.4	5.37
15059.17	14316.71	15059.17	14316.712	19940,301	2386.1	8.36
20263.83	**19940.30**	**26229.78**	**26207.27**			
MFE 1	3377.30	**MAD 1**	4371.63			
MFE 2	3323.38	**MAD 2**	4367.88			

* exponential smoothing model

** Holt model

The performed calculations prove the better reliability of the obtained data in the course of forecasting according to the Holt model in comparison with exponential smoothing, at the same time, the possible error of the results is from 3323.38 to 4367.88 thousand UAH.

Calculation of forecast values of sales volume of SKB Electronmash for 2017-2018.

Table H.4

Source data for forecasting the sales volumes of SKB Electronmash TDV

Years	2010	2011	2012	2013	2014	2015	2016
Net income from the sale of products (goods, works, services), thousand hryvnias.	13566	14354	15212	13135	12026	15833	18942
The pace of change	-	1.06	1.06	0.86	0.92	1.32	1.20

Average annual rate of change	1.07

Table H.5

Smoothing of values of sales volume of SKB Electronmash TDV according to Holt's model, thousand hryvnias.

alpha		beta			
0.3		0.6			
Year		The actual demand value	Exponentially smoothed series, Ft	Trend value, Tt	Predictive value according to the Holt method, AF - for 1 period
2010		13566	14377,3333	0	
2011	1	14354	14133.93	-146.04	13987.89
2012	2	15212	14199.95	-18.80	14181.15
2013	3	13135	14503.57	174.65	14678.21
2014	4	12026	14093.00	-176.48	13916.51
2015	5	15833	13472.90	-442.65	13030.25
2016	6	18942	14180.93	247.76	14428.69

The forecast value for 2017-2018 is determined by formula (I.1).

Thus, in 2017, the volume of sales of TDV "SKB Electronmash" according to Holt's model will be: 14,180.93 + 1x247.76 = 14,428.69 thousand hryvnias; in 2018: 14,180.93+ 2x247.76=14,676.44 thousand hryvnias.

The reliability of the obtained results is checked by calculating the error indicators: FE , MAD and control indicator.

Table H.6

Verification of the reliability of the Holt model for calculating the forecast values of sales volumes of TDV "SKB Electronmash"

FE according to model 1*	**FE by model 2****	**FE module according to model 1**	**FE module according to model 2**	**Increasing FE 2**	**Increasing MAD 2**	**Benchmark**
220.07	366.11	220.06667	366.10667	366.11	366.1	1.00
1012.05	1030.85	1012.0467	1030.8507	1396.9573	515.4	2.71
-1368.57	-1543.21	1368.5673	1543,2141	-146.2568	514.4	-0.28
-2067.00	-1890.51	2066.9971	1890.5137	-2036.7705	472.6	-4.31
2360.10	2802.75	2360,102	2802.7549	765.98432	560.6	1.37
4761.07	4513.31	4761.0714	4513,3142	5279.2985	752.2	7.02
4917.72	**5279.30**	**11788.85**	**12146.75**			

FE according to model 1*	FE by model 2**	FE module according to model 1	FE module according to model 2	Increasing FE 2	Increasing MAD 2	Benchmark
MFE 1	819.62	**MAD 1**	1964,81			
MFE 2	879.88	**MAD 2**	2024.46			

* exponential smoothing model

** Holt model

The performed calculations prove the better reliability of the obtained data during forecasting by the exponential smoothing model in comparison with the Holt model, at the same time, the possible error of the results is very similar and ranges from UAH 879.88 to 1964.81 thousand.

Calculation of forecast values of sales volumes of NVP "Altosan" LLP for 2017-2018

Table H.7

Source data for forecasting sales volumes of NVP Altosan LLC

Years	2010	2011	2012	2013	2014	2015	2016
Net income from the sale of products (goods, works, services), thousand hryvnias.	12694.8	21066.6	17126.5	9330.2	6199.4	15197.4	13046.5
The pace of change	-	1,659	0.813	0.545	0.664	2,451	0.858
Average annual rate of change	0.999						

Table H.8

Smoothing of values of sales volumes of "NVP "Altosan" LLC according to Holt's model, thousand hryvnias.

alpha		beta			
0.3		0.6			
Year		The actual demand value	Exponentially smoothed series, Ft	Trend value, Tt	Predictive value according to the Holt method, AF - for 1 period
2010		12694.8	16962,6333	0	
2011	1	21066.6	15682.28	-768.21	14914.07
2012	2	17126.5	17297.58	661.89	17959.47

2013	3	9330.2	17246.25	233.96	17480.22
2014	4	6199.4	14871.44	-1331.30	13540.13
2015	5	15197.4	12269.83	-2093.49	10176.34
2016	6	13046.5	13148.10	-310.43	12837.67

The forecast value for 2017-2018 is determined by formula (I.1).

Thus, the volume of sales of LLC "NVP "Altosan" according to the Holtau model in 2017 will be: 13,148.10 + 1x(-310.43) = 12,837.67 thousand hryvnias; in 2018: 13148.10 + 2x(-310.43)= 12527.23 thousand hryvnias.

The reliability of the obtained results is checked by calculating the error indicators: FE , MAD and control indicator.

Table H.9

Verification of the reliability of the Holt model for calculating the forecast values of the sales volumes of the LLC "NVP "Altosan"

FE according to model 1*	**FE by model 2****	**FE module according to model 1**	**FE module according to model 2**	**Increasing FE 2**	**Increasing MAD 2**	**Benchmark**
5384.32	6152.53	5384.3167	6152.5267	6152.53	6152.5	1.00
-171.08	-832.97	171.07833	832.97133	5319,5553	416.5	12.77
-7916.05	-8150.02	7916.0548	8150.0179	-2830.4626	2716.7	-1.04
-8672.04	-7340.73	8672.0384	7340,7338	-10171.196	1835.2	-5.54
2927.57	5021.06	2927,5731	5021,0619	-5150.1345	1004.2	-5.13
-101.60	208.83	101.59881	208.83353	-4941.3009	34.8	-141.97
-8548.88	**-4941.30**	**25172.66**	**27706.15**			
MFE 1	-1424.81	**MAD 1**	4195.44			
MFE 2	-823.55	**MAD 2**	4617.69			

* exponential smoothing model

** Holt model

The performed calculations prove the reliability of the obtained data during forecasting by the exponential smoothing model in comparison with the Holt model, at the same time, the possible error of the results is very similar and amounts to -823.55 thousand hryvnias. up to 4,617.69 thousand hryvnias

Appendix P

Calculation of the forecast values of the sales volumes of Electroprilad LLC NVP for 2017-2018.

Table P.1

Source data for forecasting sales volumes of Electroprilad LLC

Years	2010	2011	2012	2013	2014	2015	2016
Net income from the sale of products (goods, works, services), thousand hryvnias.	17096	21050	20571	18460	17786	23815	35450
The pace of change	-	1.23	0.98	0.90	0.96	1.34	1.49
Average annual rate of change	1.15						

Based on the use of the Excel analysis package to construct a regression equation for the purpose of forecasting the sales volume of the Electroprilad LLC NVP, it is possible to operate with the parameters of the trend line construction, which makes it possible to construct 5 types of growth curves with a display of their function and the value of the coefficient of determination.

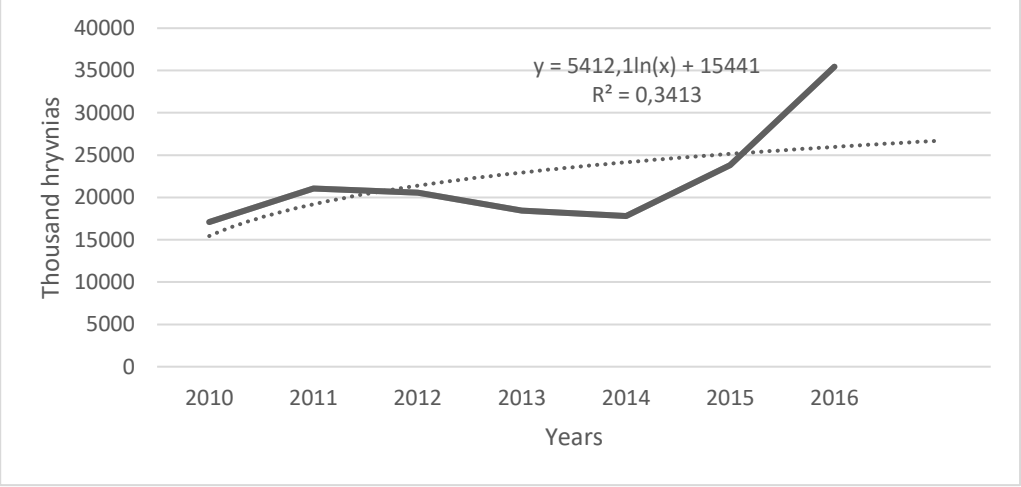


Fig. P.1. Net income trend line of Electroprilad LLC (logarithmic function)

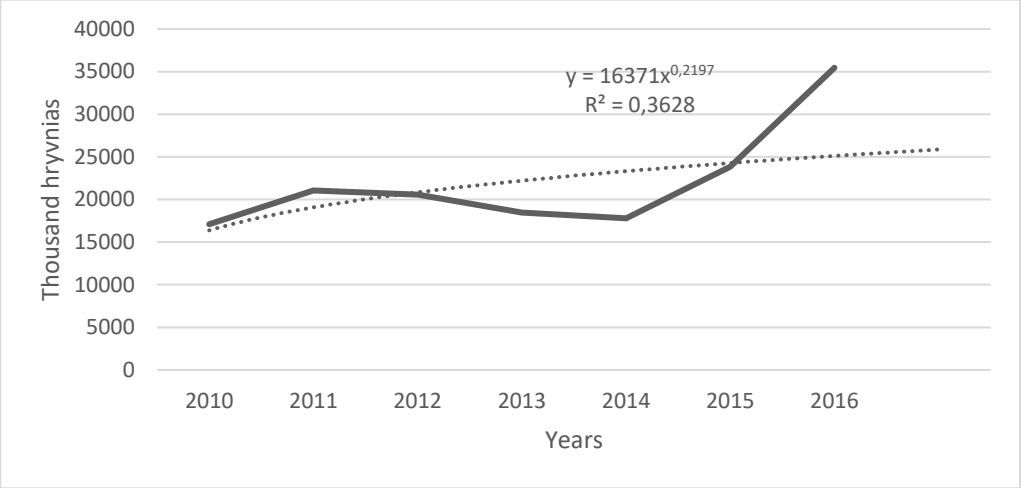


Fig. P.2. Net income trend line of Electroprilad LLC (power function)

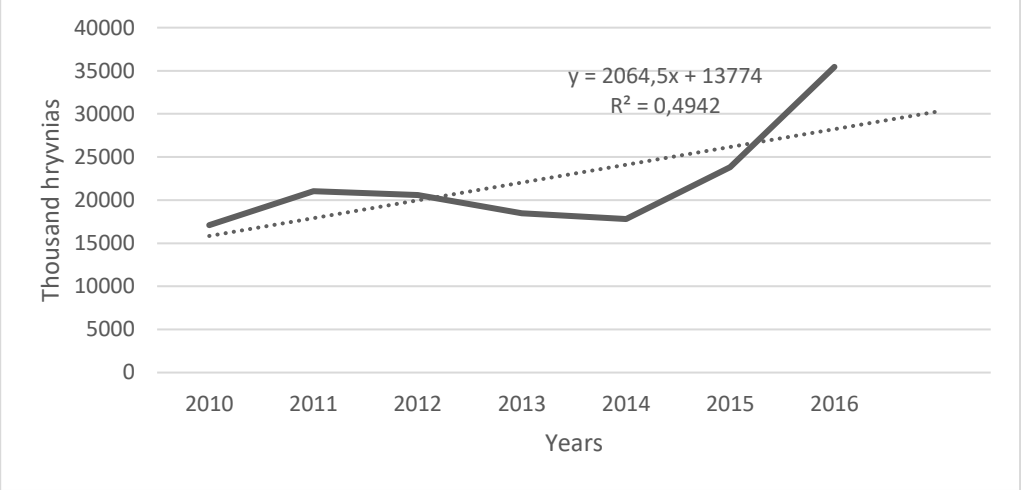


Fig. P.3. Net income trend line of Electroprilad LLC (linear function)

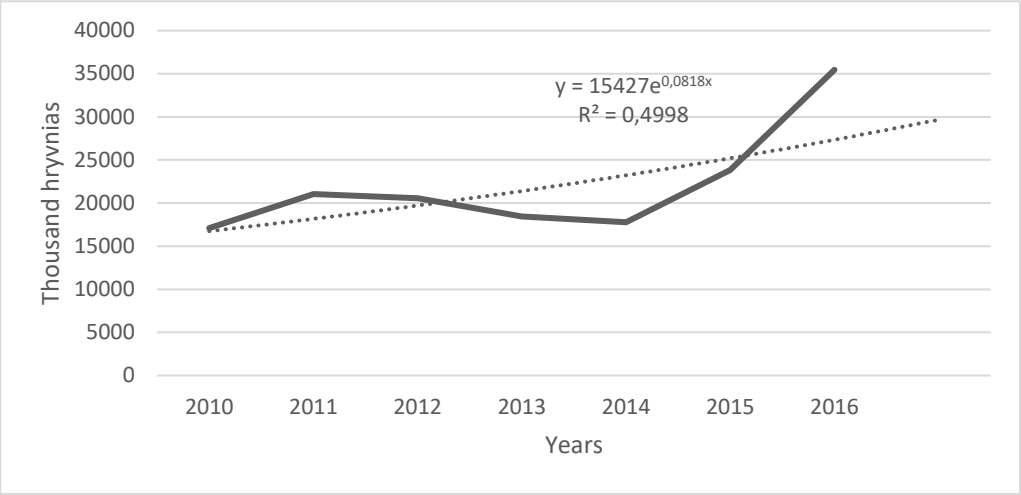


Fig. P.4. Net income trend line of Electroprilad LLC NVP (exponential function)

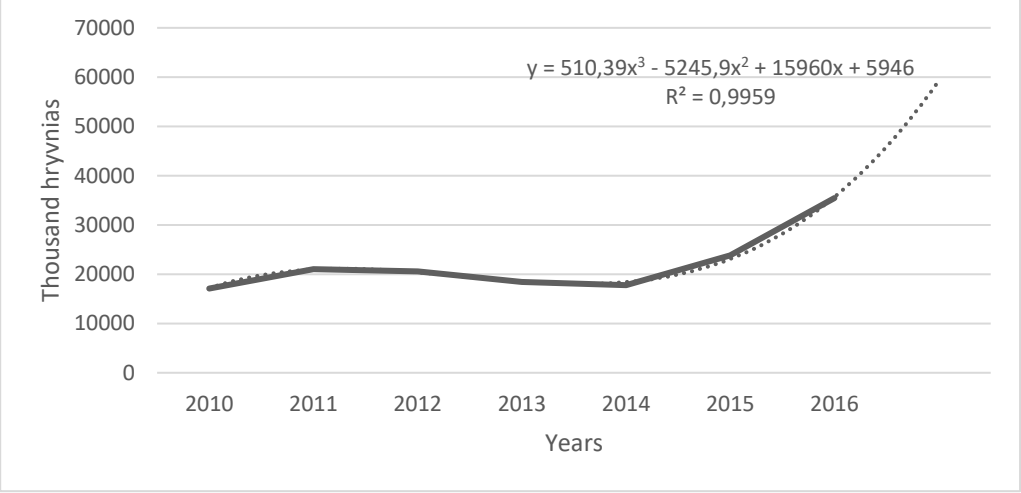


Fig. P.5. Trend line of net income of Electroprilad LLC (polynomial function)

Based on the value of the coefficient of determination, the relationship between the actual and theoretical data of the net income of TzOV NVP "Electroprylad" is best described by a polynomial function, which makes it possible to calculate the forecast value for the next period (2017): 510.39*8 ^{3} -5245.9 *8 ^{2} +15960*8+5946= 59208.08 thousand UAH.

Calculation of forecast values of sales volume of SKB Electronmash for 2017-2018.

Table P.2

Source data for forecasting the sales volumes of SKB Electronmash TDV

Years	2010	2011	2012	2013	2014	2015	2016
Net income from the sale of products	13566	14354	15212	13135	12026	15833	18942

(goods, works, services), thousand hryvnias.							
The pace of change	-	1.06	1.06	0.86	0.92	1.32	1.20
Average annual rate of change	1.07						

Based on the use of the Excel analysis package to build a regression equation for the purpose of forecasting the sales volume of SKB Electromash TDV, it is possible to operate with the parameters of the construction of trend lines, which makes it possible to build 5 types of growth curves with a display of their function and the value of the coefficient of determination.

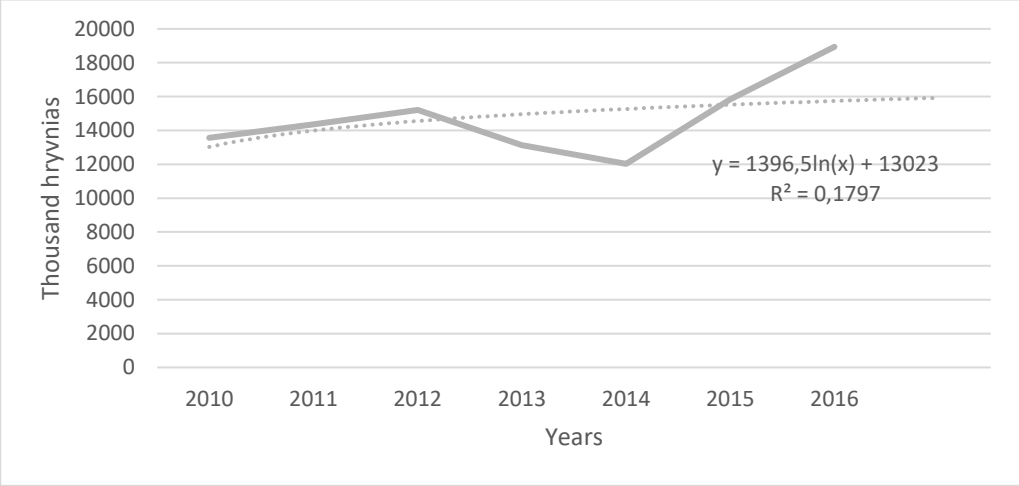


Fig. P.6. The trend line of the net income of SKB Electronmash TDV (logarithmic function)

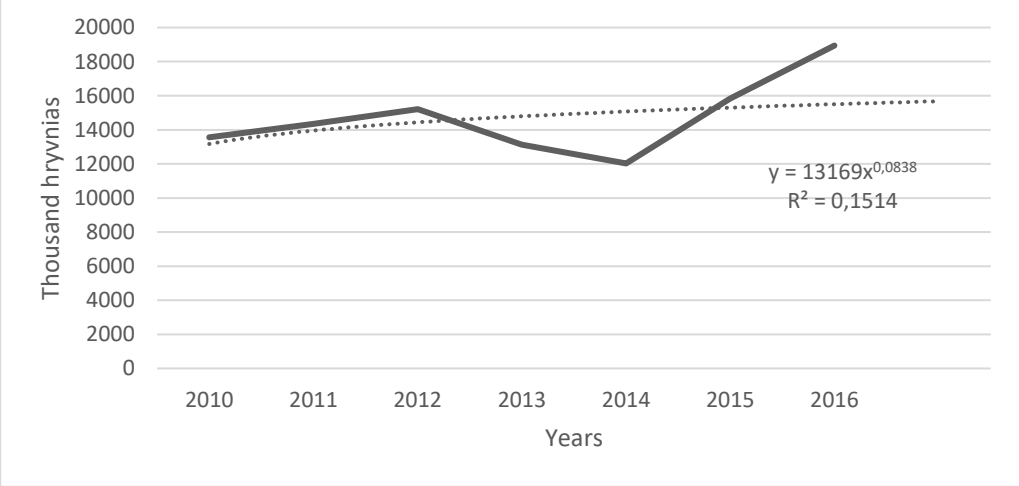


Fig. P.7. The trend line of the net income of SKB Electronmash TDV

(power function)

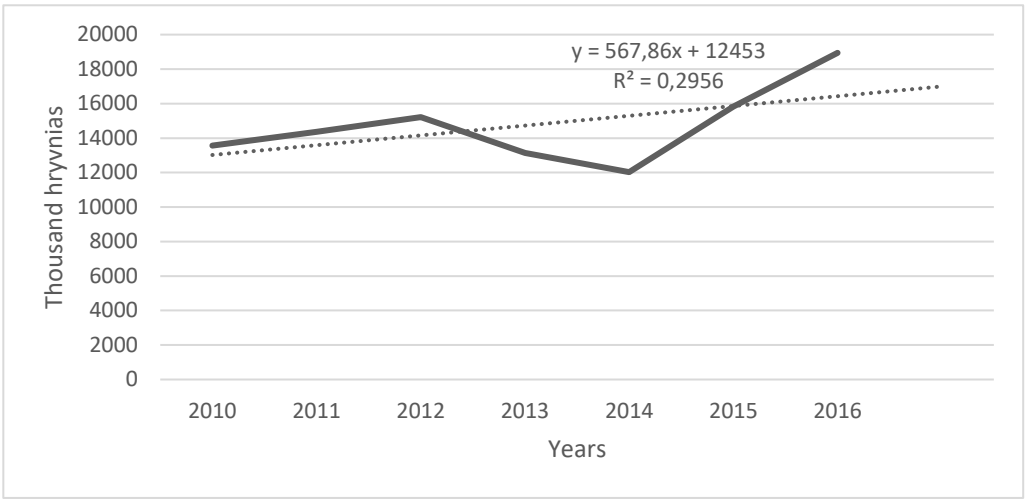


Fig. P.8. The trend line of the net income of SKB Electronmash TDV (linear function)

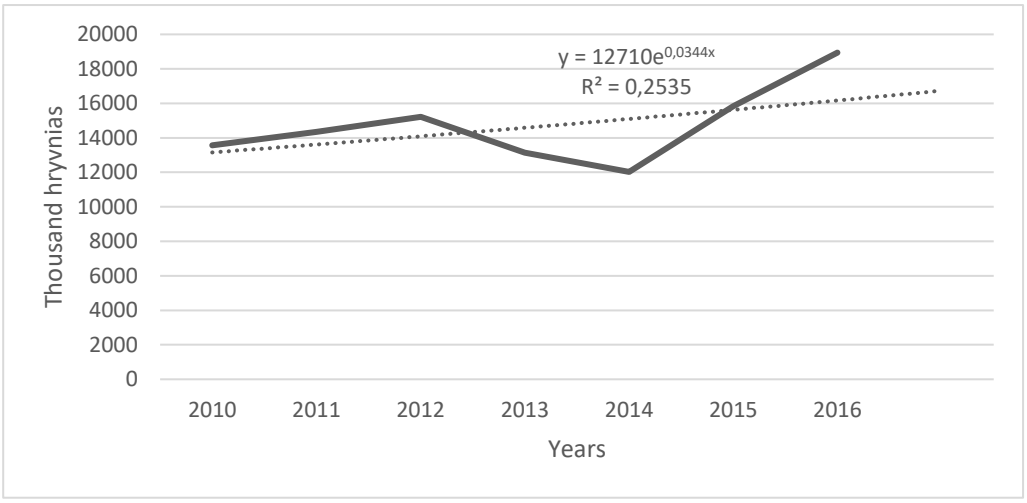


Fig. P.9. The trend line of the net income of SKB Electronmash TDV (exponential function)

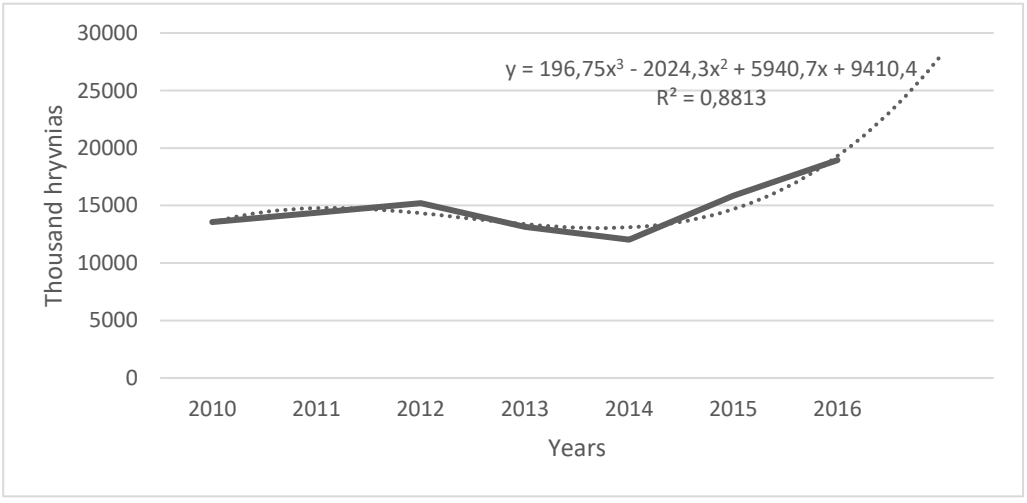


Fig. P.10. The trend line of the net income of SKB Electronmash TDV (polynomial function)

Based on the value of the coefficient of determination, the relationship between the actual and theoretical data of the net income of TDV "SKB Electronmash" is best described by a polynomial function, which makes it possible to calculate the forecast value for the next period (2017): $196.75x8^{3} - 2024.3x8^{2} + 5940.7x8 + 9410.4 = 28116.8$ thousand hryvnias

Calculation of forecast values of sales volumes of NVP "Altosan" LLP for 2017-2018

Table P.3

Source data for forecasting sales volumes of NVP Altosan LLC

Years	2010	2011	2012	2013	2014	2015	2016
Net income from the sale of products (goods, works, services), thousand hryvnias.	12694.8	21066.6	17126.5	9330.2	6199.4	15197.4	13046.5
The pace of change	-	1,659	0.813	0.545	0.664	2,451	0.858
Average annual rate of change	0.999						

Based on the use of the Excel analysis package to construct a regression equation for the purpose of forecasting the sales volume of Altosan LLC, it is possible to operate with the parameters of constructing trend lines, which makes it possible to construct 5 types of growth curves with a display of their function and the value of the coefficient of determination.

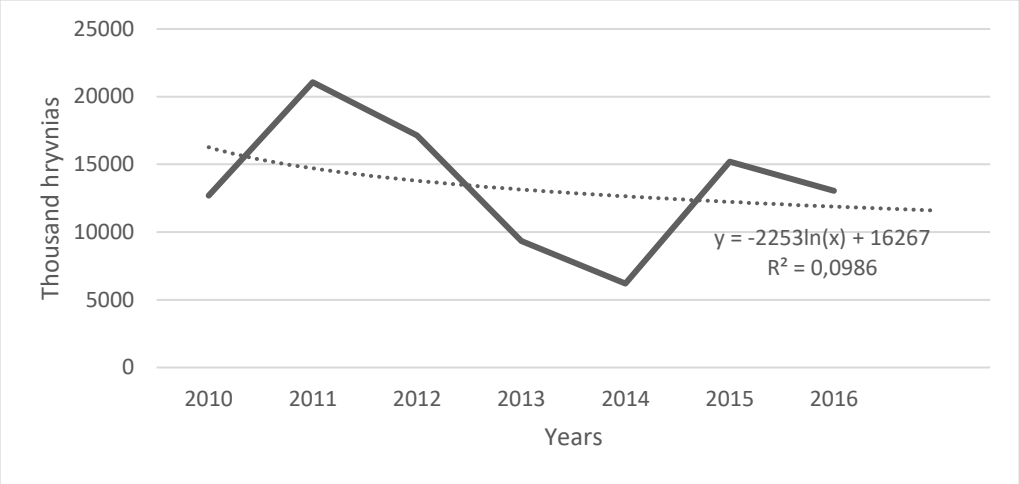


Fig. P.11. Net income trend line of NVP Altosan LLC (logarithmic function)

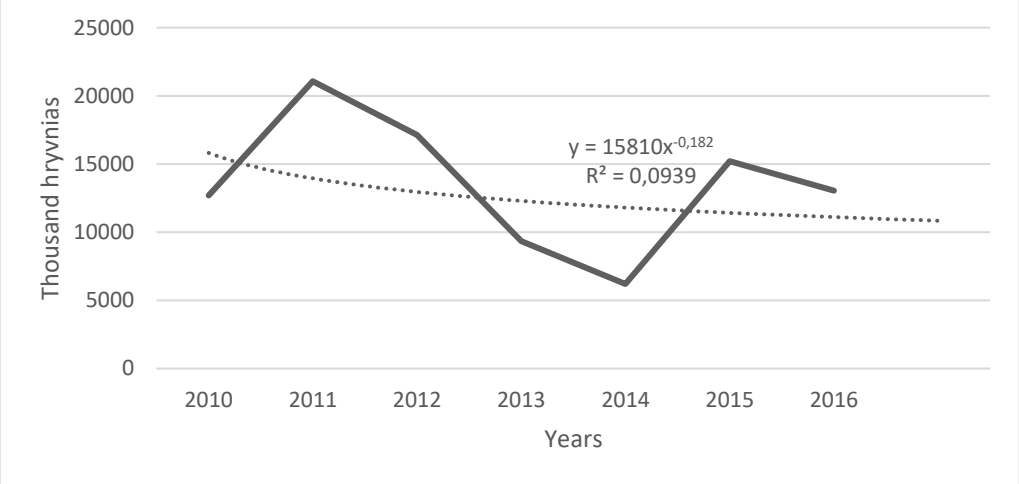


Fig. P.12. Net income trend line of NVP Altosan LLC (power function)

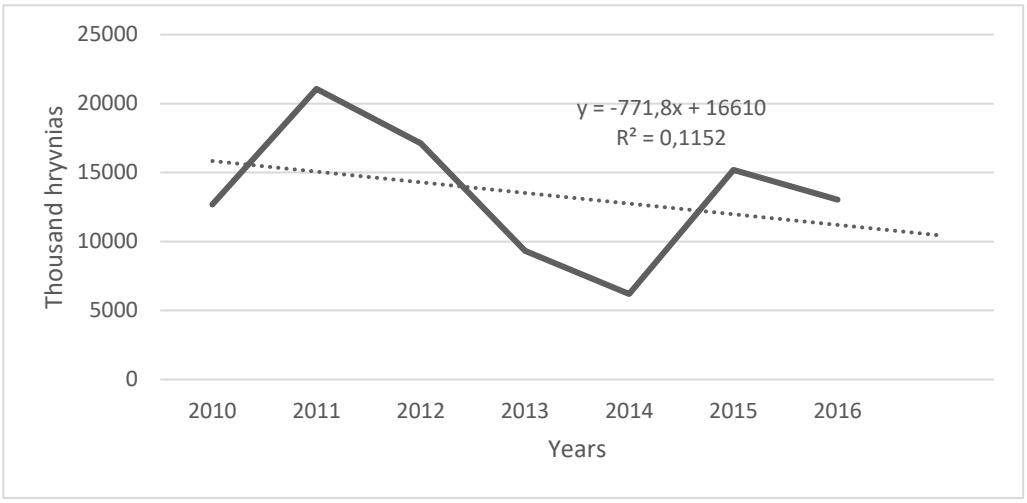


Fig. P.13. Net income trend line of NVP Altosan LLC (linear function)

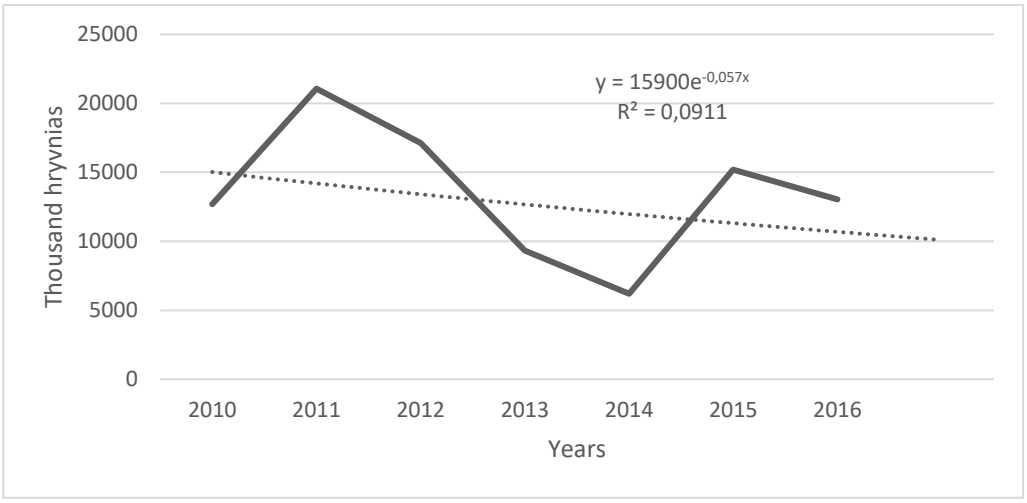


Fig. P.14. Net income trend line of NVP Altosan LLC (exponential function)

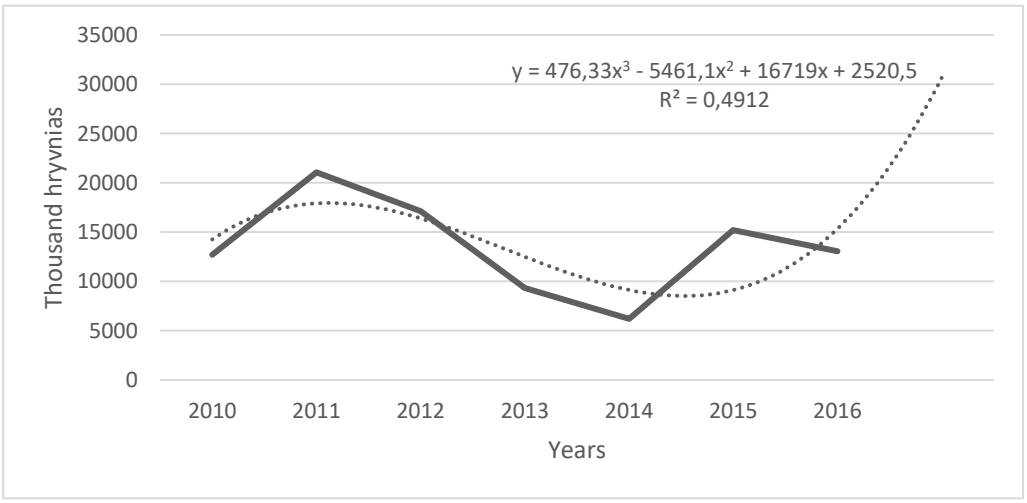


Fig. P.15. Net income trend line of NVP Altosan LLC
(polynomial function)

Based on the value of the coefficient of determination, a polynomial function best describes the relationship between the actual and theoretical data of the net LLC "NVP "Altosan", which makes it possible to calculate the forecast value for the next period (2017):

$476.33x8^{3} - 5461.1x8^{2} + 16719x8 + 2520.5 = 30643.06$ thousand UAH.