

**Concepts, strategies and  
mechanisms of economic  
systems management in the  
context of modern world  
challenges**

**Scientific monograph**

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## INTRODUCTION

Modern global challenges caused by the COVID-19 pandemic force economic entities to develop and implement new strategies for managing economic systems, and states to form new concepts and visions for the further functioning and development of economic entities and mechanisms for overcoming the consequences of socio-economic crises. Improvement of modern strategies and mechanisms of anti-crisis management of economic systems and social processes is impossible without the use of scientific approaches and practical tools for optimizing the resource provision of economic entities, the formation various models of public-private partnership, collaboration of various infrastructure entities and the creation of institutional associations.

To ensure the effective development and implementation of new concepts, strategies and mechanisms for managing economic systems it is necessary to use modern information technologies and innovations, create competitive advantages by enhancing the resource potential of economic entities, and develop promising and export-oriented sectors of the economy.

The *purpose* of writing this scientific monograph is to substantiate the theoretical and methodological foundations, the formation and improvement of new concepts, strategies for the further functioning of economic systems and the develop of organizational-economic mechanisms to overcome the negative consequences caused by the COVID-19 pandemic taking into account the changes and challenges in the modern world. The *object* of the authors' research was the process of forming and improving concepts, strategies and mechanisms for managing economic systems in the context of the COVID-19 pandemic, mitigating negative consequences on the activities of economic entities. The *subject* of the research was socio-economic, organizational and institutional processes of formation and effective implementation of concepts, strategies and mechanisms for managing economic systems; maintaining the stability of the functioning of economic entities; development of digital technologies; implementation of the best practices for managing economic systems using global experience in various sectors of the economy caused by the COVID-19 pandemic.

## Chapter 1

# MODERN GLOBAL CHALLENGES AND THE TRANSFORMATION OF ECONOMIC SYSTEMS MANAGEMENT

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## UKRAINIAN ECONOMY FACING THE CHALLENGES OF DEINDUSTRIALIZATION

Ukraine is perhaps the only country in the world which can not reach the pre-reform level of manufacturing output as a result of market reforms. At the end of 2020, it was only 73.2% of the 1990 level<sup>1</sup>. In addition to the reduction the manufacture suffered from structural primitivization. It caused the decline of labor productivity and the growth of unemployment, as well as all the negative socio-political and demographic processes that became an essential component of the country's life. All the above mentioned factors are the evidence of the domestic economy deindustrialization.

For the first time, the phenomenon of deindustrialization for the world economy has been described by British economist C. Clark. In 1940 he proved that increasing income in the economy leads to advancing of service industries growth to the growth of industrial and agrarian manufacture [2]. It is worth mentioning that the latest deindustrialization articles are presented by D. Rodrik [3], V. Krasilshchikov [4] and M. Zveryakov [5]. They connect the emergence of this phenomenon with technological changes, the globalization of the world economy and the activities of transnational corporations. These corporations are searching the opportunities to

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<sup>1</sup> *By the end of 2019, according to UNCTAD data, the gross value added (GVA) of industry in developing countries has increased 3.5 times since 1990, in developed countries – 1.9 times, in transition economies the figure was only 89.6% of the base year [1].*

reduce production costs and geographical approximation of manufacture to sources of natural mineral resources and moved the latter from developed countries to the underdeveloped countries.

As we consider the causes of deindustrialization in the domestic economy, they are often associated with the so-called "transformation break" – the process of transition from the Soviet administrative-planning to market economy and objectively caused by this transition difficulties. However, in our opinion, these reasons should not be related only to the difficulties of the transition period. For example, China is aimed at creating a market economy, like Ukraine, but the country moved in the direction opposite to us. China transformed from a backward country into an industrial leader of the world for a quarter century<sup>2</sup>. Therefore, in order to overcome deindustrialization, it is important to identify the determinants that have caused it.

UNIDO suggested the approach to identify these determinants [6]. It operates the resources availability in the country – capital, labor, natural and energy resources, labor productivity (technology). It is quite obvious that this resource approach is clearly limited. It is more or less acceptable to explain the growth of manufacturing output. But it is unsatisfactory to explain its degradation, especially in such countries as Ukraine that have an inverse nature of economic transformation. In particular, the presence of higher starting positions for every resource determinant in Ukraine as we can compare with developing countries (for example China) did not allow the country to boost economic growth. The researchers are not paying attention only to the availability of resources, but also the state of the institutional system of the country, its socio-political and economic institutions [7]. Therefore, instead of resource approach it is necessary to apply the institutional and structural approach. It takes into account not only the availability of resources, but the effectiveness of their disposal.

Therefore, we can identify important determinants that on the one

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<sup>2</sup> *China has demonstrated a genuine industrial breakthrough: volumes of manufactured GVA industries have increased for the last 25 years (from 1990 to 2016) by 15 times. It has become the undisputed leader in world industrial production since 2011, pushing the US out of the first place. In 2016 China covered a fifth (21.8%) of the world's GVA industry, while the United States – 16.6%.*

hand – led to the decline of domestic industry and on the other hand – are the basis for its restoration in the future. They are institutional and political, organizational and managerial, foreign economic, structural-production, financial-investment, innovation-technological, social.

*Institutional and political determinants* have become a catalyser for changes in Ukraine. These determinants dealt with the transformations in the system of property relations – the review of formal and informal norms of relations between entities on their claims to limited resources and on the revenues from their use. Officially, the reform of the Institution of Property came to a nominal replacement of the owner from the state to private by accelerating the process of privatization. At the same time, there was no proper explanation of its methods and mechanisms for legal and organizational and managerial support. The existing "failures" of the non-established market were not taken into account. Therefore, Soviet property was privatized for next to nothing by the former party economic elite, criminal authorities, newly-created dealers. As a result, in the early 2000s, a criminal-oligarchic model of the state emerged and strengthened in Ukraine. This small group of people de facto and de jure seized the reins of government (political and economic) and turned into oligarchs. Oligarchic clans were formed, constantly competing among themselves for spheres of influence, state resources and national wealth. This not only aggravated a problem of soft budget constraints, inherited from the Soviet economy, but also gave impetus to the spread of extractive political and economic institutions<sup>3</sup> in the country, aimed at consolidating power and enriching the oligarchy.

Finally, this led to the autonomy and separation of the state from society, complete neglect of the state the interests of the society and the strengthening of not only the representative but "facade" democracy. The phenomenon of the privatized state by oligarchy appeared. It was developed the phenomena of inefficient and illegitimate owner, ambiguous and unprotected property rights with the spread of unjust ("raider") transfer of property, shadow economy and politics, "exhaustion/using up" of property. Particularism

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<sup>3</sup> The term "extractive institutes" was proposed by Acemoglu D., Robinson J. [8].

became the main form of relations between the state and business entities. Consequently, a wide spectrum of unproductive and "non-innovative" sources of rental income of the oligarchy and bureaucracy appeared at a time when the society rejects a state. Similar phenomena have led to deepening income inequality of society, large-scale social disasters, have become a key demotivator for the effective economic activity of the overwhelming majority of constituents.

Accordingly, institutional and political determinants are closely connected with *organizational managerial*. The structure of the executive branch, managerial decisions, as well as the model of the economic policy of the state became directly determined by the demands of the oligarchy and their business groups. Management of the industry has become eclectic, it has no integrity and strategic expression, subordination to the public interest. It is scattered between individual ministries and departments created by industrial or functional principle, closely depending on the specialization of these business groups level<sup>4</sup>.

The oligarchy fully controls the large state-owned companies in the industry. It appoints to a senior role its management through the ministries and forces them to make contracts with their entities that are a priori quasi-paritative – loss-making for enterprises and profitable for the oligarchy<sup>5</sup>. During the last decades, a large number of various state programs and legislative acts on the activities of manufacturing sector were approved peculiarly on demand of oligarchic business groups. These acts provided significant state assistance in the form of tax concessions, customs privileges and credit facilities, subsidies, government financing, writing-off of debts or installments of debts to the state, compensation of debts at the expense of the state to creditors, etc. In fact, domestic privileges, unlike privileges in developed countries, did not pursue the goal of rising the efficiency of production at the expense of higher productivity, but on the contrary allowed the oligarchy to provide high profitability without investing in modernization.

In such circumstances, the formation of an effective, purposeful and functionally organized system of public administration that is

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<sup>4</sup> For more details see [9].

<sup>5</sup> For more details see [10].

oriented to the demands of society is impossible. Accordingly, due to the "merging" of the oligarchic business with the state management apparatus and subordinating the activity of the state management to the interests of the oligarchic business, the system of state administration of the Soviet model was not dismantled, but only modifies from the administrative-planning to the administrative-oligarchic.

The institutional political and organizational managerial determinants on the one hand formed the model of Ukraine's relations with the outside world. At the same time their characteristics considerably formed under the influence of *foreign economic determinants*. The revocation of the state monopoly on export-import activity and the accelerated large-scale liberalization of foreign economic activity with the full opening of the domestic market for foreign goods and services in the early 1990s have become a shock for the Ukrainian economy. This shock led to long-term destructive trends not only in the real sector, but also in the financial and social spheres. Most enterprises in the primary processing industries did not meet foreign competition neither on the domestic market nor foreign markets. On the foreign markets Ukrainian products found their niche mainly in the segment of raw agricultural and industrial low-tech primary processing products.

The terms and depth of foreign economic liberalization have not become attached to the need for early modernization and restructuring of manufacture with the active financial and organizational support of the state at a time when the underdeveloped capital market and financial sector. It was believed that such liberalization would be a powerful incentive for modernization. Obviously, this did not happen, but on the contrary, it is possible to support the conclusions of UNIDO that liberalization proved to be one of the main causes of de-industrialization in some countries such as Ukraine [6]. In the space of a few years the Ukrainian economy has become the most open economy in the world with a share of export and import GDP of about 50% (for the predominance of the import above the export)<sup>6</sup>. Due to its excessive orientation towards

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<sup>6</sup> According to UNCTAD in 2010, domestic exports were 46.5% of GDP, imports – 49.3%, in 2016, respectively, 49.2% and 53.2%. For comparison, in the world economy in 2016, exports amounted to 30.5% of GDP, imports – 29.5%, in

foreign markets, the dynamics of the domestic economy development has been tightly connected with the cycles of the world market for goods that constitute the main items of Ukrainian exports – non-precious metals and products from them, cereal crops [11].

Over the past 15 years, the commodity structure of domestic exports and imports has undergone significant changes, but not for the better. The agrarian and raw material component of export and the industrial high-tech component of import have increased<sup>7</sup>. Offsets in the commodity structure of export and import are the result of both internal institutional-political and structural-production factors, as well as external political-economic and since 2014 military-political factors. Internal institutional-political factors have caused distortion of the investment motivation of business entities, made investment activity unattractive and too risky. This investment activity is unattractive in terms of dilemmas aggravation of choosing the priorities of capital investment and in terms of the significant restriction of the vast majority of entities the access to investment resources and subsequent disposal of received profits. Accordingly, the reproductive processes in manufacture stopped, its technological underdevelopment and deterioration level continued to progress. These factors led to the displacement of domestic producers from the domestic market (primarily non-food) and its further non-competitive orientation to the world commodity markets<sup>8</sup>.

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*developed countries – 28.3% and 28.4%, in developing economies – 33.5% and 31%, respectively 4%. Even in the economies of the United States and China, which are considered to be the most open in the country in the domestic export environment, exports accounted for 13.8 and 23.7% of GDP, while imports were 16.8% and 21%.*

<sup>7</sup> *While in 2001, the share of non-precious metals accounted for 41.3% while agricultural products (sections I-III UCG FEA) 8.4% in 2010 – 33.7% and 14.3%, then in 2016 agrarian production amounted more than one third (35.3%), and the share of precious metals was reduced to 23%. In terms of imports, the share of mineral products has halved, from 42.6% in 2001 to 21.6% in 2016 and by one third the share of machine-building products has increased (sections XVI-XVIII UCGFEA – the Ukrainian classification of goods of foreign economic activity), from 21.5 to 29.1%.*

<sup>8</sup> *In 2016 in the commodity structure of retail trade domestic goods dominated only in the food group with a combined share of 85.2%. The food products accounted for 41.1% of the retail trade turnover, the rest (58.9%) accounted for non-food products, while domestic production in this group amounted only 39.3%.*

Deformations in the system of property rights led to a significant narrowing of business entities planning. In these circumstances investment in production as a form of deferred consumption became inappropriate and entities began to organize their activities following strategy of "fast buck". Due to this precise reason, manufacture has shifted to medium and high-tech industries in developed countries. In the Ukrainian economy *structural production determinants* are characterized by a predominance of raw material production and low technological production of agrarian and industrial activities whereas these activities were only able to provide such "fast buck" against the background of the underdevelopment of advanced refining sectors and the lack of proper motivation for both the entities and the state with regard to their modernization<sup>9</sup>.

As a result of the opening of the domestic market, Ukraine has changed the vectors of its foreign economic and political integration within the framework of regional associations and unions during the last decades. These changes were also facilitated by contradictory trade restrictions and wars during 2010–2013 and earlier by the Russian Federation on certain important positions of domestic exports. The geography of domestic exports and imports and their

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*For most types of non-food high-tech goods, the share of domestic production was scarce. For example, the share of domestically produced cars amounted only 4.3% of their total sales, while the sales volumes of cars occupied the fourth position in the retail market (4.8%). The market of telecommunication equipment, mobile telephones, audio and video equipment, computers and software, was almost completely represented by products of foreign manufacture. The share of foreign products in the clothing and footwear market was over 95%, household electrical goods 90%.*

<sup>9</sup> *While in 1990 the largest share of machine-building was in industrial production (30.5%), the food industry was in the second position (18.6%), followed by ferrous metallurgy (11%) and light industry (10.8%). By 2010 the situation changed dramatically: in the processing industry metallurgical production (being export oriented) occupied the first position (18.8%), the second was the production of food products (18.1%), the third – machine building (9.3 %), while the light industry (textile and apparel production) practically disappeared as an industry with only 0.7%. By 2016 significantly as a result of military operations in the eastern part of the country, the structure of production was again undergoing significant changes: the first position in the processing industry was occupied by the production of food products (21.6%), metallurgical production (17.1%) was shifting to the second place and machine building fell to its minimum for the last 25 years (6.6%).*



commodity structure have changed for the worse<sup>10</sup>. Expansion of trade with the EU and shortening with the CIS countries has led to an increase in the raw material orientation of domestic exports and increased producibility of imports<sup>11</sup> taking into account the fact that CIS countries were the main consumers of domestic middle and high-tech engineering products<sup>12</sup>.

The shifting in the exports structure indicates the transformation of the country from industrial agrarian to agrarian. The shifting in the structure of imports indicates the strengthening of the external technological dependence. These two tendencies in combination lead to deepening the process of deindustrialization and consolidation in the economy of the model so-called "pauperization" or "exhausting" development.

The opening of the domestic market and the rapid achievement of import dominating role on it led to the rapid transfer to the country of standards and practices of consumption from developed countries at a time when their home manufacture inadequacy and inability cannot satisfy their needs which remains to this day. As a whole these factors have determined the formation of financial and investment determinants features of domestic deindustrialization.

The saturation of the domestic commodity market and product

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<sup>10</sup> When in 2000 CIS countries accounted for 30.6% of domestic exports and 57.5% of imports, the EU countries (28) accounted for 31.4% and 29% respectively, while in Asia it was 23.9% and 6% respectively. In 2015 the share of exports to the EU increased to 34.1%, imports – to 40.9%, to Asia – 32.5 and 19.3%, while with the CIS countries the volumes of trade sharply decreased to 20.5 and 27.9%.

<sup>11</sup> In 2016 more than three quarters of export supplies to the EU were agricultural raw materials and low technological industrial products: ferrous metals (20.2%), cereal crops (12.5%), ore materials, slag and ash (7.4%), wood (5.5%), oil-bearing seeds (5.0%), food-industry waste (3.8%), etc. At the same time, imports from the EU in 2015 by two thirds were represented mainly by high-tech products of mechanical engineering and chemistry – mineral fuels (22.2%), nuclear reactors (10.2%), electric machines (7.1%), plastics (7.1%), pharmaceutical products (6.5%), vehicles for land transport (5.4%), etc.

<sup>12</sup> In 2011 in the structure of domestic exports to the Russian Federation, the first ten goods were rail locomotives (16.1%), nuclear reactors (11%), electric machines (5.3%), land transport vehicles (2.5%). In 2015, despite the fact of armed aggression from the Russian Federation, it remained the largest buyer of domestic machine-building products. In particular, the first export position to this country was occupied by nuclear reactors (18.7%), in the first top ten were electric cars (5.3%), rail locomotives (2.3%).

mix width, opening up to the population access to the material goods of modern Western civilization at a time when citizens lack, on the one hand, a balanced and rational culture of consumption, and on the other hand – good performance formed a number of contradictory effects. These effects considerably affected institutional deformations and the formation of social dissatisfaction and social conflicts. The population quickly developed a "thirst" for consumption (materialism), this trend was not confirmed by the same "thirst" for effective work. Wealthy people (representatives of upper echelons of government and business) have turned it into demonstrative, kleptocratic, "elite" consumption. In the middle class people and people on lower incomes this has aggravated the feeling of own poverty, inequality and social dissatisfaction.

Advance formation of overestimated consumer wants and consumer culture against the background of low-productive manufacture has led to considerable problems in the financial sector in general and in particular in investment. The population and the authorities, as noted by V. Heyets, formed a "stereotype of consumption behavior not for resources and self-indulgence" [12]. The myth that the well-being of the developed countries is due to a permanent life in debt is rather widespread. At the state level, these stereotypes were not transformed into the policy of production development, but to the policy of constant borrowing of funds to cover the budget deficit. The formation of budget took place, based not on the actual results of economic activity, not on requests for the modernization of the production basis of the country but from overextended ("overblown") consumption, both in the form of social support of the population and in the form of direct state consumption.

Against the background of a degrading economy, trying to maintain a level of consumption already familiar to it, the Ukrainian state has been caught into a "debt loop". The lion's share of new borrowings is aimed at paying old loan obligations, the rest is aimed at supporting of consumption and social obligations of the state and not at the development of manufacture. While the level of debt servicing at the expense of the budget increases, while the real revenue base of the budget is narrowed due to the constant stagnation of production. At the same time, international donors provide their loans with requirements, the implementation of which by the

Government is often negatively affecting public opinion, as it results in a reduction of social guarantees for the population and poverty [13].

For the population consumption over their own resources and life in debt is particularly manifested in the expansion of consumer lending. Its volumes were comparable with the level of lending to the processing industry. Taking into account that consumer loans were provided for non-food high-tech goods of long-term use, mainly of foreign origin (automobiles, household appliances and electronics, communications tools), it can be said that such loans became for domestic processing industries a significant factor in their oppression. For foreign products loans became a mechanism for accelerated advancement into the domestic market which could affect the strengthening of the raw material bias of domestic industry.

The corporate nonfinancial sector of the economy did not become an exception to its business activities at the expense of debts. Over the last decade, according to V. Zymovets and N. Shelud'ko, this debt has grown rapidly: if in 2005 it almost did not exceed its own capital, by 2016 the relation between the debt and the capital (debt burden) amounted to 4.37 times [14]. The researchers point out that the excessive debt dependence, the insignificant role of banks in financing and capital accumulation together with the expansion of shadow activities and tax-haven money schemes are signs of a deformed "quasi-market" financial model of business dealing in Ukraine. It was formed as a result of the abovementioned deformations of the institutional system and property rights system as its key component. In this context this is manifested, firstly, in the weak protection of the rights of creditors and secondly, in distrust of the banking system<sup>13</sup>.

The adoption in society of the priority of current consumption over deferred consumption against the background of high risks of permanent redistribution and unlawful alienation of property, openness of the domestic market and underdevelopment of manufacture, directly affected the reproduction processes in

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<sup>13</sup> *In particular, according to the World Bank as of June 2017 in Ukraine at the end of bankruptcy proceedings, creditors were reimbursed an average of 7.5% of the funds invested by them, whereas in Norway and Japan – 92%, in the United Kingdom – 88.6%, Germany – 84.4%, the United States – 78.6%, Poland – 60.6%. [15].*

manufacture. The poor level of investor protection has made investment in manufacturing unattractive to business and the level of gross fixed capital accumulation is too low products<sup>14</sup>. The crisis of reproduction has become a feature of permanent and sustainable deepening which is confirmed by the ever-increasing level of depreciation of fixed assets in the economy and manufacture<sup>15</sup> and in the end may turn into a complete economic collapse in the near future.

As a result of destructive transformations in the system of property rights and the prevailing of current consumption over investment in the context of the spread of Western consumer practices and the preservation of a low production culture and quality management of it. The investment "exhaustion" of the economy took place and what is more important the acquisition of it failure to reproduce on an innovative basis. This is a key characteristic of the *innovation-technological determinants* of the country's de-industrialization.

Inherited from the former USSR a high level of population education was unclaimed in the processes of property redistribution and did not become an obstacle to the formation of oligarchic capital. On the other hand it gave impetus to the destruction and degradation of the educational potential of the country because the motivational basis of its formation was substantially undermined by the unjust distribution of property and large stratification of society by the level of wealth. Education and a high level of education ceased to be for an average person the main factor of high wealth, the guarantee of receiving well-paid occupational work, social and moral satisfaction of their lives. Accordingly, the capacity of the economic system to generate and implement innovation significantly weakened.

Another no less important factor of such weakening was the inappropriateness of the system of the national science organization

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<sup>14</sup> During the last fifteen years, the GFCF (gross fixed capital formation) only approached in 2006–2008 the accepted in the world practice minimum norm of 25% of GDP for ensuring the process of expanded reproduction and intensive modernization of manufacture. In different years, it was within the range of 16-19%.

<sup>15</sup> During the last fifteen years the depreciation of fixed assets has almost doubled from 45% in 2001 to 83.5% in 2016 in the economy, and from 52% in 2001 to 77% in 2016 in the manufacture. An even higher level of wear and tear is observed in energy and communal infrastructure sectors, in particular, in the production and distribution of electricity, gas – 82.6%, water supply – 62%.

to the new conditions of management – to the needs of both new owners of enterprises and to market demands for innovative goods and services. Bearing in mind that innovations are considered by the entrepreneur primarily as a source of income, provided that other sources are absent or exhausted. It should be noted that the insecurity and fragility of property rights in Ukraine led to the emergence of a permanent generation phenomenon of income sources not related to the implementation of innovations and with the redistribution of property and national wealth of the country.

In addition, arbitrary manipulation by the authorities of the ordinary citizens' rights led to a discriminatory redistribution of income from the majority of the population in favor of the "oligarchic" and ruling minority. This became another "non-innovative" and almost the Klondike of the oligarchy. Therefore, an innovative determinant of the Ukrainian society development was de facto leveled primarily by an institutional and political determinant and the commercialization of society on an innovative basis, as noted by V. Heyets, did not take place [12]. Instead of such commercialization, the state offered the population ineffective and excessive in comparison with its financial capabilities, a system of social protection to mitigate the negative effects of the property relations transformation and the unfair redistribution of the country wealth. It is the substitution of commercialization of society for its social protection, according to V. Heyets, was the main mistake of reforms with all their negative consequences for the population of countries.

Accordingly, science in Ukraine has ceased to be considered by the state and business as the main condition for the development of the economy and the welfare of society. Applied industry and industrial components of scientific technical activities in the form of industry-specific research institutes and factory research laboratories practically disappeared in Ukraine. In the state perception academic science has become a "keptie"<sup>16</sup> whose expense is considered,

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<sup>16</sup> *That is why the high level of GDP (expenditures on scientific, technical and research-engineering to GDP) in Ukraine is one of the lowest in the world and is constantly decreasing. In 2015 it was 0.62% against 0.99% in 2005, while in the EU28 it was 2.03% (2014) and in some developed countries it was significantly*

according to V. Heyets, as nothing more than a form of "social security" for those who work in it [12].

Evening-out the rights of ordinary citizens by the state and unfair division of property in relation to them with the restriction of opportunities for the self-realization of "innovative" creative abilities of a person and the emergence of an inefficient paternalistic system of its social security, formed in such a destructive phenomenon in the Ukrainian society – a society of total distrust, fear and protest. It can be considered as the main *social determinant* that causes with other determinants the nature of the development of the domestic economy and production. The basic behavior pattern of society members is not a constructive social dialogue and mutually beneficial partnership but it is a "war of all against all". It is conditioned by the distrust of all against all and the fear of all before all.

Summarizing above mentioned facts we note that the change in the economic and social model of the development of the Ukrainian society, the modernization of manufacture in its interests, should start with the correction of deformations in the system of property rights in the areas of guaranteeing the rights of ordinary citizens and business entities, as well as the revision of unfair redistribution results of national wealth of the country. It is necessary to begin with the deoligarchization of the country, the construction of a bilateral parity link between society and the state, the restructuring of the state administration of the country based not on the interests of criminal oligarchic business groups, but on the interests of society and the development of domestic production to meet its social, consumer and investment needs. Great ownership should not be the property of the oligarchy and the entire population of the country because of its "democratization", inherent in the most developed countries of the world, in other words, transfer to the disposal and management of state sovereign funds, shares of equally owned by all citizens of the country.

In addition to this, we should consider a number of other circumstances. First of all, it is about taking into account the trends of scientific and technological development of the world industry in shaping the corresponding policy of production development in Ukraine. The expansion of the Fourth Industrial Revolution at a time

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*higher in particular in South Korea (4.15%), Japan (3.47%), Finland (3.17%), Germany (2.87%), the United States (2.81%) [16].*

when policies overcome deindustrialization and employment growth in developed countries will be accompanied by maximum localization of production, the closure of technological cycles and value added chains within their national jurisdictions or economic and political alliances, in particular the EU. Therefore, in prospect Ukraine should expect from the developed countries to strengthen protectionism and barriers to entry into their markets of Ukrainian goods, primarily medium and high-tech while simultaneously imposing agrarian, resource-raw materials and low-tech specialization in Ukraine.

It should be remembered that the external economic determinant in the form of excessive orientation of manufacture on external, mainly raw materials markets and dominant presence in the domestic market of foreign products, to a large extent, is involved in the degradation of the manufacture structure and the unfavorable integration of Ukraine's economy into the world one. Therefore, modernization should be accompanied by measures on significant diversification of domestic production, its withdrawal from raw materials and low technological monospecialization, the refusal of excessive export orientation, reorientation with moderate protectionism to the needs of the domestic market and the reduction of import dependence on domestic consumer and investment commodity markets. This step will bring closer opportunities for domestic production, both in terms of output and in terms of income growth, to external standards of consumption and consumer behavior, abandoning the practice of living in debt, both the state and the subjects of production and ordinary citizens. At the same time, the reorientation of production to the domestic market will reduce the dependence of the Ukrainian economy on fluctuations in world market conditions.

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**DEVELOPMENT OF  
COMPLEX PROJECTS OF  
BASED ON OPTIMIZATION  
MODELS WITH USING OF  
DATA MINING**

## **1. Introduction**

The modern stage of development of technologies for managing complex high-tech projects is characterized by the use of not only cloud technologies. But also it means of intellectual support for project management in the creation of distributed information systems (DIS) [1].

Analysis of the main trends in the development of such technologies defines them as an effective tool for solving modern business problems. At the same time, the implementation of such projects should be considered taking into account the influence of the external environment of such projects, which is of a dynamic turbulent nature [2].

It should be noted that the using of these technologies inevitably gives rise to the complexity of projects, which in turn leads to an excessive increase in the timing of such projects. There is a later receipt of the product and, as a consequence, the loss of efficiency of such processes. The solution of these problems can be facilitated by the application of methods and technologies of project management [3, 4], which has also received significant development over the past 20 years [5].

Considering the use of project management in the creation of modern DIS, it is possible to consider the tasks of optimizing the costs and timing of such projects [6], but they are multivariate and are poorly formalized.

For telecommunication projects, it is important to have optimal or at least rational options for the distribution of project resources, their balanced workload. This can significantly reduce costs and improve the efficiency of such projects.

The solution of such problems can be helped by the use of intelligent data processing technologies [7]. Through the use of data analytics, it is hoped that it will be possible to significantly reduce the number of key project parameters involved in the calculations, which will allow making more adequate decisions on the management of such projects.

Thus, the combination of approaches to project management and the experimental application of intelligent data processing technologies and the study of their interaction in the analysis of dynamic changes in the influence of the external environment on the parameters of the project when creating high-tech products is an actual task.

## **2. Analysis of recent research and publications**

Consideration of the application of modern methods and technical possibilities for the implementation of infocommunication projects was investigated in the works of the following Ukrainian scientists, such as M. Klimash [8], O. Lemeshko [9] and a number of others. In these works and their followers, the issues of building the configuration of complex infocommunication products for use in various applied aspects were deeply studied. However, no attention was paid to the application of project management methods and increasing the efficiency of such projects.

Modern research in the field of project management of complex projects using the value approach was carried out by such scientists as Winter M. [10], Karsten V. [11], Highsmith Jim [12] and others.

In turn, the study of important problems of using the apparatus of Markov chains, the impact of changes on the progress of projects and increasing their efficiency publications of a number of domestic and foreign scientists, such as K. Kolesnikova [13], V. Morozov [14, 15] and others.

The analysis of information sources shows that the problem of applying project management to the peculiarities of the implementation of high-tech projects is not sufficiently studied. In addition, there is little or no discussion of methods for intelligent processing of large amounts of data when managing such projects. All this can lead to the loss of efficiency of such projects and even to their closure.

The authors consider the considered range of issues to be relevant and they constitute the essence of this work.

The purpose of the article is to build models of effective project management for the creation of infocommunication products using intelligent data processing methods.

### **3. Research and development of a conceptual framework**

To describe the model of complex infocommunication projects for the development and implementation of DIS, it is necessary to understand what elements they consist of, what determines the configuration of the IT product as a result of project execution, how the elements interact and how changes in the project parameters as a result of the turbulent influence of the external environment are taken into account. This will determine the architecture of the information system, which will control the execution of such projects.

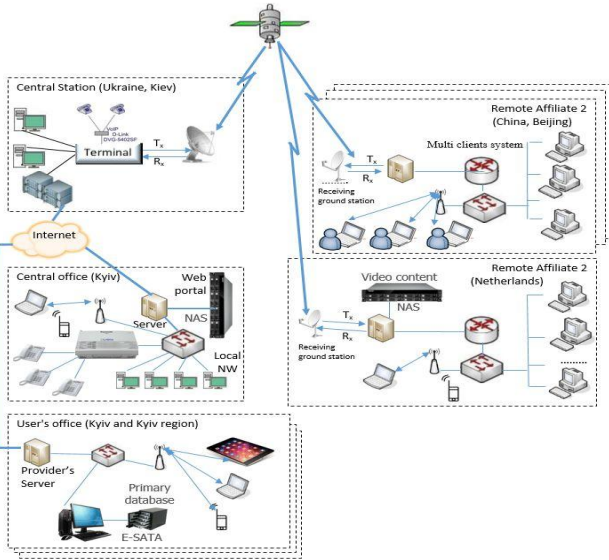
Figure 1.1 shows one of the examples of distributed information systems, in which the authors were directly involved. Such projects are usually interstate in nature, are remote control using virtual data and processes. This circumstance is especially relevant in the context of restrictions and lockdowns in connection with the Covid-19 pandemic.

The considered figure contains the parameters and components of a real project, which was implemented by the authors in Kiev in a distance learning system for project management with universities in China, for example, in Beijing and projects in Zhejiang province.

The considered figure contains the parameters and components of a real project, which was implemented by the authors in Kiev in a distance learning system for project management with universities in China, for example, in Beijing and projects in Zhejiang province.

Next, let's move on to building models and methods of intelligent data processing used in managing such projects.

Three algorithms are presented in [13]: RNet, KTail, and Markov. The Markov algorithm was fully developed by the first researcher Cook, the rest are adaptations of known technologies to the analysis of working protocols. The RNet algorithm is showing the worst results. The Markov algorithm itself is based on the theory of discrete random Markov processes to find the most likely sequences of events.



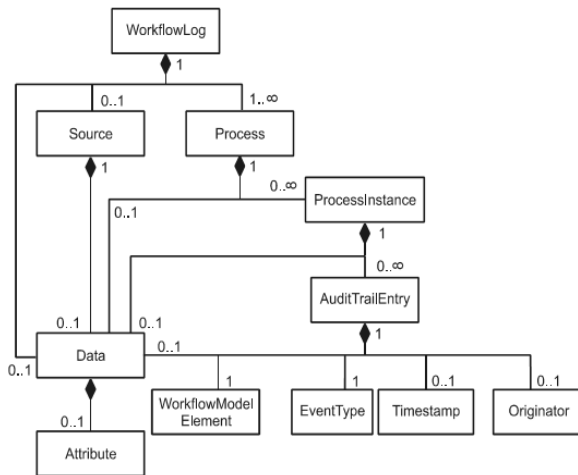
**Figure 1.1 An example of the structure of elements and the interaction of configuration components of an infocommunication project**

The Rnet algorithm uses artificial neural networks. KTail implements an algorithmic approach. Markov is based on static and algorithmic approaches. The Markov algorithm is superior to both algorithms. After that, it converts probabilities into states and transitions between states in the course of the algorithm. This is the best answer to our task. This processed Process Mining algorithm is needed to consolidate requirements and unify protocols. The protocol recording standard used for research is MXML (Mining XML).

This format is extensible and is based on the XML extensible markup language. It is convenient for presenting and storing information in the form of event beams. The format focuses on the key information needed to apply process mining techniques - the main focus of such a presentation. Additionally, it is possible to expand the format for recording auxiliary information. The components of the MXML format are shown in Figure 1.2 as a class diagram.

Below is a UML diagram of the relationship between different

types of data used in the analysis of technical log files for process analysis.



**Figure 1.2 UML-diagram of MXML-format**

The log file that will be used for the system is called WorkflowLog and is the root element of MXML. Any work log can contain any number of process nodes. A process type element is a group of events that occurred during the execution of that process. Elements of the ProcessInstance type indicate a single execution of the process.

So the ProcessInstance type is a one-time process. And AuditTrailEntry (control records) corresponds to a unique event in the beam. ProcessInstance contains a group of any number of AuditTrailEntry elements. The control record of the event log must contain at least two elements: the name of the completed task - WorkflowModelElement and the type of event describing the stage of the task-EventType. The timestamp contains the exact date and time of the event. The role of the initiator tag is to identify the resource, i.e. the person or information system that initiated the event. A data field can contain any number of properties that look like a pair of <name-value>strings.

The choice of process mining as the main tool of our research is due to the fact that it is an automated determination of the prospects

of business processes. And it is also able to present this in the form of human-readable models. At the same time, it makes it easier to solve the tasks of the automation of business processes itself:

- building a process model based on the existing bundle of events that trigger the information system;
- checking whether a real copy of the underlying process matches;
- automatic system recovery after a crash;
- improvement and expansion of processes.

In the process of preparing and building a business process model, the automation of processes is formalized. First of all, you should describe the business processes. For this purpose, a separate specialist is allocated when designing and creating document management systems. This is a fairly complex and initial task. The success of the implementation of the system largely depends on the quality, first of all, of its solution. This requires the ability and skill to formalize and understand the process. Similar automation processes cover different types of activities, and often several people are experts in them. Building a workflow model is a complex and irrelevant task. Because the description of a model usually describes "as should be", not "as is". When checking an existing model, you need to compare it with the event log and identify the differences.

The Markov algorithm uses the probabilities of a sequence of events as the main indicator. During the execution of this algorithm, tables are created for sequences of events. Tables are filled with the number of occurrences of the same sequences in the overall event stream.

In [14], the authors extended Markov's algorithm to extract parallel elements of processes. It was proposed to identify the elements of separation and connection of flows. To do this, check the frequency table for the immediate predecessor and the next analyzed event.

The process flow control graph  $P$  is a set:

$$CF(P) = \langle S, E, a_0, F \rangle, \quad (1.1)$$

where:  $S$  – limited set of tasks,

$E \subseteq (S - F) \times (S - \{a_0\})$  – the relationship of order among the

tasks  $a_0 \in A$  – initial task,  
 $F \subseteq A$  – set of final tasks.

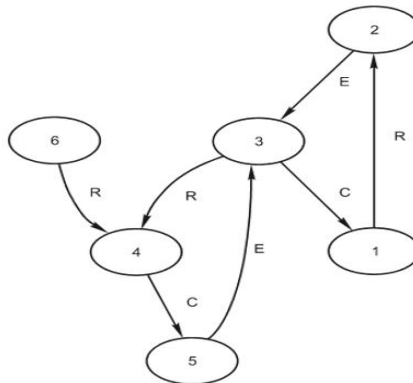
#### 4. Mathematical model development

Any related subgraph  $I = \langle S_I, E_I \rangle$  = flow control graph, such that  $a_0 \in S_I$  and  $S_I \in F \neq \emptyset$  corresponds to one of the possible instances process P. Since some instances of a process can be built up an unlimited number of times, restrictions are modeled on possible instances of the process. Thus, it is necessary to describe the process taking into account local or global constraints. For example, a task should (should not) directly (indirectly) follow a set of other tasks. In our case, local constraints are defined using three functions:

$$S \rightarrow: N: \text{OUT}_{\min} \text{ and } \text{OUT}_{\max},$$

each compares the node to a natural number, as follows.

As a result of the implementation of these four steps, we obtain the establishment of a direct successor and predecessor for each type of event (Figure 1.3).



**Figure 1.3 Finite deterministic automaton obtained by Markov algorithm**

The path of the process between the main nodes (web pages) was obtained during the mathematical analysis and recovery of the business process from the file logs.

Let the input degree of the vertex be:

$$\text{InDegree}(a) = |\{(b, a) | (b, a) \in E\}| \quad (1.2)$$

and the initial degree of the vertex

$$\text{OutDegree}(a) = |\{(a, b) | (a, b) \in E\}|, \quad (1.3)$$

then:

$$\forall a \in S - \{a_0\}, 0 < \text{IN}(a) \leq \text{InDegree}(a), \quad (1.4)$$

$$\forall a \in S - F, 0 < \text{OUT}_{\min}(a) \leq \text{OUT}_{\max}(a) \leq \text{InDegree}(a), \quad (1.5)$$

$$\text{IN}(a_0) = i \quad \forall a \in F, \text{OUT}_{\min}(a) = \text{OUT}_{\max}(a) = 0 \quad (1.6)$$

The semantics of the constraints are as follows: the execution of task  $a$  can begin no earlier than at least  $\text{IN}(a)$  previous tasks in log files have been completed.

If  $\text{IN}(a) = \text{InDegree}(a)$ , AND -connection it can be performed only after all its predecessors have been performed.

If  $\text{IN}(a) = 1$ , an OR - connection, as it can be executed as soon as any of its previous tasks completes its execution.

Immediately after the completion of task  $a$  must activate a subset of the output arcs, the power (cardinality) of which is within  $\text{OUT}_{\min}(a)$  and  $\text{OUT}_{\max}(a)$ .

If  $\text{OUT}_{\max}(a) = \text{OutDegree}(a)$ , then  $a$  is a complete branching, and if moreover  $\text{OUT}_{\min}(a) = \text{OUT}_{\max}(a)$ , then  $a$  is a branch (AND - division), as all subsequent tasks are activating. Finally, if  $\text{OUT}_{\max}(a) = 1$ , then  $a$  is the exclusion branch (XOR -separation), as it activates only one of the output arcs.

Finally, a set of  $\sigma$  -local constraints, denoted as  $C_{L\sigma}$ , can be obtained using the process of flow control:

$$\text{OUT}_{\min}(a) = |\text{succ}(a)| - \max_{s \subseteq \text{succ}(a), \{a\} \rightarrow_{\sigma} s} |s|, \quad (1.7)$$



$$\begin{aligned} \text{OUT}_{\max}(\mathbf{a}) &= |\text{succ}(\mathbf{a})| - \min_{s \subseteq_{\text{succ}(\mathbf{a}), \{\mathbf{a}\} \rightarrow_{\sigma} S}} |S|, \\ \text{IN}(\mathbf{a}) &= \min_{s \subseteq_{\text{prec}(\mathbf{a}), \{\mathbf{a}\} S \rightarrow_{\sigma} \{\mathbf{a}\}}} |S| \end{aligned} \quad (1.8)$$

where:  $\{\mathbf{a}\} \rightarrow_{\sigma} S$  means that  $S \rightarrow \sigma B$  not executed.

## 6. Conclusion

In this article, the authors propose a model for managing complex projects based on creation of infocommunication products using intelligent data processing methods. This makes it possible to solve the problem of accounting for complex mutual influences of parameters both within such projects and the effects of the external environment.

The work presented data sets that were formed in the process of research. Each of these datasets included about 125 indicators relative to the project budget, an average of 142 parameters relative to the actual data on interaction with the user system, about 153 parameters in terms of estimated financial indicators, about 232 positions in the SaaS budget, etc.

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**SCIENTIFIC APPROACH  
TRANSFORMATION FOR  
LIQUIDITY AND  
SOLVENCY ASSESSMENT**

The elimination of bankrupt business structures from the market is a prerequisite for effective functioning of the market mechanism. However, the prevention of bankruptcy and security of long-term prosperity of these structures is a much more complicated and important task.

The mechanism formation and the bankruptcy procedures application to many companies involve an objective assessment of their financial state and are a priority of companies themselves as well as of their counterparties, investors, creditors and government agencies. The most important characteristics of financial insolvency assessing of any economic entity are the ratios of solvency and liquidity.

Unfortunately, there is no unambiguity in understanding the essence and, consequently, the assessment system for categories such as "venture liquidity" and "venture solvency" in the existing domestic economic theory and practice.

First and foremost, it should be noted that the concepts of liquidity and solvency are closely interrelated but not identical. It is necessary to mention that the concept for "liquidity" is referred to both the specific types of assets and to all of them as a whole ("balance sheet liquidity", "investment liquidity") and a company as a subject of financial relations.

“Liquidity of an asset is meant as its ability to be transformed into money, and a degree of liquidity is determined by the length of a time period during which this transformation can be carried out. The shorter the period the higher is the liquidity of this type of assets” [1]. The meaning of the category of liquidity of assets is determined by the existence of an asset that has a special property – the absolute

liquidity, i.e. the absolute exchange capacity. Such assets are funds.

Liquidity can be characterized on both sides. First, it is the inverse of time it takes to sell an asset quickly at a certain price. Secondly, it is an amount of money that can be obtained for it. Of course, they are interconnected as it takes more time to get a higher price for a product (asset) and in order to speed the implementation process up it is necessary to reduce the price [2].

As for the concepts of "balance sheet liquidity" and "venture liquidity" we must admit that many authors do not see much difference in them. In general, the balance sheet liquidity is characterized by the actual asset status and its ratio to the current liabilities. It is defined by some authors as a degree of coverage of company's liabilities by its assets so the term of conversion into money corresponds to a maturity date [3-5].

Doctor of Economics V. Kovalev, a specialist in financial management, emphasizes that the main indication of the company's liquidity is a formal excess of current assets (in value) over short-term liabilities. "Speaking of the venture liquidity we mean the availability of working capital in an amount theoretically sufficient to repay short-term liabilities even if the maturity date of the contract is expired. As you can see the main difference in determining the balance sheet liquidity and the venture liquidity in this case is to take into account the time factor. If in determining the balance sheet liquidity the ratio of different types of liabilities in terms of their maturity date and a need to be repaid with the relevant groups of assets in terms of their transformation into the most liquid form (cash) are emphasized then in determining the venture liquidity all current assets and current liabilities are considered in general. However we believe that the company's ability to meet current financial liabilities is determined not only by the quantitative balance of assets and liabilities but also by their time balance.

The qualitative difference between the concepts of "asset liquidity" and "venture liquidity" is that the latter characteristic feature synthesizes not only the asset properties but also in terms of attracted for their formation financial resources while the asset liquidity is determined regardless of the balance sheet liability [6].

On the one hand, the venture liquidity depends on the specified demand for payments, on the other, on the ability to pay. There is a

point of view that could be found in some domestic publications that the company is called liquid when it is able to meet its obligations for creditors, budget, insurance companies, landlords, employees, suppliers, etc., besides these obligations should be committed on time. If the ability to pay at this time is greater than the payment obligation then such a venture is considered to be as liquid [7].

However, these regulations, in our opinion, do not maintain the differences between the concepts for "balance sheet liquidity" and "venture liquidity". Today there is adopted in the Western countries the practice of a broad interpretation for liquidity which reflects not only the current situation but also liquidity disclosure that may arise in the future in connection with future payments and decisions. According to this interpretation an venture is called liquid (planned) if its payment obligations at each point of the planning period meet the deadlines set in the contract [8,9].

In this regard let's consider how the essence of the venture liquidity concept is interpreted in the classic textbook "Economics Of A Venture" edited by FK Bea, E. Dichtl, M. Schweitzer. According to the authors: "Based on the concept of solvency, it becomes clear that liquidity (illiquidity) depends on the evidence of a claim for a company, on the one hand, and the availability of resources for payment, on the other. The liquidity property can be assessed by the ratio of payment resources for existing requirements "[10]. In this case, payment resources mean the ability of a venture to provide means for payment (e.g. funds). "If the payment resources of a venture are greater than payment obligations at any given time, the venture is considered to be liquid" [ibid].

Further on, the authors of the textbook emphasize that this definition, although, typical does not take into account the following important points: first, the aspect of venture liquidity development in future; secondly, funds are not the only liquidity medium. The venture payment resources can be any goods suitable for exchange. In this case, the venture liquidity can be assessed not only by the total value of a certain range of assets but (what is more importantly) as its cumulative value in the form of a property complex. It is further specified that if the balance sheet liquidity is provided by means of repayment from internal sources then the venture liquidity is provided by its ability to attract borrowed funds from abroad.

Thus, the main features of the balance sheet liquidity are: a) the presence of current liabilities; b) the availability of means of payment in various forms; c) the determination of their conformity at any given time. And the venture liquidity is not only determined by its balance sheet liquidity but also by its business image in the world and by its investment appeal.

In this regard we adhere to the following definitions of the balance sheet liquidity and the venture liquidity. The balance sheet liquidity is the ability of a business entity to turn assets into cash and repay its payment obligations at any time, or rather it is a degree of a discharge of the venture liabilities by its assets which period of conversion into cash is relevant to the repayment period. The venture liquidity is its ability to be responsible for a range of assets either individually or in complex with its payment obligations at any time during the current and planning periods in accordance with a treaty concluded wherein it can be provided by both an increase in assets and an increase in liabilities.

This definition of the venture liquidity makes it possible to distinguish it from the concept of the venture solvency.

According to M.N. Kreinina: "Solvency means that a company has a financial capacity to regularly and timely repay its debts. Such opportunities are determined in the end by the availability of venture funds"[11].

Unfortunately, in some publications the concepts of venture liquidity and venture solvency are not differentiated [4; 6] and if they are distinguished then their definition implies a similar meaning which in our opinion narrows and distorts the possibilities of their evaluation and hence reduces the ability to make timely decisions to overcome the venture insolvency.

The classics of analytical science A.D. Sheremet and R.S. Saifulin distinguish the current and long-term liquidity understanding current liquidity as a ratio of the most liquid assets (funds and short-term investments) and assets (receivables) that are quickly implemented by short-term liabilities. The comparison of slow-moving assets with the long-term and the medium-term liabilities reflects in their opinion the promising liquidity. In this case the current liquidity is associated by them with the solvency for a near future and the prospective liquidity is a forecast of solvency [12].

We agree with the opinion of a majority of authors [1; 3] that despite having the affinity of these concepts there are certain differences between them. The concept of the venture liquidity is more capacious than the concept of the venture solvency. "Solvency means that the company has funds and their equivalents are sufficient to settle accounts payable which requires an immediate repayment. Thus, the main features of solvency are: a) the availability of sufficient funds on the checking account; b) no overdue of accounts payable" [1].

The venture liquidity largely determines its solvency provided that the current assets include highly liquid elements. At the same time a company having a high level of inventories that do not meet the market requirements and receivables of insolvent customers may be characterized by high liquidity ratios but be virtually insolvent. Similarly, the availability of funds in a company sufficient to make current payments today does not guarantee its solvency in the long run i.e. its liquidity.

The authors such as A.A. Mazaraki, L.A. Ligonenko [13; 14] interpret the notion of venture solvency somewhat more broad. Solvency is determined by a consistency of income and venture expenses which in their turn provide (or do not provide) opportunities for permanent or periodic financing of activities and implementation of commitments undertaken.

The characteristic features of solvency are the availability of sufficient funds to meet their obligations and finance their current activities. That is a company is solvent not only when it has the ability to meet its external obligations but also when it has the ability to finance its current activities. In our opinion rectification on current activities financing is inadvisable due to the fact that current commitment meeting is nothing more than the financial security of the current activities.

M.N. Kreinin notes a slightly different nature of a capacity to pay. She writes that the availability of a certain amount of funds for this or that date is not yet a criterion for the venture solvency assessment. Quite a different thing is a change in a cash flow pattern for a certain period and reasons that caused this change. In other words, it is necessary to determine which activities and which elements of assets and liabilities contributed to an increase or a decrease in funds and to

what extent did it happen. Having determined this issue we can answer the question which direction assets and liabilities should be changed to for an increase in the amount of funds [11]. This point of view we cannot but agree with and it is especially important in the process of the venture solvency regulation.

If the venture liquidity state is determined by its capital flows then it is its solvency that depends on a capital flow. The capital flows occur in parallel, and they are in a constant correlation. Maximizing the amount of money a company has is not an end in itself. It should be sufficient to cover current liabilities. With a standard turnover cash it is constantly transformed into other elements of assets and liabilities that are necessary for the venture operation.

Funds can be considered as a resource and as an outcome of a venture activity. Funds are a tangible form of financial resources of a venture. Their presence at the time of the venture state assessment characterizes the amount of available financial resources that can be invested in a new business cycle or investment activity and determines a current venture solvency and a liquidity of its assets [14].

Solvency is formed under influence of all types of a venture economic activity though its quantitative representation it finds in cash flows.

Most authors associate the concept for solvency with a company's ability to pay off its short-term liabilities though there are some different points of view when solvency is associated with the ability to pay off long-term liabilities and the ability to pay off short-term liabilities which is called – liquidity [15].

In the literature of economics and finance there is a trend which the authors do not see any difference in between such characteristics of a venture as its solvency and financial stability. Determining solvency as "... the adequacy of the liquid assets to repay all of its short-term liabilities to creditors at any time" they define financial stability as "the guaranteed solvency free from contingencies of market conditions and the behavior of business partners". In which case "the main "symptom" of stability is the availability of net liquid assets that are considered as the difference between all liquid assets and short-term liabilities at one time or another" [16]. In the



translated publication “Fundamentals of Financial Management” by J. K. Van Horn while characterizing a financial state of a venture we find some groups of indicators for assessing the liquidity and solvency but there is no such thing as financial stability. Solvency is defined as a long-term liquidity i.e. as an ability of a company to meet its long-term liabilities. But in this case we are dealing with an inaccuracy of translation – the word “debt” is translated as solvency though its literal translation means “credit” or “liability” and the word “solvency” in English means “paying capacity” or “paying ability”. The ratio of the total debt (or the loan capital) to the equity characterizes its long-term solvency which many authors call the financial stability of a venture. Thus V. V. Kovalev points out that financial stability is associated with the whole financial structure of a venture and the degree of its dependence on creditors and investors and characterizes the stability of operation in terms of a long-term perspective [1].

If to put it more simply the assets and liabilities balance that is involved in the assessment of the venture’s financial performance can be represented as follows:

Solvency < Liquidity < Stability

In connection with the above said we stick to the point that solvency is the ability of a venture to meet its short-term liabilities secured by the available money and its equivalents.

Thus, the main differences between the venture liquidity and solvency are as follows:

- the venture liquidity is determined by a size and amount of current assets and solvency is determined by the currently available assets in a certain (monetary, highly liquid) form;
- the venture liquidity implies the ratio of all current assets and their groups with current liabilities, and solvency implies the highly liquid assets with the most urgent liabilities;
- solvency is more dynamic than liquidity;
- solvency characterizes a current state of a venture and liquidity characterizes not only the current state but also the promising one;
- the venture liquidity is determined by financial flows and solvency is determined by cash flows.

To be brief in our opinion liquidity differs from solvency in the sense the means of exchange differ from the means of payment.

The diversity of the content, the variety of manifestations and consequences of liquidity and solvency phenomena for a venture determine a need to distinguish between their types and individual characteristics which should be taken into account in the process of their assessment and management.

In the literature of economics there are the following types of liquidity: commodity or commodity-economic liquidity; loan or liquidity on loans; future or perspective liquidity; and expected or anticipated liquidity. This division is due, on the one hand, to the source of liquidity (assets or liabilities), and on the other – to the period of liquidity assessment over time (current or reporting date and future dates).

Under commodity (commodity-economic) liquidity we mean the venture liquidity based on the ability of goods and services that specify its production needs with varying degrees of intensity for exchange. This type of liquidity is provided by the appropriate size and consistency of venture assets for the asset valuation date. It depends on the following factors:

- technical and underwriting characteristics of goods;
- a period of time necessary to find a buyer and a final point of sale of goods;
- commercial costs of transactions with the buyer;
- market conditions.

Borrowed liquidity or liquidity on loans is the ability of a venture to obtain a loan (to attract liquid funds) secured by available assets. It is provided with the growth of liabilities and can be assessed at any moment.

Liquidity guaranteed by obtaining a loan has some advantages:

- the mortgaged property is not alienated but is used by its owner and often remains at his disposal;
- the risk of losses from assets sale with a low liquidity level is reduced as the company is freed from a need for the rapid implementation of this process;
- there is an opportunity to get extra money after repaying a loan and selling goods provided as collateral in case of the favorable financial and market conditions.

At the same time along with the advantages this kind of liquidity guarantee has it can also have some negative effects under

favourable conditions of loans.

The venture efficiency assessment based only on a state of property, assets liquidity, and also on its ability to be collateral at the moment is one-sided. It is acceptable under circumstances when a company is being liquidated and will operate no longer. If the business is operating then possible receipts and payments should be considered.

In this regard there is long-term, or future liquidity which is provided by possible revenues and payments resulting from resolutions of current and future periods. This type of liquidity involves a continuous dynamic operation of a venture during a planning (future) period.

Expected or anticipated liquidity is the ability of an enterprise to obtain loans secured by the future receipts. In this case a bank provides a loan for a company not being secured with its goods or services i.e. on trust.

If the first two types of liquidity can be estimated on the basis of a balance sheet and other forms of financial reporting then the last two can be estimated on the basis of a financial plan and forecast estimates.

Thus, the synthesis of the main characteristics for the "asset liquidity", "balance sheet liquidity", "venture liquidity" and "venture solvency" concepts has allowed to distinguish and clarify such parameters of a venture as its liquidity and solvency. This made it possible to identify clearly the venture liquidity types with the help of such sources as security and evaluation periods.

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**THE USE OF FUZZY LOGIC IN  
DECISION SUPPORT SYSTEMS  
FOR EVALUATING  
INVESTMENT PROJECTS FOR  
THE MODERNIZATION OF  
HEAT POWER INDUSTRIES IN  
AIMS OF UKRAINE  
ACHIEVING CARBON  
NEUTRALITY**

Due to air pollution, 57 thousand Ukrainians die annually, and the state, according to the WHO estimates, incurs losses of 13 billion UAH. One of the most “dirty” sectors of the economy is energy, in which the share of coal generation is high [1]. Coal-fired capacities are currently 18 Gigawatts. Ukrainian thermal power plants (TPP) are outdated, inefficient and not environmentally friendly and have long been in need of modernization. The top priorities of Ukraine, according to Deputy Energy Minister Y. Demchenkov, are to reduce thermal generation, phase out fossil fuels (primarily coal), and reduce emissions of greenhouse gases, sulfur and other hazardous substances into the air from enterprises of the fuel and energy complex.

According to the assessment carried out by the DiXi Group within the framework of the Energy Policy Tracker, since the beginning of the pandemic in Ukraine, government support in the decarbonization, energy efficiency and environmental activities has decreased, while support for fossil fuels, on the contrary, has increased [2]. This contradicts the global trend, as more and more countries view the development of green energy and the reduction of the energy sector's impact on the climate as a driver of recovery, a source for economic growth and job creation. This paradigm shift is not unique to the EU. The UK has announced a “Green Industrial Revolution” plan to revive the economy through public investment and create about 250,000 green jobs. South Korea announced a Green New Deal Initiative to foster economic recovery after the crisis and adopted a Carbon Neutrality 2050 Strategy. By 2025, the

country wants to invest in the creation of 1.901 million new jobs, increase generation capacity from renewable energy sources (solar and wind) by 30 Gigawatts, and develop hydrogen energy.

But due to the acceleration of the decline in electricity production from coal due to the fall in electricity demand due to the pandemic, combined with the strong growth of renewable energy sources (RES) and competition from highly efficient gas-fired generation, there is no future in coal generation.

Examples of the use of coal infrastructure, preservation of the designated purpose of assets - energy, are demonstrated by Hungary, where projects for the cultivation of energy plants and the production of electricity from the sun have been launched on the basis of an old brown coal thermal power plant, integrated with an industrial park into a single cluster. In Germany, a demonstration project for electrical storage of thermal energy has been launched on the basis of a coal mine to be closed and abandoned. In Scotland, using the vertical shaft of an old mine, they want to test the latest energy storage technology.

The global trend towards a green transition could be an engine for change in Ukraine.

Independent Commodity Intelligence Services states that “Ukraine is the main European gas producer” [3]. Its untapped reserves are believed to be in excess of one trillion cubic meters. It also has significant potential in bioenergy and offshore wind generation, allowing Ukraine to join the ranks of Europe's leading clean energy and gas producers.

Ukraine has untapped potential for energy efficiency, hydrogen energy development, bioenergy, energy storage technologies, but huge financial resources are needed to ensure new construction in order to achieve its carbon neutrality goals [4]. The National Economic Strategy plans to attract \$ 40 billion of investments in the development of the energy system of Ukraine until 2030 [5, p. 173].

Recent scientific research indicates the need for information modeling of fuzzy knowledge, which will allow, on the basis of fuzzy, incomplete, and especially expert information, to obtain adequate and objective knowledge about the object of research. The construction of information models for the representation of fuzzy knowledge has a number of advantages, namely: accuracy, work

with abstractions, transfer of information in a logically monotonous way and increasing the objectivity of expert assessments, reveals the subjectivity of experts, a quantitative assessment of non-formalized tasks is obtained. The disadvantages of this approach include the use of different models of membership functions, which can lead to ambiguity in the final results [6].

In works [7-8], general ideas and advantages are considered, on which modern views are based on the use of fuzzy logic in decision support systems. The works [9-10] are devoted to the evaluation of investment projects and start-up projects with indistinct and incomplete input data. The work [11] outlines the basics of data mining. The issue of data mining, mainly from the point of view of machine learning and statistics, is considered in [12].

The use of precise methods does not allow taking into account the verbal inaccuracy and subjectivity of expert information, which in turn imposes restrictions on the qualitative display of knowledge for decision-making. Therefore, the use of the modeling method, in particular, the apparatus of fuzzy mathematics [13-14] to create models for the representation of fuzzy knowledge based on the membership functions of evaluations by criteria in management decision support systems is relevant in the process of attracting significant investments, choosing from a variety of investment projects for modernization heat sources and heat networks in Ukraine by united territorial communities and companies that provide services of common economic interest.

The task is to simulate multi-criteria choice using the apparatus of fuzzy sets and to construct their membership functions. The problem of modeling multi-criteria choice using the apparatus of fuzzy sets and constructing their membership functions can be formulated as follows: Choose the best alternative from the set of alternative solutions  $P = (P_1, P_2, \dots, P_n)$ , when estimates  $(K_i, \mu(K_i)), i = \overline{1, m}$  are known on this set, where  $K = \{(K_i, \mu(K_i)), i = \overline{1, m}\}$  – is a fuzzy set of performance criteria, which are used to evaluate each alternative from the set  $P$ . In this case, the set  $P$  can be both finite, that is, admissible alternatives can be enumerate, and continuous, specified conditions-constraints;  $\mu(K_i)$  – assessment of the membership function of the corresponding criterion, built by information modeling of the representation of

fuzzy knowledge.

In an unstable situation, the use of classical probabilistic-statistical methods that give averaged estimates is not entirely correct, and then decisions should be made taking into account the subjective judgments of experts or according to rules that correspond to the principles of a decision-maker when building an adequate model for choosing the best alternatives. Different experts and decision makers in the same decision-making situation, based on the same model, can get different results. Any expert opinion, even based on accurate objective data, is significantly uncertain compared to a conclusion based on a complex multidimensional set of data. Thus, although expert conclusions may contain practical predictions, they contain uncertainty. In the problem posed, all incoming data are obtained, to one degree or another, by an expert method.

Without diminishing the generality, we will consider the problem of choice, in which the set of feasible alternatives is discrete and finite, then the estimates of the values of the membership functions by alternatives can be presented in the form of Table 1.1 or decision matrices:

$$O = (O_{ij}), \quad i = \overline{1, m}; \quad j = \overline{1, n}, \quad (1.9)$$

when:  $O_{ij}$  – assessment of the  $j$ -th alternative by the  $i$ -th criterion;

$m$  is the scale of criterion assessments;

$n$  – number of alternatives.

*Table 1.1*

**Estimates of the values of membership functions by alternatives**

	$P_1$	$P_2$	...	$P_n$
$\mu(K_1)$	$O_{11}$	$O_{12}$	...	$O_{1n}$
$\mu(K_2)$	$O_{21}$	$O_{22}$	...	$O_{2n}$
...	...	...	...	...
$\mu(K_m)$	$O_{m1}$	$O_{m2}$	...	$O_{mn}$

The variant of existence of quantitative and qualitative assessment criteria is considered. All criteria are determined and



evaluated by experts, therefore they carry a certain subjectivity, uncertainty of data and information, the need to combine quantitative and qualitative information. As a result, it becomes possible to use the apparatus of fuzzy sets to disclose uncertainty and formalize quality information. Therefore, information modeling of fuzzy knowledge by means of criteria membership functions will allow a more adequate approach to the estimation problem.

In [6], the following suitable criteria are given:

$$I = (I_1, I_2, I_3, I_4), \quad (1.10)$$

$I_1$  – net present value of the project;

$I_2$  – simple payback period of the project;

$I_3$  – loan to project cost ratio;

$I_4$  – the ratio of the loan to the value of the project / object.

Their membership functions, according to which it is possible to evaluate investment projects, taking into account the factors of uncertainty in decision-making and the uncertainty of an expert in his conclusions, are as follows.

1. The net present value of the project [15-17] is calculated by the formula:

$$NPV = \sum_{k=1}^{\bar{n}} \frac{CF_k}{(1+r)^k} + CF_0, \quad (1.11)$$

when:  $CF_0$  – initial investment;

$CF_k$  – the flow of payments at the  $k$ -th step, or in the  $k$ -th period;

$r$  – discount rate;

$\bar{n}$  – average simple payback period.

The result of calculating this formula will be the monetary value of the project. In this formula, the initial investment is expressed as equity. In the case under consideration, the funds invested in the investment must also be taken into account, and the interest that is charged on the invested funds can be taken into account.

$I_1 = \frac{NPV}{IC}$  ( $IC$  is the total cost (investment budget) of the project, excluding interest), then the membership function for this criterion is

constructed as s-shaped as follows:

$$\mu(I_1; 0,2; 1) = \begin{cases} 0, & I_1 \leq 0,2; \\ \frac{(5I_1-1)^2}{8}, & 0,2 < I_1 \leq 0,6; \\ 1 - \frac{(5-5I_1)^2}{8}, & 0,6 < I_1 < 1; \\ 1, & I_1 \geq 1. \end{cases} \quad (1.12)$$

2. Simple payback period of the project (years) – the time required to cover the investment costs (excluding discounting).

The membership function for a given criterion is constructed as z-shaped:

$$\mu_z(I_2, a, b) = \begin{cases} 1, & I_2 \leq a \\ 1 - 2 \left( \frac{I_2 - a}{b - a} \right)^2, & a < I_2 \leq \frac{a+b}{2} \\ 2 \left( \frac{b - I_2}{b - a} \right)^2, & \frac{a+b}{2} < I_2 < b \\ 0, & I_2 \geq b \end{cases}, \quad (1.13)$$

where  $a, b$  are numerical parameters.

Let's put  $a$  – the minimum possible payback period of the investment project,  $b$  – respectively, the maximum acceptable for an investment institution. So the given membership function will have the following content: the shorter the payback period, the more the membership function will tend to unity, and in the opposite case – to zero. As a separate case, the payback period can be considered on the interval [1; 5] years, then the membership function will be as follows:

$$\mu(I_2; 1; 5) = \begin{cases} 1, & I_2 \leq 1; \\ 1 - \frac{(I_2-1)^2}{8}, & 1 < I_2 \leq 3; \\ \frac{(5-I_2)^2}{8}, & 3 < I_2 < 5; \\ 0, & I_2 \geq 5. \end{cases} \quad (1.14)$$

### 3. Loan-to-value ratio [17].

This ratio is determined by the formula:

$$I_3 = \frac{C_s}{IC}, \quad (1.15)$$

when:  $C_s$  – loan amount (principal);

the project cost ( $IC$ ), in this case, means the total costs of the project.

Criterion  $I_3 \in (0; 1]$ . Then, the z-like membership function will have the form:

$$\mu(I_3; 0,2; 0,8) = \begin{cases} 1, & I_3 \leq 0,2; \\ 1 - \frac{2(5I_3 - 1)^2}{9}, & 0,2 < I_3 \leq 0,5; \\ \frac{2(4 - 5I_3)^2}{9}, & 0,5 < I_3 < 0,8; \\ 0, & I_3 \geq 0,8. \end{cases} \quad (1.16)$$

### 4. The ratio of the loan to the value of the project / object [17].

The formula for calculating this criterion is as follows:

$$I_4 = \frac{C_s}{VM}, \quad (1.17)$$

when:  $VM$  – the market value of the asset. The final market value of the property is filled in when the project is completed. Within the framework of this criterion, the market value is understood as the appraised value of an object, which is defined as the most probable price at which it can be sold on the open market in a competitive environment.

The z-shaped membership function will then have the form:

$$\mu(I_4; 0,3; 0,9) = \begin{cases} 1, & I_4 \leq 0,3; \\ 1 - \frac{(10I_4 - 3)^2}{18}, & 0,3 < I_4 \leq 0,6; \\ \frac{(9 - 10I_4)^2}{18}, & 0,6 < I_4 < 0,9; \\ 0, & I_4 \geq 0,9. \end{cases} \quad (1.18)$$

Thus, on the basis of models for constructing membership functions as a result of the analysis of investment activities and on the basis of processing a significant amount of statistical information, it is possible to compare the input data and disclose uncertainty for an adequate assessment of investment projects.

The proposed information model for obtaining fuzzy knowledge for the gained expert points of a weakly structured or unstructured task will make it possible to obtain an interpretation, revealing the subjectivity of experts, and will be a useful tool in increasing the validity of decision-making by investment subjects.

The use of the theory of fuzzy sets allows an expert to give not only accurate estimates, but also to set an interval of acceptable values. At the same time, in contrast to the methods of interval mathematics, on such an interval, the distribution of the possibilities of realizing one or another value in the form of membership functions is set. The result of the calculations is also represented as a fuzzy number and at the same time we get at least three estimates: the most rational (expected), optimistic and pessimistic.

In addition, an expert may refuse to assign numerical estimates altogether and use linguistic ones, which, by specifying membership functions, obtain a rigorous mathematical representation. The methods of fuzzy set theory allow us to model plausible judgments.

The apparatus of fuzzy sets, fuzzy logic and a systematic approach to constructing models of fuzzy knowledge has a wide potential for applied applications. The apparatus of fuzzy sets requires the decision maker to compare not point probabilistic estimates, but on an interval showing a corridor of values of predictive parameters. The advantage of such methods is manifested in an increase in the level of validity of decisions, since all possible development scenarios are taken into account here, depicting a continuous spectrum, in contrast, for example, from the Hurwitz method, which is calculated on a discrete set of scenarios. The reliability of the results obtained using the information model for evaluating investment projects according to incoming expert estimates is ensured by the correct use of the apparatus of fuzzy sets.

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### **CLASSIFICATION OF TYPES OF SOCIO-ECONOMIC SYSTEM DEVELOPMENT**

The main object of the economy is a socio-economic system (SES) which is understood as a set of resources and economic agents that form a coherent whole (social and economic structure), interconnected and interacting in the production, distribution, exchange and consumption of goods and services that are needed in the environment. By SES related companies, organizations, firms and their individual structural units (branches, subsidiaries) and various integration and sectoral associations (associations, trusts, corporations, holding companies, etc.).

Market environment functioning of SES dictates tough competition, survive and become a leader which can only be based on the timely implementation of development programs. Therefore, in the current economic conditions are more relevant to the issues of development of such systems, their ability to fairly quickly and with minimal cost, flex required to respond to market needs and changes in the external and internal environment.

For effective management of development of SES must solve a number of problems, one of which is the development of generalizing the classification of types of such systems. A clear specification development for the classification features allows further development, make appropriate methodological approaches

to the management of each development of SES.

In the scientific and economic literature [1, 2, 4-10] presents a variety of valve signs and appropriate types of socio-economic systems. The results of the analysis of scientific opinions concerning the possible types of businesses and other SES are presented in Table 2.1.

*Table 2.1*

**Typology of development of SES**

Classification attributes of type	Type of development	Reference
1	2	3
Quality changes (or vector of character development)	progressive, regressive	1, 2, 5-9
Quantification of changes	progression, regression, immutability, pulsation	4
Stages of development	nucleation, ascending, maximum, a crisis, descending, death of system	8
Depending on the method of dissemination	ascending, descending, randomizing	10
Nature of change	evolutionary and revolutionary	1, 2, 4, 5, 7-10
Dynamics of changes	uniform, uneven	6, 9
Orientation changes	extensive, intensive	1, 2, 6, 9
Character change	directed, cyclic, spiral	2,5,6,9
Type of trend (trajectory)	linear, non-linear	2,5,6,9
Form of development	straightforward, linear-progressive, broken, wavy, spiral	4
Source (root cause) of development	exogenous (external), endogenous (internal)	4,8
Spatial changes	development within the system, the expansion of the external environment	4,8
Relation to the enterprise	internal (endogenous), external (exogenous)	10
Medium dissemination	internal, external, general	5
Purpose of the changes	simple, comprehensive	2, 5, 6
Availability subject of development	subjective, subject-object	4
The degree of coherence of the internal and external environment	Synchronized, without synchronized	7



Table 2.1 (continued)

1	2	3
Depending on the change controllability	controllable and spontaneous	2,5,6,9
Bold vector	vector, quasi-chaotic	4
The possibility purposeful influence on development	fully managed, controlled, poorly managed, unmanaged	4
The notion of the subject of development	projected, not projected	4
Number of selected vectors	multi-vector, frontal	4
Nature key criteria	absolute, relative	2, 5, 6
Duration of action	short-term, medium-term, long-term	6
Purposefulness	investment, innovation	6
By the time	retrospective, current, perspective	5
The scale of change	general corporate, internal corporate (local)	2, 5, 6
Complexity changes	cell, integrated, systematic	2,5,6,9
The scale and complexity of the object	individual, total	4
Medium spread	total, partial (local)	9, 10
The object changes	organizational, technical, technological, social, economic	2, 5, 6, 9
The qualitative nature of the object	sustainable, innovative, organizational, social, political, economic, technical	4
Type of potential	production, employment, financial, managerial, communication, motivation, marketing, innovation	5
Dominant transformation	substrate, structural, organizational, functional	4,8
Uncertainty level processes	predictable (accurate), random	2,5,6,9
The mechanism of development	deterministic, stochastic, bifurcation	4,8
Depending on corporate strategy	adaptive, reactive, anticipatory	2,5,6

Analyzing classification features and types of SES (Table 2.1), we note that, depending on the interpretation of the term "development" each scholar, they differ considerably, and sometimes contradictory.

Thus, D.C. Voronkov, Y.S. Pogorelov [4] characterized by quantitative changes tristichous the following types of development: progression, regression, immutability, ripples. However, the vast majority of scientific [1, 2, 5, 6, 7, 9] to classify the development or progression rehire – shoyu on the basis of quality changes, and J.P. Surmin [8] calls this feature character or vector development. Types of immutability and pulsation in essence correspond to stable and unstable development, as recognized by classification attributes resistance development [8].

Bold evolutionary and revolutionary development of scientific carried out on various grounds: I.O. Bohatyriov [2] L.S. Zapasna [5] it is called "dynamic changes" D.C. Voronkov, Y.S. Pogorelov [4] "nature changes", J.P. Surmin [8] "speed of development", I.V. Tyuha [9] "depending on the course of change", V.P. Chernenkyy [10] "depending on the course of development", and M.V. Afanasyev, V.D. Rogozhin, V.I. Rudyka [1] and E.V. Rayevneva [7] did not making this feature. In turn, N.T. Mala, O.V. Hrabelska [6], I.V. Tyuha [9] on the basis of "the dynamics of change" is classified in the development of uniform and non-uniform, which matches the description of the essence of the evolutionary and revolutionary development, respectively.

In relation to the company V.P. Chernenkyy [10] identifies internal and external growth. However, it should be noted that not always the root cause of development occurs in the same environment, which further develops.

Depending on the change of control I.O. Bohatyriov [2], L.S. Zapasna [5], N.T. Mala, O.V. Hrabelska [6], I.V. Tyuha [9] isolated keratodes and spontaneous development. Spontaneous development occurs evaporated deonym manner and does not include preset target values and actions. However, if there are prerequisites for spontaneous development it can and should be managed. Therefore, a more appropriate classification is D.C. Voronkov and Y.S. Pogorelov [4] for the possibility of targeting development.

Duplication of types and their characteristics is carried out according to the following classifications, which are presented in Table 2.1:

- the scale changes [2, 5, 6], the complexity of the changes [2, 5, 6,

9], the complexity changes [4], the scale and complexity of the object [4], the extent of [9], the environment propagation [10];

- the object changes [2, 5, 6, 9], the qualitative nature of the object [4], the by type potential [5], the dominant transformation [4, 8];

- the level of uncertainty processes [2, 5, 6, 9], the mechanism of [4, 8];

- the depending on the corporate strategy [2, 5, 6], the power of the adaptive properties [7].

Thus, it may be noted that to date there is sufficient diversity classifications and types of SES, but the lack of systematization leads to duplication of names and characteristics of occurrence between contradictions and incomplete description of all the properties that makes it impossible to implement a clear classification of SES.

The development of socio-economic system – is irreversible, naturally aimed at resolving the conflict between the system and the external environment or within the system of quantitative, structural and qualitative changes in conformity with the established goal, which lead to the achievement of a qualitatively new positive steady state (properties) system and obtain social and economic effect [3].

As a result of the study [11] interpretation notion of "development" set and organized in terms of the emergence of time following expression of its essence: an inherent property of the principle of law, process, phenomenon, result.

The classification of types of SES in some classification features and types of features from existing scientific literature (Table 2.1) in cases where they are not correct and contrary to the aforementioned definition of SES.

Arrangement types of SES doable for all entities of general and philosophical concepts which based specification of features inherent to such systems. The classification of types of SES's development and their characteristics are presented in Table 2.2.

The scientists [1, 2, 4-9] distinguished two types of development: the progressive and regressive development. However, the development in accordance with the above definition, is always aimed at the progressive transition from lower to higher, from less to more sophisticated, ensuring the formation of a new one.

Table 2.2

### Classification features and types of development of SES

№	Sign	Type of development	Characterization of development
1	2	3	4
<b><i>Development as an immanent property</i></b>			
1	Source (root cause)	exogenous	source and root cause of development the external environment in SES
		endogenous	source and root cause of development is inside SES
<b><i>Development as a principle</i></b>			
2	The awareness of development objectives	conscious a purpose (vector)	provides for the specification and the vector (attractor) in the form of development purposes
		lack of purpose (quasi-chaotic)	done without formalizing the vector of development
3	The complexity of change (complexity of the object)	individual (cell)	development of a single indivisible object may have a complex structure, but not its individual parts form the integrity level of the object and does not lead to changes in other components of SES
		total (system)	development of one or more structural elements, business processes, etc., that have a significant impact on all components and SES leads to its development as a whole
4	The method of implementation (spatial change)	internal (within the system)	involves the transformation of internal subsystems and processes
		external (transformational, expansive) including:	organizational and economic transformation SES integration and disintegration processes that lead to changes in the structure of the enterprise, the qualitative change in SES relationships through engagement
		- insourcing	is to convert external activities into internal business processes SES because of the potential of organizations
		- outsourcing	provides for the establishment of cooperative relationships with other organizations in order to transfer the internal functions of the SES

*Table 2.2 (continued)*

1	2	3	4
5	The level of adaptation	adaptive	includes external and internal adaptation of SES to operating conditions that vary
		weakly adaptive	characterized by the inability to implement adaptive management measures regulating the activities of SES, after the occurrence of internal and external impacts and contradictions
		anticipatory (preventive)	preceded by possible future changes in the internal and external environment of SES
6	Strategic orientation	balanced (harmonious)	characterized by a continuous and gradual changes in resource
		offensive	SES provides impact on the environment to improve the efficiency of their behavior in the present and future, arising in situations where you need the ability to overcome technological gaps, achieving maintaining or proactive leadership
		Protecting	characterized by the use of observations over the actions of the leaders in the market, allowing for a short time to recreate their achievements and enter the market without following them on fire claims a leading position
		absorbent	is an imitation of innovative transformation and direct major efforts to ensure industrial and commercial process
<b><i>Development as a law</i></b>			
7	The nature of change	evolutionary (evenly)	characterized by a gradual (smooth) quantitative, structural and qualitative change
		revolutionary (uneven)	is an abrupt transition from one state to another SES
8	The configuration (shape) of development	straightforward	configuration is determined by the nature of development the changes in intensity over time, frequency of changes and their recurrence
		broken	
		linear reciprocating	
		spiral	

Table 2.2 (continued)

1	2	3	4
9	The character of permanence (stability) of development	established (stable)	SES's ability to maintain a certain rate of movement and do not deviate from the set of development vector and external destabilizing influences
		unstable	SES inability to maintain certain rate movement, there are deviations from the set of development vector with different destabilizing influences
<b><i>Development as a process</i></b>			
10	The direction of change	extensive (evolutionary quantitative)	is a manifestation and growth of the existing state SES aims to use more resources
		intensive (quality)	characterized by the emergence of new forms of using the innovation
11	The scope of manifestation (direction change)	organizational (management)	a set of changes that lead to the development of management of SES, its structure and functioning
		technical and technological	set of changes in the technical and technological component of SES, leading to increased productivity, efficiency and quality of production operation
		social	a set of changes that lead to improvement of the socio-psychological climate team SES, social infrastructure, working conditions, health and safety material compensation
		economic	a set of changes that lead to improved methods, forms of calculations and economic work in general
		financial	a set of changes that lead to increasing financial capacity, which manifests itself in the effective attraction, distribution and use of financial resources that provide achieve the objectives the owners of SES
		entrepreneurial	a set of changes that lead to channel resources into new business areas (development and implementation of new products or services) to maximize competitiveness for maximum long time

Table 2.2 (continued)

1	2	3	4
		marketing	a set of changes that lead to expanding the boundaries of the market, diversification of production
		logistic	a set of changes that lead to improved transportation and warehousing SEZ and relationships with suppliers
		ecological	a set of changes that lead to improvement of the environment, improved management and production of environmentally friendly products
12	The degree of coherence	synchronized	characterized by speed or frequency ratios in negotiating interaction parameters SES and the environment
		asynchronous	characterized by inconsistency rhythm of life SES and the environment
13	The level of uncertainty	determined	significantly predicted the direction of development of SES in quite a stable state of the environment
		stochastic	provided guidance with sufficient probability transition SES from its current state to the future
		bifurcation	no prediction SES from its current state to the future together under the influence of various factors driving
14	Availability planned actions	projected (planned)	development that provides pre-defined plan of action to achieve the set target
		absence projected (situational)	development that occurs randomly and does not provide predefined actions
15	Ability to control	controlled	development that is influenced by meaningful actions managers designed ties aimed at achieving the set target
		poorly controlled	development that occurs as a result of management actions and significantly affected by other factors
		unmanageable	development without managers
16	The horizon (duration) of development	long-term	period greater than three years
		medium-term	period of development from 1 to 3 years
		short-term	term of development up to one year
		operational	term of development up to three months

Table 2.2 (continued)

1	2	3	4
<b><i>Development as a phenomenon</i></b>			
17	The scale of change	simple	does not change the objective of the SES and does not guarantee its transition to a qualitatively new level of performance, characterized by the existing effect
		expanded	leads to a change in the objectives of the SES and ensure its transition to a qualitatively new level of functioning
18	The radical of changes	absence radical	acquired properties and characteristics lead to the improvement of the new socio-economic system
		radical	acquired properties and characteristics lead to a qualitatively new state of the socio-economic system
<b><i>Development as a result</i></b>			
19	The effectiveness of changes	highly effective	the resulting socio-economic effects far outstrips the amount of costs to achieve
		medium effective	the resulting socio-economic effects dominates spending on its achievements
		not enough effective	the resulting socio-economic effects at the level of expenditure on its achievements
20	Quantification of results	absolute	set of changes in SES, which can be measured in value, natural or conventional units, which lead to an absolute increase of indicators
		comparative	set of changes in SES, which can be measured relative to other economic indicators and determine their increase

Regression describes the degradation of SES, lower levels of knowledge and attitudes shift to inefficient or have passed the forms and structures (seen as the movement of trajectory downward line lifecycle, which can subsequently access the upward leg or cause to eliminate SES). Thus, it can be noted that the degradation of SES – irreversible quantitative and qualitative structural changes that lead to the achievement of a qualitatively new negative state of the system and the lack of socio-economic impact.



Also, in accordance with the above, the configuration of development can be wavy, so that only the ascending phase of the wave refers to the development and downward – to degradation.

D. Voronkov and Y. Pogorelov [4] for the classification attribute "availability of subject" isolated subjective, no-subject and subject-object types of development. However, it should be noted that the subject of control subsystem is always there, but not necessarily development can be managed (Table 2.2, classification feature "ability to control").

According to the classification attribute "time" there are the following types [5]: retrospective, current and future development. However, it should be noted that the source of SES are contradictions that arise in real-time or in the future. This is reflected in the Table 2.2, in which the classification features for "adaptation level" respectively stand or weakly adaptive and preventive development.

Classification attribute scale changes [2, 5, 6], the complexity of the changes [2, 5, 6, 9], the complexity of the changes [4], the scale and complexity of the object [4], the extent of [9], propagation environment [10] and the appropriate types of development are reflected in the sign of "the complexity of change" (Table 2.2).

Classification of the object changes [2, 5], the qualitative nature of the object [4, 6, 9], in view of the potential [5] and the corresponding development of more advanced types are presented in Table 2.2 on the basis of "sphere of change direction".

The new proposed classifications include strategic direction, and the effectiveness of radical change. In Table 2.2 shows the appropriate types of development and given their characteristics.

Also experienced some improvement on the existing classification groups in the literature attributes. Thus, the horizon of the selected operational development and implementation of the method – external and external outsourcing development.

Thus, the proposed systematization types of SES for the classification features and classification groups established by describing the development of SES as inherent characteristic, principle, law, process, phenomenon, result. Generalized classification of SES allows to specify the nature of the development, will improve its modeling and management, improve the quality of design and implementation strategies.

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**INTERMODAL LOGISTICS  
STRATEGIC MANAGEMENT  
PERFORMANCE, CASE OF  
SITUATION ANALYSIS OF CHINA  
ROAD-RAILWAY  
TRANSPORTATION PROCESS**

## **Introduction**

Intermodal transport involves the transportation of freight in an intermodal container or vehicle, using multiple modes of transportation (e.g., rail, truck, and ship), with container or carrier swapping to simplify freight handling when changing modes (Caris, Macharis, and Janssens, 2008) and (OECD, 2002). Intermodal freight transport has received increased attention due to problems of high shipping costs, road congestion, air pollution, and global warming concerns (Konings, Priemus and Nijkamp, 2008). A growing recognition of the strategic importance of speed and agility in logistic services is forcing firms to reconsider traditional freight shipping approaches that heavily rely on trucking transport (Morlok, Sammon, Spasovic, and Nozick, 1995). As a consequence, research interest in intermodal freight transportation issues is growing. From an economic perspective, a cost benefit over road trucking is the key benefit for road-rail intermodal transport use (Stull, 2008). In addition, China's relocation of manufacturing to the inland provinces and the growth of domestic consumption pose challenges for logistics. Transportation distances increase, while the highways become increasingly congested. Seeking a solution, the Chinese government and logistics companies have identified that road-rail intermodal, or domestic container logistics, is one of the ways to address these challenges (Cole, 2008). We use the shipping information and routing plans obtained from S.F. (Shun-Feng) Express in this study. As an important part of transportation development in today's world, the combined transport of railway and water has rapidly expanded to all parts of the world. As an efficient mode of combined transportation, it also develops rapidly in China with strong comprehensive national strength. Although railway and water transport have made great contributions to the transportation

and turnover of goods in China, as a combined transportation mode, the combined transport of railway and water has a low market share and total transport volume in China. In developed countries, such as the European Union and the United States, the proportion of container railway and water combined transport accounts for 30% on average. However, China has always been within 3%, because China's containers are more inclined to the road transport with greater energy consumption and higher cost, which leads to a huge waste of transportation resources and transportation funds.

### **Analysis of China road-railway key elements transport channels communication system**

At present, China's water transport capacity ranks among the top in the world, among which COSCO shipping container fleet is the fourth largest in global transport capacity, and there are seven ports in the top 10 in the world. As the "backbone" industry of national transportation, the total amount of railway freight is in a downward trend. For one thing, the freight owner's choice of convenient and rapid road transport reduces the market share of railway transport. For another thing, it also reflects that the characteristics of railway freight transport mode have not fully adapted to the market economy system, so the railway still has a long way to go. Although the government gave the railway economic support and issued many policy provisions to solve the railway problems in China, In addition, railways have the property of public welfare, in terms of the nature of enterprises, the ultimate goal of railways is to pursue enterprise benefits and profits. At present, China's railway and water intermodal freight volume takes a very low proportion in the multi-modal intermodal transport, and the railway intermodal transport takes about 1.5% of the total port container transport volume, which is greatly different from the proportion of over 20% in developed countries such as the European Union and the United States. To sum up, the combined transport of railway and water has great room for improvement in railway development and social and economic prosperity.

3. Analysis of combined transport of railway and water in containers As the container port enterprises, railway, shipping companies, freight forwarding companies and other major markets for continuously nourish hot metal container multimodal transport, as

well as container terminal, railway transportation, shipping, such as the constant improvement of infrastructure, molten railway transport by container shippers recognized gradually, molten railway transport internationally has risen steadily in the volume of sales, market share of molten railway transport also gradually improve. Container railway and water combined transport has begun to take shape in China, and there is a large space to rise. At present. China's eight major container railway and water intermodal transport channels have a certain scale. There are described China's container railway and water transport channel. The second passage starts from Tianjin port and runs from north China to Xinjiang and then to the Eurasian land bridge. The third passage is from Lianyungang Qingdao to the old Asian land bridge and then to Europe. The fourth corridor starts from Shanghai, runs along the Yangtze river to Chengdu, and then from Chongqing, to Europe. The fifth passage is from Ningbo port to Nanchang, Changsha and Chongqing. The sixth channel is Xiamen. The seventh passage is from Nanchang, Changsha to Shenzhen, then the coast to Kunming and then to Europe. The eighth channel is from Chongqing and runs from Zhanjiang to Singapore. There are three relatively long cross-border railway and water transport routes mainly to foreign countries. The first is the trans-border Eurasian rail link. The second is from Qingdao to Shanghai port, and then through the Eurasian land bridge to Europe, which belongs to the Central Line. The third route crosses many countries, from Shenzhen and Guangzhou to Yunnan, then Pakistan, Afghanistan and Turkey. The development and prosperity of these channels can respond positively to the implementation of One Belt And One Road strategy. The development of these channels can drive the economic prosperity of countries radiated along the routes, facilitate the transportation and trade between countries, and build a logistics information network of connectivity, which is more conducive to the promotion of the global village. The top 10 coastal ports in terms of container throughput of national ports in 2011-2017 are: Shanghai port, Shenzhen port, Ningbo Zhoushan port, Guangzhou port, Qingdao port, Tianjin port, Dalian port, Xiamen port, Yingkou port and Lianyungang port [3]. The total volume of container throughput of these ports in 2011-2017 was 129.64 million TEU, 138.98 million TEU, 146.90 million TEU, 155.07 million

TEU, 172 million TEU, 196.00 million TEU and 209.85 million TEU respectively. Container throughput of the National Coastal Ports in 2011-2017 (10000 TEU) From the point of the data and trends in the graph, China's coastal port container throughput increased year by year, the momentum of rapid development, it is due to the stimulation of some developed countries such as the European Union and the United States, along with eight channels of exemplary role and the government of the molten railway intermodal attaches great importance to and constantly introduce the result of a lot of relevant policies and subsidies. It can be seen from that only Tianjin port, Xiamen port, Yingkou port and Lianyungang combined transport account for more than 2% of the top 10 coastal ports. Although the container throughput of other ports is large, the combined transport of railway and water accounts for less than 2%. Main cargo of combined railway and water transport Coal, grain, railway ore and other bulk commodities are the main cargo of China's combined railway and water transport, with the proportion of consolidation, distribution and transportation reaching an average of more than 60%.The pattern of railway and water transport system for grain, railway ore and coal has been basically formed, with nearly 600 million tons of coal being transported through the railway and water transport system every year. Combined transport of railway and water also plays a vital role in grain transport and imported railway ore. The imported railway ore from coastal ports is transported to inland steel plants, the coal from Shanxi is transported through railway channels to regions where the coal demand is high, and the grain from northeast China is sent to the southern market. The poor quality of railway services, the imperfect information network and the rapid growth of the bulk cargo volume of China's ports, the expansion of port infrastructure, which affect the efficiency of bulk cargo turnover. This also increases unnecessary loading, unloading, and handling, as well as the time and cost of transportation, which will result in the phenomenon of goods loading and unloading port and gathering port. Some port goods have been diverted by water or road. For example, in 2005, Zhanjiang port constructed the 200,000-ton railway ore terminal transfer system. In order to solve the problem of insufficient railway transportation capacity, foreign trade ships arrived at the port and transferred to

domestic trade ships along the Yangtze river. The shortage of coal transport capacity of Shanxi railway forced the rise of coal cross - provincial road transport. In May 2011, due to the overhaul of the Daqin line, highway coal transport market share reached 51% and drove up coal prices. After the railway capacity of Qingdao port was significantly improved in 2010 and 2011, the railway transportation volume of ore was also significantly increased. The lack of logistics network system There is a lack of systematic logistics network system in the transportation of bulk goods by rail and water combined transportation. The information system is not developed and the infrastructure construction is not perfect, which makes the customers unable to pay attention to their goods in real time and worry about the safety of the goods. Enterprises lack effective means to maintain customer relations, customers do not really enjoy the advantages of seamless railway and water transport. With the improvement of the management level, the improvement of service quality, the improvement of infrastructure, and the perfection of logistics network, the capacity of railway transportation of bulk groceries such as coal, railway ore, grain and fertilizer will be further improved, and the freight volume of the combined transport of railway and water will be further improved. Analysis of the policy and system of the combined transport of railway and water As a large multi-party system, the combined transport of railway and water contains many subsystems, and the participants are mainly divided into transport demand, transport service and government management. Imperfection on laws, regulations and policies of the combined railway and water transport The railway and water intermodal transport involves multiple government authorities. The management system, management system, management means, management measures and policies and regulations vary greatly. Each management department wants to fight for more rights within its own jurisdiction and ignores the whole interest. There are still some deficiencies in international policies, regulations and related policies on the combined transport of railway and water, as well as the popularity and implementation of the policies. Imbalance of government support The support and coverage of the government of the country and the port are obviously not enough to promote the development of the railway and water transport. In addition, there is

a lack of government-led departments to take the lead in handling the work related to the combined transport of railway and water, formulate relevant laws, regulations and policies, and allocate funds for infrastructure construction to complete the seamless connection of the combined transport of railway and water to promote the long-term development of the combined transport of railway and water. At the same time, the supporting policies enjoyed by various ports are not balanced: first, the same source of goods in the same region will be sent to different regions, and there will be different preferential policies on freight rates. Second, the different policy support of local governments also results in different development for the combined railway and water transport in various regions. Relative lack of special regulations for multi-modal transport At present, the international regulations related to multi-modal transport of containers mainly include the uniform rules of multi-modal transport documents and the United Nations convention on international multi-modal transport of goods. This part is mainly covered in the relevant chapters of The Maritime Law , The Contract Law and The Customs Law . Since China is not a party to the United Nations convention on international multi-modal transport of goods ,generally the multi-modal transport activities involving Chinese consignor, consignee and carrier are mainly carried out with reference to the maritime law. China lacks special laws and regulations on multimodal transport, and it is difficult to deal with such problems as the combined transport of railway and water under the strategy of global economic integration. Continue to increase on policy promotion In recent years, policy promotion has been intensified. In 2014, the state council promulgated the medium – and long-term plan to promote logistics industry (2014-2020). The plan calls for accelerating the construction of logistics channels connecting major domestic and international economic ports and vigorously developing multi-modal transport, with the goal of reducing logistics costs and simplifying logistics operations. In 2016, 18 departments, including the ministry of transport, jointly issued a notice on further encouraging multi-modal transport. The circular promotes multi-sectoral coordination and linkage, promotes the accelerated development of multi-modal transport, guides the practice of multi-modal transport industry and speeds up the supply-side structural reform of the transportation



industry. The national development and reform commission has also published «the development plan for china-europe railway construction (2016-2020)», which will deploy the construction and development tasks of china europe railway in the next five years. Driven by these policies, various regions have successively implemented the construction of water free ports, the construction of railway and water intermodal transport channels, and the project of convenient customs clearance to promote the development of multi-modal transport. Recognizing the huge potential of roadrail intermodal transport in China, the Ministry of Transportation in China has established demo road-rail intermodal terminals in both Wuhan city and Guangzhou city in 2014. The purpose of the demo intermodal terminals is to improve facility design, equipment selection (Rodrigue, 2013), operations procedures, and collecting data to benchmark those intermodal terminals in developed counties (Li, 2010). The China government has identified intermodal transport as a strategic economic development project in its 13th 5-year national development plan to be carried out from year 2016 to 2020. The goals of adopting intermodal transport are to improve the transportation efficiency (Douglas, 2013), and to reduce highway congestion, air pollution, as well as greenhouse gas emissions (López-Navarro, 2014).

## **Conclusions**

Due to global competition in logistics services and the focus on environmentally friendly transport, intermodal transportation is increasingly receiving attention. Long distance service by railway transportation reduces costs and is by far the most environmentally friendly solution. Using trucks for pick-up and delivery ensures the flexibility to serve a variety of locations and to deploy transportation capacity to match seasonal or fluctuating logistic demand. Combining the use of containers, intermodal transport can further control transshipment times and handling cost. In China, severe air pollution and increasingly congested highways offer excellent conditions for road-rail intermodal container transportation. In addition, the relocation of production facilities from the coastline to Central and Western China will increase average transport distance and further raise the attractiveness of combined rail solutions which

have a competitive edge over medium to long distances. China's Ministry of Transportation has embarked on an extensive investment program in its medium and long-term plan. The growth of road-rail intermodal transport in China is expected to be exponential in coming years. Numerical data is then utilized to evaluate the operational benefits in numerical terms, while qualitative data extracted from interviews with senior managers in S.F is used to analyze the non-operational factors in decision making. Based on the analysis results, an evaluation framework is proposed to create an understanding the assessment process of implementing road-rail intermodal transport in a private logistics company in China. In addition, more operational studies may focus on scheduling and routing improvement within intermodal transport networks to achieve higher efficiency. Other investigations may be made into contracting issues that involve multiple transportation operators and multiple decision makers when involving joint investment and collaborative operations. The combined transport of railway and water has formed a great climate in China's coastal ports and inland waterless ports. Ports, shipping companies, railways and the government are also actively promoting the development of combined transport of railway and water, which has achieved preliminary results.

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**COMPETITIVENESS  
MANAGEMENT OF  
REGIONAL ECONOMIC  
SYSTEMS: CONCEPTUAL  
APPROACH, PROBLEM  
STATEMENT,  
PRINCIPLES OF  
MODELING**

Scientific works devoted to the study of the problems of competitiveness of regional economic systems (the term competitiveness of the region, competitiveness of the territorial system, etc. is also often used in the literature) belong to a relatively new field of research.

In Ukraine to ensure sustainable development of territories, increase competitiveness and improve the regional environment in the 90s of the twentieth century. the concept of regional innovation systems (RIS) is developing. To a large extent, it is the result of

intensified competition of economic entities in world markets and the inability of regional systems to ensure their own competitiveness. This concept proves that the most important elements of the innovation process are geographically localized and therefore the territorial factor is significant. The concept of RIS provides for a developed innovation infrastructure, the creation of a regional center for innovation management, establishing effective relationships between innovation actors and the availability of regional innovation programs developed by regional authorities with the participation of stakeholders to intensify innovation processes in certain areas [1].

In Ukraine, the concept of RIS has not yet acquired practical features. But the level of RIS development can be used to assess not only the level of regional development, but also the quality of regional governance, because this system is not created by itself, by chance, it needs constant attention from the authorities.

A new stage of competitive territorial development begins with the realization of the importance of identifying the territory, its role as a competitor and partner for other territories and as a specific subject of economic relations. At the end of the twentieth century, the theory of stimulation (increase) of regional competitiveness becomes a new theory of regional development. It takes into account the approaches and ideas of all existing regional theories and concepts, economic and social theories and provides for the use of exclusive, innovative mechanisms to ensure territorial development.

Based on the analysis of a number of scientific papers on regional development and competitiveness of territories, we can say that today the following basic concepts have been formed to stimulate the competitive development of territories:

- the concept of cluster development;
- the concept of regional competitive advantages;
- the concept of regional innovation networks.

The founder of the concept of cluster development is M. Porter. This concept is based on a broader, more dynamic vision of the process of competition between firms and regions based on productivity growth. At a time when industrial policy tends to distort competition in favor of a particular region, cluster theory focuses on removing restrictions on production and productivity growth [2]. According to O. Osadcha, considering the positive experience of

applying the cluster approach, we must not forget that in world practice there are many clusters that have not succeeded and do not have competitive advantages [3].

The cluster approach in comparison with the traditional branch analysis allows to consider more adequately the basic features of various sectors of economy and to reveal their competitive advantages thanks to what this approach is actively used in the countries with the developed market economy. The cluster concept focuses on the relationships between corporate structures, investment, intermediary, scientific, educational, public organizations in the region, and its essence is to realize the consolidated potential of regions whose economic territory is the basis for the development of international cooperation. According to the founders of the cluster approach, the place in which we can talk about the existence of a cluster does not exceed the area within which people can move freely. For example, key industrial clusters in Germany were formed in the 1950-60's. Now the industry of Finland and Scandinavia is fully clustered, in the US more than half of the companies work on this model of production. The experience of implementing this approach by leading foreign countries (Finland, USA) shows that it is a good basis for a constructive dialogue between representatives of the business sector and the state. The basis for the development of territorial industrial complexes is the industrial (industrial) potential of the territories. It would seem that these taxonomic spatial structures can be divided according to a very simple criterion: territorial industrial complexes exist in a socialist economy, while clusters are a reality of a market economy. Therefore, complexes are created artificially, by the state, clusters – themselves, by market forces; complexes aimed at ensuring economic efficiency, clusters – to maximize profits; complexes arise in areas of new development, clusters – in already developed areas [4].

The foundations of the concept of competitive advantage are also laid by M. Porter [5]. This concept is based on the research of A. Smith and D. Ricardo, their theory of absolute and comparative advantages, but the emphasis is shifted from economic entities in the territory as subjects of competitive relations.

To analyze the competitive advantages of territorial development

actors, it is necessary to determine what can be the source of their competitive advantages. The «buyers» of territories can be different groups of consumers who need territory for production, social, tourist, transport and logistics, management and other needs.

In the study of the subject of competitive territorial development of territorial competition, the «economic buyers» of territories interested in the location of new enterprises and investment are considered. To this group it is necessary to add competition not only for new enterprises and new investments, but also a special kind of competition for the preservation of existing enterprises, especially if they are territorial. This is the kind of «buyers» of the territory, for which it is necessary to compete with the subjects of government, especially in cities and regions with a monostructure of the economy. Competition for the preservation of existing industries is often not taken into account, which threatens to gradually reduce the activities of enterprises in the area, bankruptcy or departure to other regions or countries due to the failure of their local conditions. The idea of treating existing businesses as «regular customers» is that local authorities do not consider that already located consumers in their territory are permanent and cannot change their location due to deteriorating conditions in the area or the emergence of more favorable conditions elsewhere. Therefore, it is necessary to change the mentality of local authorities so that they focus on maintaining and developing existing production capacity and reducing obstacles to the functioning of existing industries.

Attracting new investors is a very difficult task, associated not only with the creation of attractive conditions, but also with the active marketing of potential locations for new businesses. Creating attractive conditions in regions, cities and rural settlements is also important for the local population.

Competitive advantages are sources, factors of competitive force of the territory. In the scientific literature there are various theories of factors of competitive advantage of the territory. Thus, M. Porter proposes a rhombus model as a model of competitive advantage [5]. Ensuring the competitiveness of countries is carried out, according to M. Porter, on the basis of the so-called «diamond rule», ie creating four basic prerequisites that the state tries to maintain for its economy: conditions for factors, demand, related and supportive

industries, sustainable strategy, structure and rivalry.

These elements are closely interrelated, and the action of one of the components often depends on the state of the other three. Creating an enabling environment, such as a growth-friendly macroeconomic environment, job creation, a stable society, a tax and legal system that encourages business development and job creation, is needed to make sustainable development more sustainable. Thus, D. Sepik's work offers 11 factors that, according to the author, describe the competitive advantages of the territory [6]: clusters; human capital; existing enterprises and networks; innovations or regional innovation systems; management and institutional capacity; branch structure and type of enterprises; infrastructure in a broad sense; typology of regions and the level of integration of enterprises; internationalization and nature of foreign direct investment; geographical location; investment attractiveness. The author draws attention to the fact that the prerequisites for regional (territorial) competitiveness are created at the national level.

In theoretical terms, indicators of competitive properties by source of geopolitical status can be:

- proximity to developed or developing regions of the country and the world;
- proximity to significant sources of demanded minerals;
- proximity to recreational resources or tourist attractions;
- military-strategic importance of the region;
- administrative status or status of the territory in the country or in the world;
- special climatic or geodetic conditions that distinguish this place from other locations of production, residence, visits.

The resources of factors of production include labor resources, land, natural resources, commercial premises, provision of electricity, water, heat, gas, sewerage and municipal treatment facilities.

Due to their special importance, scientific and innovative potential, transport and information infrastructure, and financial capital have been removed from the group of «resources of factors of production» into separate groups. This is due to the fact that the name of the group of factors is currently a special concern of the territory in its strategic development and are in demand from

consumers. The importance of competitive advantages on these factors is of particular importance in transforming the regional structure of the economy in the direction of modern, innovative and informational.

It should be borne in mind that the current demand for competitive factors of production is increasingly shifting from universal (land, labor, energy, raw materials) to specific and highly specialized.

Regarding the factor «economic structure development, specialization and cooperation, clusters»: a modern, rather high-tech enterprise cannot exist separately, because it will be very expensive. It is expected to be located in or near a large city to be able to cooperate with other companies and use various services of financial, legal and administrative structures.

Scientific and innovative potential and mechanisms for their support are the most modern and promising source of competitive advantage. The most developed countries are trying to increase their scientific and innovative potential, because it is a factor in creating fundamentally new products to upgrade and improve the quality of products, inventing new technologies to increase productivity and reduce resource costs. The scientific and innovative potential of the territory helps enterprises to update products more often, reduce their cost, ie use these competitive properties of the place to strengthen their competitiveness.

Transport and information infrastructure is very important for the development of any region. Here it is necessary to assess the internal transport and information infrastructure, which is necessary for the effective functioning of the socio-economic complex of the region or city, as well as external, intercity and interregional infrastructure.

Regarding the group of factors «Demand potential for goods and services, domestic and foreign consumers»: regions that have significant potential for consumer demand (meaning not only the population but also enterprises), have significant attractiveness for both trade and production goods and services.

Living conditions are one of the most significant sources of competitive advantage, the higher the quality of life, the more interesting the region for residents, migrants, students and tourists. For companies, it also has economic and social significance. When



choosing a place for a new company, foreign investors must take into account the living conditions of managers and specialists who will come from the investor's country.

Effective management on the territory is a powerful source of competitive advantage.

Cultural, historical and tourist potential provides special competitive advantages of economic and social nature, which affects the interests of residents and tourists, provides a significant inflow of income into the region. This also has a certain significance for attracting investments in the creation of enterprises.

Good environmental conditions are an important competitive advantage for the population of most consumers in the area, although production is not always interested in increasing the cost of environmental protection, because it increases the cost of production. However, such enterprises may also benefit from increased environmental requirements, because it encourages them to develop innovations and save resources, upgrade products, improve its quality.

According to the theory of competitiveness of nations proposed by M. Porter, the key factors in the formation of competitive advantages are factor conditions, demand conditions, the activities of related industries and strategies of individual enterprises. Accordingly, the competitive growth of the country and a separate territory should be divided into four stages: 1) the stage of factors; 2) stage of investment; 3) the stage of innovation; 4) the stage of wealth. The globalization of the world economy is changing the requirements for the formation of competitive advantages, as a significant amount of means of production, information and financial resources, human resources due to migration processes, market conditions are constantly changing, many world leaders are losing their positions, new global production centers are being formed. assortment groups of goods and services [7].

High competitive properties of the region provide additional inflow of development resources (capital, labor resources, etc.) and increase their efficiency. Therefore, it can be assumed that the competitive advantages of the region allow to attract more resources for development or contribute to the growth of results per unit of resources. The development of the innovation sphere is also a

competitive advantage, because it contributes to the growth of labor productivity and the achievement of social results, ie competitive advantages are a general condition for the development of the region.

Given the above, competitive advantages can be understood as the competitive potential of the territory, which provides the possibility of its additional development by increasing its demand in conditions of free competition. We consider the competitive potential of the territory to be a set of competitive advantages and attractive characteristics of the territory, which contribute to the efficient use of available and external resources, and distinguish the territory among other subjects of competition for its opportunities for effective socio-economic development.

The next step in the formation of the theory of regional development is to identify the importance of the social factor, in particular social capital, without which regional innovation networks can not be effective. Today, this issue is more developed by foreign researchers [8, 9]. They prove that the trust created on social capital can become a factor of business stabilization and a basis for innovative development of territories.

As a factor of territorial development, social capital is considered only at the beginning of the XXI century. Today the foundations of the theory of social capital of the territory as a new theory of regional development are being laid. Its application in practice takes a long time, determines the strategic measures and understanding of the importance of integration and the relevant own starting points. In foreign countries, this issue is already receiving considerable attention, while Ukraine is still focused on rapid results, and its policy is little focused on establishing various networks of cooperation [10].

For the territories of Ukraine seeking to increase their competitiveness in national and global markets, the choice of business region formation strategy requires the creation of special management mechanisms that ensure effective use of existing socio-economic potential and mastering the methods of network interaction. To solve this problem, there are three conditional forms of competition of territories and their corresponding forms of competitiveness, representing certain subject-object relations and relations in different conditions of regional economic development.

These are: economic competition; spatial competition; network competition [11]. The specifics and features of the forms of competition of the territories are presented in Table 2.3

*Table 2.3*

**Features and forms of competition of territories**

Signs	Forms		
	Economic competition	Spatial competition	Network competition
The subject of competition	Large enterprises	Local authorities	Regional networks of government and business
Object of competition	Costs and profits of enterprises	Competitive advantages of the territory	Public and private investments
Competition goals	Growth in production of goods and services	Creating favorable living conditions and creating a business	Capitalization of the territory
Area of competition	Territory space	Territory space	Interregional economic space
Factors of competition	Natural, financial, labor, etc.	Natural, financial, labor, etc.	Flows of capital, goods and resources
The nature of regional policy	Industrial	Alignment policy	Innovative and structural
Regional policy instruments	Subsidies	Subsidies, transfers, taxes	Grants, investments

In modern conditions of socio-economic development, Ukrainian regions are involved in all three forms of competition. Therefore, given the specifics of regional development, the main task of the authorities is to implement socio-economic policy that allows to create and develop competitive advantages that shape spatial and network competitiveness by stimulating network interaction of regions as a necessary condition for creating business regions. Of particular importance is the formation of financial factors of competitiveness [12].

Considering the management of competitive development of the territorial economic system, it is necessary to take into account a

certain dualism of this category: on the one hand, the territorial economic system is an integral part of the national economic system with its inherent patterns of development; on the other – the territorial economic system – the bearer of regional interests and motivations, which determines the specifics of its management processes.

Management of competitive development of the territory is a specific area of management, the set of elements of which in their relationship is a system of coordination and regulation of economic activity to ensure the competitiveness of the territory through the use of appropriate techniques, methods, procedures and tools.

The management of the process of competitive territorial development can be based on the following principles of modeling:

- principle of monitoring;
- the principle of balance of interests;
- the principle of consistency;
- the principle of maximum consideration of external factors.

The principle of monitoring provides assessment and systematic analysis of data on the implementation of the tasks of competitive development of the territory, development of development scenarios, substantiation of recommendations for territorial authorities to achieve the goals of competitive development. The principle of balance of interests involves taking into account the interests of all subjects of market relations operating in the territory. The principle of sequence is the consistent operation of all functional subsystems (analysis, planning, implementation, control). The principle of maximum consideration of external factors is due to the need to take into account all the factors that affect the achievement of the parameters of competitive development of the territory, which is a condition for forming a management model adequate to the goals and objectives of development.

Thus, competitive advantages are sources, factors of competitive potential of the territory. Factors that characterize the competitive advantages of the territory include: clusters; human capital; existing enterprises and networks; innovations or regional innovation systems; management and institutional capacity; branch structure and type of enterprises; infrastructure in a broad sense; typology of regions and the level of integration of enterprises;

internationalization and nature of foreign direct investment; geographical location; investment attractiveness. In general, for modern conditions of development requires 10 sources of competitive advantage of the territory: geographical location, economic and cultural-historical image of the territory; resources of factors of production; transport and information infrastructure, developed economic structure, specialization and cooperation, clusters; scientific and innovative potential and mechanisms of their support; ecology; cultural-historical and tourist potential; demand potential for goods and services, internal and external consumers; living conditions; management efficiency.

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**CORPORATE  
STRUCTURES ARE A  
SOURCE OF INCREASING  
THE COMPETITIVENESS  
OF SMALL AND MEDIUM  
ENTERPRISES**

Whatever the competitive confrontation in terms of origin or other classification features, management perceives it mainly in the form of significant divergent influences, under the influence of which there are threats of deterioration of the enterprise compared to the external environment or the results predicted by the owner.

In fact, this means that for the sake of growth and development, the company must continuously diagnose its current capabilities in the context of the effects of endogenous and exogenous factors. The conclusion is especially relevant for small and medium-sized enterprises (SMEs), which are not easy to withstand without external assistance very unfavorable for each of them the external environment. Confirmation is in Table 2.4 [1].

With the help of the survival indicator, it is possible to form an idea of how many newly established enterprises remain in working order for a certain period of time and how many of them cease economic activity. As we can see, many newcomers fail and find themselves «out of the game» in the first five years of existence. The second year of the life cycle is especially difficult for them.

Moreover, the bulk of bankruptcies or liquidations occur in enterprises with the number of employees from 1 to 9 people (Table 2.5) [1].

*Table 2.4*

**Enterprise survival indicator, %**

Country	Firms (enterprises) that remained in working order after their organizations for, years		
	1 year	2 years	5 years
France	84	62	48
Germany	86	70	63
Ireland	91	70	57
Italy	87	66	54
Portugal	76	56	47
Great Britain	87	62	47

Thus, it becomes clear: in a market economy, any enterprise, and small and medium in particular, simply have to take care of improving their competitiveness. It should be noted that competition, if we consider it from the standpoint of a systems approach, is accompanied by a set of negative influences from suppliers, consumers, substitutes, competitors (Figure 2.1) [2].

Changes in the nature of the relationship between the enterprise and the elements of the external environment attract attention. To some extent, they are due to the constant «drift» of the latter in the direction of deteriorating business climate (depletion of traditional energy sources, inflation, growing environmental problems, etc.). The heritage of history has become: the traditional (almost conservative) location of consumers to selected once and almost forever suppliers of products (services) and the slow movement of information flows, which were the key to long-term stability and profitability of the business. With the development of computer technology, globalization of the market space, restructuring of the transport infrastructure, the business environment is becoming less inert and predictable.

The use of the latest telecommunications, which has fantastically accelerated the exchange of data, has radically changed the conceptual essence of a number of areas of business: information about the chance to gain a competitive advantage in a particular

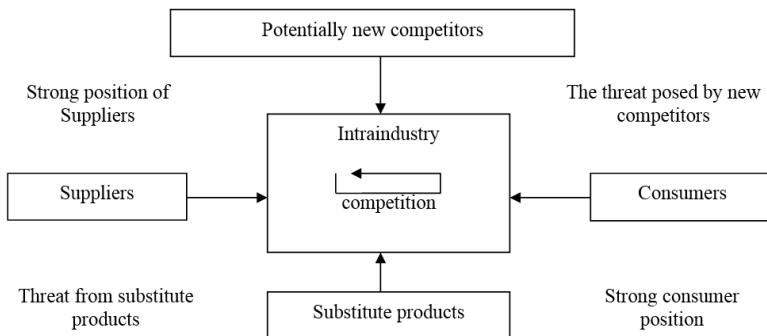
segment becomes almost instantly available to those who can and, most importantly, seek to use it.

Table 2.5

**Liquidation of small and medium enterprises**

Country		Number of employees, people				
		1-9	10-49	50-99	Less than 500	Total
Belgium	Liquidated, units	5637	431	43	24	6135
	Share of liquidations,%	92	7	0,7	0,3	100
	Share in the total number of enterprises,%	84,5	12,9	1,3	1,3	–
Finland	Liquidated, units	5738	754	43	32	6597
	Share of liquidations,%	87	12	0,6	0,4	100
	Share in the total number of enterprises,%	94	5	0,6	0,4	–
Italy	Liquidated, units	13352	2344	232	88	16016
	Share of liquidations,%	83	15	1,5	0,5	100
	Share in the total number of enterprises,%	94,2	5,2	0,3	0,3	–
The Netherlands	Liquidated, units	3590	806	39		4435
	Share of liquidations,%	81	18	1		100
	Share in the total number of enterprises,%	88	10	1,1	0,9	–
Sweden	Liquidated, units	175457	1137	89	41	18724
	Share of liquidations,%	93	6,3	0,5	0,2	100
	Share in the total number of enterprises,%	94,6	4,4	0,5	0,5	–





**Figure 2.1 Threats arising from market confrontation**

With an increase in the supply that can satisfy the needs of customers, their loyalty to unwavering brand names decreases in inverse proportion. Suffice it to recall the fiasco of the famous «Coca-Cola» in America during the spread of the idea of «dosed calorie intake». The popular drink, from the point of view of supporters of a healthy lifestyle, turned out to be overly saturated with sugar.

The theory and practice of marketing offers a number of measures aimed at increasing competitiveness, which are posteriori built into the logic of the respective strategies (Table 2.6).

Obviously, each of them is far from fully taking into account the peculiarities of small and medium-sized businesses, since it presupposes that business entities have significant funds.

That is why we are convinced that an important prerequisite for increasing the competitiveness of small and medium-sized enterprises is the creation, on their initiative and with the direct participation of corporate associations.

The course towards the integration of small businesses is accompanied by the transformation of their links with the main components of the marketing environment.

First, there is a unique transformation of its external part into an internal organizational one. A mechanism is emerging for using such opportunities that were previously not available: each small business had its own individual marketing strategy, and from now on its effectiveness is enhanced by a new, corporate understanding of the best directions for moving towards the set goals.

Table 2.6

**Examples of types of competitive strategies**

View	Characteristic
Low costs	The maximum possible reduction in the cost of production and marketing of products, thereby ensuring reasonable prices for goods without compromising the quality of products
Differentiation	Creation of an offer that would be significantly different from the alternative and the formation of this account of an autonomous demand for your product
Concentration	It involves careful segmentation of the market with the subsequent selection of that part of it that is able to satisfy the enterprise's claims regarding the desired amount of profit and focus on it the entire arsenal of available marketing tools

Secondly, the relationship between former competitors is changing: those small enterprises that have become part of the corporation acquire complementary, complementary interests. It is undeniable that the corporate structure does not completely eliminate the adversarial aspects in the business coexistence of the participants, but they lose their once defining role. This means that scarce resources of small and medium-sized enterprises are no longer spent on neutralizing the actions of opposing marketing tools, but on creating a complex image that meets competitive prices, product quality and, at the same time, stability of work due to the increased market influence of the corporation. The considered metamorphosis can be considered qualitative.

At the same time, there are also quantitative changes. They are not accompanied by a change in the organizational, legal or economic and financial status of each of the enterprises, but are associated with a rebalancing of the balance of power between different participants in the marketing space: those small enterprises that have become part of the corporation and those that have remained outside it. It is quite possible to expect the results of the competition in favor of the first group of firms. Therefore, it is not surprising that in the United States of America, strategic economic alliances covered up to 55% of companies in the electronics industry, and in the field of research and advanced technologies – over 70% [1].

New motives appear in relations with consumers. As a result of the alignment of marketing behavior, the corporation better meets their needs. For example, due to the cheapening of the cost of the offered goods, just as it happens in clusters – territorial-sectoral voluntary associations of enterprises that cooperate with scientific institutions, public organizations and local authorities to increase the competitiveness of their own products and contribute to the economic development of the region.

This approach to business organization involves the rejection of centralized influence; compliance with the conditions of an equal, loyal business partnership regulation regime; introduction of new progressive technologies [1]. In the world economy, the level of «clustering» has reached high levels.

So, in the USA only in the processing industry and the service sector there are about 380 of them. The clusters employ 57% of the country's labor force and produce 61% of the industrial output [3].

The first experience of creating clusters in Ukraine has been accumulated in the Khmelnytsky region. Four such associations cover food, processing, clothing, construction and tourism industries. In a generalized form, the directions of transformation of the business environment as a result of the implementation of the corporate marketing strategy are presented in Figure 2.2.

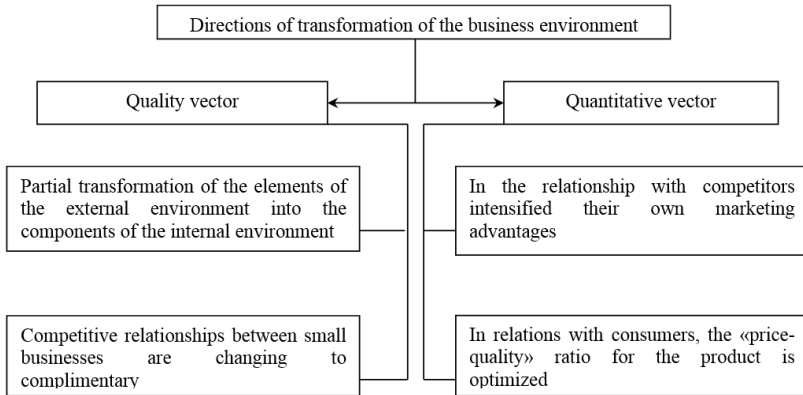
From a methodological point of view, the essence and genesis of competitiveness and competitive advantages in integrative business communities can be explained in the context of several scientific theories. The first is the theory of transaction costs.

Ensuring the competitiveness of a business requires the use of assets, some of which have limited suitability for other purposes:

- highly productive or special machines;
- technological equipment;
- know-how;
- state licenses;
- the structure of the authorized capital;
- a trademark (brand) is registered;
- the qualifications of the workforce and the like.

Market transactions involving specific assets are risky for the operator who invests in them, since antagonistic behavior on the part of the partner can lead to the loss of part of the income that rightfully

belongs to the investor.



**Figure 2.2 Consequences of coordinating marketing strategy in small business corporations**

Market transactions involving specific assets are risky for the operator who invests in them, since antagonistic behavior on the part of the partner can lead to the loss of part of the income that rightfully belongs to the investor.

The prospect of such a danger either hinders investment in economic development or encourages their implementation within the framework of integrated, coordinated, and therefore more or less predictable corporate structures that unite small and medium-sized enterprises that seek to gain competitive advantages due to the access to specific assets that has opened up for them. Indeed, if the market environment does not promote the most efficient use of production capacities, and the sale of surplus machines, equipment, buildings, structures is impossible due to insurmountable technical, economic or legal obstacles, then the organization of joint access of several users to such «inconvenient» – that time assets. Of course, with agreed and strictly observed operating rules.

An eloquent confirmation of this is the experience of using complex agricultural machinery, accumulated by small and medium-sized farms in foreign countries. These are «neighborly help» in Germany, and «exchange circles» in Luxembourg, France and Poland, «agroservice circles» in Canada, «machine lists» (Sweden), «machine rings» (Austria, Luxembourg, Germany). In the

aforementioned cases, the concerned owners reduce the outflow of circulating assets serving production for the acquisition of the necessary (but only temporarily) equipment; reduce individual service costs.

In Germany, for example, there are about 200 farmers' associations for the use of agricultural machinery and providing assistance to farmers. They comprise 20% of all farms, which cultivate 30% of the useful agricultural area. But in Poland, where the agricultural sector is dominated by small family farms, in 40% of them, without the help of agricultural circles, growing products would not only be difficult, but, in all likelihood, even impossible [4].

This is, so to speak, an exogenous explanation of the corporate aspects of the development of small and medium-sized businesses. At the same time, they also have an endogenous nature associated with the regularities of the dynamics of the internal environment of the enterprise, which predetermine the desire of business entities to move from an individual defense strategy to a general attack on sources of unfavorable influence. In such circumstances, we are talking about the desire to gain advantages no longer in product competition, but in business management competition (management competition).

We emphasize: the synergistic effect extends to the diversification of production in its sacramental understanding (the spread of marketing presence on the sales markets of products, the production of which is absolutely not related to the existing specialization), and to horizontal integration, as well as to relations that can be identified as vertical coordination. An example of this kind is the experience of the agro-industrial concern «Kolos», created in the city of Berezan (Kyiv region). It unites 55 agricultural enterprises employing 60-300 people, which cultivate from 1.5 thousand to 3.5 thousand hectares. agricultural land. Let's pay attention: when the unprofitability of crop production in the Kyiv region reached 18%, and even more – 41% of livestock production, the farms participating in the association and their contractual partners had quite satisfactory business results (Table 2.7).

Table 2.7

**The results of the economic activities of the participants of the agro-industrial concern «Kolos»**

Indicators	Groups of member companies by the duration of their joint activities				
	4 years and more	2-3 years	1-2 years	up to 1 year	Kyiv region
Number of farms in the group	12	17	11	15	55
Indicators of economic activity					
Gross production per 1 ha of agricultural. land, UAH	1277	989	863	679	598
Productivity, c / ha:					
– cereals	30	29	28	27	26
– sugar beet	248	232	218	182	175
– sunflower	13	11	11	10	9,3
Milk yield from a cow, kg	2736	2428	2209	2103	1820
Profit per 1 ha of agricultural. land uah	29,7	24,5	17,4	-10,4	-170
Profitability,%	17,5	12,0	6,3	-9,4	-18
Average monthly salary of employees, UAH	183,0	141,3	127,1	90,2	93

*Source: [5]*

As you can see, the common sources of synergistic effect from the combination of the activities of small enterprises include a decrease in costs per unit of output while increasing the volume of its production. It is characteristic that the rates of positive dynamics grow in «Kolos» in proportion to the length of time the participants are in the corporate ranks. The same happens with marketing activities, which within the corporation require less funds than the sum of the individual expenses of isolated small businesses. Including, for example, through the use of special resources, access

to which in some small businesses is complicated due to their significant cost.

An important source of synergistic effect should be considered the reduction of losses from the prevention of cases of using insufficiently balanced elements of the technological process, which increase the total coefficient of their efficiency.

Complementary relations between operators can be deepened by improving the transfer mechanism between successively combined technological stages (in terms of synchronizing their interaction in time, balancing the output indicators of the previous stage with the required values of the input indicators of the next, etc.). So, for example, as it happens in enterprises involved in the baking of bakery products. Various forms of combining the stages of processing raw materials have become widespread here:

a) elevator (grain-receiving enterprise) – grain processing units (cereals, flour-grinding);

b) elevator – grain processing units – feed mill (shop).

In this case, a significant reduction in the cost of the oncoming transportation of goods helps to reduce the overall logistics costs and, as a result, the cost of production. Hence – a direct road to gaining advantages over competitors in the sales market, especially in the context of a rapid rise in food prices.

Another useful distribution scheme is organically linked to the system of transfer prices for products circulating within the corporation. With a technologically consistent type of communication between operators, their characteristic relationships can be called vertically complimentary. If (unlike the previous one) the type of technological connection is differentiated, then we are talking about a horizontal business partnership. Its continuation is strategically connected alliances: holdings, financial and industrial groups, business associations, as well as various cooperatives.

From the point of view of positional theory, the reason for the increased competitiveness of corporations lies in the advantageous structural and functional placement of the enterprise among competitors and its ability to defend its positions by establishing or skillfully using permanent or temporary barriers to «market counterparts» while changes in production technology and customer needs will not erode the always relative economic advantage.

Corporations of small and medium-sized enterprises create additional prerequisites for this: they form an internal corporate culture; a system (including a hidden one) of organizational knowledge and learning, for which there was no place in each individual enterprise; provide member firms with a positive reputation that translates into additional income for them

The task of the third theory – the resource theory – is to establish the conditions under which the means of production become the basis for the formation of the enterprise's competitive advantages. The main hypothesis in this case is based on the assumption of uneven distribution of resources among competing business entities. Practice confirms its validity. For example, here is how the distribution of agricultural commodity producers looks in accordance with the size of the lands they cultivate in the Mykolaiv region (Table 2.8).

As you can see, 185 farms (which is 4.1% of their total number) have at their disposal almost 55.7% of the cultivated area. The most massive category – 3442 farms – uses only 23.5 hectares of land per one of them.

The heterogeneity of the resource base, in turn, means that small and medium-sized enterprises that are part of corporations have the opportunity to improve the efficiency of using their assets. And since the latter has an inherent property to accumulate over time, it is logical to assume that some enterprises will gradually form optimal combinations of different resources and find the best use for them, which, among other things, may represent some kind of entrepreneurial know-how.

The results of using these resource combinations are the basis of competitive advantages, which ultimately lead to additional income.

It is clear: if the supply of resources is not able to meet the existing demand, those of them that have relatively lower quality parameters fall into economic circulation. As a result, successful entrepreneurs will receive rents (based on obvious competitive advantages). Naturally, this kind of effect is impossible if the struggle for scarce resources is not limited by anything. Under these conditions, the price for them will rise so high that the rent will be in the hands of the owners of capital, while the entrepreneur-users (tenants, for example) will remain, as they say, with their own



interests. It is known, for example, that commodity producers are forced to pay for harvesting agricultural products with 18-22 percent of the grown crop.

*Table 2.8*

**Distribution of operating agricultural enterprises by the size of agricultural land in the Mykolaiv region [6]**

Area, ha	Number of farms	Share, %	Total area, ha	Share, %	In calculating the per farm, ha
No land	145	3,3	-	-	-
Up to 50.0	3442	68,4	80867	7,0	23,5
51-100	343	7,7	24246	2,1	70,7
101-500	446	10,0	106605	9,2	239,0
501-1000	149	3,4	106242	9,2	713,0
1001-1500	89	2,0	111294	9,6	1250,5
1501-2000	48	1,1	82693	7,2	1722,8
2001-2500	60	1,4	131386	11,4	2189,8
2501-3000	42	0,9	115222	10,0	2743,4
3001-4000	36	0,8	127502	11,1	3541,7
4001-5000	20	0,5	88136	7,6	4406,8
5001-8000	23	0,5	136439	11,8	5932,1
8000-10000	2	0,0	19355	1,7	9677,5
More than 10,000	2	0,0	24257	2,1	12128,5
Total	4302	100,0	1154244	100,0	238,3

From the point of view of the resource theory, the conditions for an enterprise to achieve permanent competitive advantages rather accurately reflect the ways to increase the competitiveness of small and medium-sized enterprises in the event that they create a common corporate structure. First, given the specific nature of the activities of

these enterprises, there is reason to consider the resource potential of the corporation, in a sense, unique. This means that no synergistic relationship between resources can be borrowed by competitors, since their resource base differs from that which was at the disposal of the newly formed corporation. Secondly, the rent from competitive advantages could not be preliminarily «diluted» due to the struggle to obtain it, since it was simply absent before the creation of the corporation. There were only owners of some resources that could potentially be integrated. Naturally, the likelihood of a synergistic effect is envisaged and taken into account by small enterprises (which, in fact, becomes the main motive for creating a corporation), but its specific value is preliminarily estimated, as a rule, exclusively at the level of working hypotheses.

These conclusions are confirmed by the experience of technoparks, which have become widespread in the world since the end of the 70s of the last century in the form of compactly located complexes of research and development institutions, educational institutions (in Ukraine – not lower than the fourth level of accreditation), production (as a rule, – venture type) enterprises, information, service and exhibition centers. The main purpose of technoparks is to create conditions for the commercialization of the results of research and development and the formation, due to this, of an autonomous demand for innovative products that can satisfy the avant-garde demand of consumers.

Technopolises have similar tasks – technoparks, in fact, geographically located on the territories of small settlements, the inhabitants of which are in one way or another connected with the generation of ideas for innovations and in every possible way contribute to shortening the «research-production» cycle. One of them is the «Rural Owner» resource and information center, which operates in the Stryi district of the Lviv region. Among the tasks that he solves, there are, in particular, the following:

- development and organization of production of our own competitive products (services) on the domestic and foreign markets, the introduction of environmentally friendly technologies for the production of agricultural products, raw materials and products of their processing;
- information support and coordination of activities to research

the current conjuncture of agricultural markets;

- study of the state of organization of agro-industrial production in the region, preparation of proposals for cooperation, integration of production and sales of products;

- placement of investments (including renewal of fixed assets, development of scientific and technical products, intellectual values, other property objects).

Summarizing the views on the sources of permanent competitive advantages that correspond to the resource and positional theory, we can formulate their common basis: such a source in both cases is the restriction of competition. It (regardless of the reasons) predetermines the possibility of receiving rent. The barriers to competition provided for in the positional theory are formed at the level of enterprises and their types of activities, as well as states (when it comes to international marketing). The combination of these obstacles underlies the distribution of competitive advantage among enterprises.

There are also differences between the above concepts, which, in our opinion, lie in the nature of obstacles to the development of competition. An obstacle may be, for example, imperfect resource or product markets. So, with the competitive advantages caused by the peculiarities of the attracted resources, there are restrictions on the purchase and sale of those that belong to the category of unique. For example, due to imperfect information support of the relevant transactions: either the seller cannot convince the buyer that the resource provides a special benefit, or he himself is not sufficiently aware of this. Positionally determined advantages are caused by the uneven distribution of economic power in the market for final products. At the same time, a certain complementarity is inherent in these views. In particular, because positional theory deepens the understanding of the nature of the resources that small and medium-sized enterprises and their associations need to maintain competitiveness at the proper level. While the resource theory outlines the special organizational and economic conditions necessary for the effective acquisition and accumulation of these resources. In addition, the categories of resource rarity and the possibility of its substitution, although they relate to the resource theory, reveal their content only in the context of comparison with

the structure of assets of competing enterprises. Similarly, the identification of attractive industries and competitive positions loses its meaning without taking into account the specific production capabilities of certain small and medium-sized enterprises, since it is with their help that management is able to determine whether an enterprise has a chance for a successful market expansion in a new business area.

Both theories state that the threat to the competitiveness of a firm is contained in product and resource substitutions associated with the development of innovative technologies and, as a consequence, with unpredictable fluctuations in consumer tastes, a decrease in the cost of manufactured products, or the creation of new attributes attractive to users in the product. It follows from this that the competitive advantages due to the combination of resources are under constant threat of destruction, since the replacement of only one of them (not even the most important one) can negatively affect the foundations of the viability of the entire system and lead to the disappearance of such a desirable synergistic effect. To resume it, it will be necessary to create a new configuration of the entire resource base of the corporation of small and medium-sized enterprises.

From the point of view of resource and positional approaches to solving the problem under consideration, the market status of corporations of small (medium) enterprises directly depends on whether competitors can imitate unique combinations of resources and advantageous market-structural positions of the enterprise, which currently occupies priority positions. Obviously, protection from this danger should be the continuous cultivation of the features of the resource system, the ways of their use and the organization of market transactions in accordance with the specific positions of the producer in the external business environment.

Considering the essence of competitive advantages due to a synergistic combination of resources in corporations of small and medium-sized enterprises, let us pay attention to the factors that complicate their imitation by rivals:

- lack of the necessary knowledge of competitors (including those related to the development of the imitation mechanism) and resources;
- lack of motivation, since an attempt by a competitor to

penetrate the market segment, which is served by enterprises united in an association, will automatically lead to a change in the balance of supply and demand, as a result of which price advantages will be lost, and, consequently, the prospects for obtaining super profits;

- legal restrictions established by state bodies in the form of compulsory obtaining of licenses, patents; registration of trademarks;

- the so-called «switching costs» that inevitably accompany the initiator of the reorientation to another area of activity;

- the problem of achieving a synergistic effect in a too short period of time - the rival often has to go as long as the corporation;

- the positive impact of the accumulated mass of assets, when the synergistic effect is formed due to the current availability of a significant amount of resources of this type that meets the specifics of production (that is, in an effort to repeat success, a competing enterprise is forced to accumulate a corresponding stock of similar assets);

- the integrity of the structure of assets, which predetermines the emergence of a synergistic effect through the relationship of assets of different types. If a competitor has a similar asset structure, imitation will not be accompanied by the expected useful results.

The previous considerations lead to the conclusion that the competitiveness of small and medium-sized enterprises in connection with joining a corporation should increase. Otherwise, it makes no sense. In this regard, there is an urgent need for management to quantify the consequences that occur after the owner or manager of the enterprise makes a fateful choice in favor of integration. It is possible to assume that the coefficient of integration expediency can serve as a means of solving ( $K_{uy}$ ), which is calculated as follows:

$$K_{uy} = \frac{I_{\kappa}^2}{I_{\kappa}^1} \rightarrow \max \quad (2.1)$$

where:  $I_{\kappa}^1$ ,  $I_{\kappa}^2$  – an integral indicator of the competitiveness of an enterprise before and after the creation of a corporation, respectively.

It's obvious that  $K_{uy}$  will satisfy the entrepreneur if its value exceeds one (and the more, the better). In other words, if  $I_{\kappa}^1$  –

enterprise competitiveness at the moment  $t_1$ ;  $I_k^2$  – enterprise competitiveness at the moment  $t_2$ , a  $t_2 > t_1$ , to  $I_k^2 > I_k^1$  – the result of the positive influence of the corporation on the participating enterprise, and  $I_k^2 < I_k^1$  – the result of unexpectedly negative consequences. In view of the above approaches to identify the factors that affect the competitiveness of the enterprise, we propose the following method of calculating the index  $K_{uy}$ :

1. Determination of individual indicators of the competitive ability of the enterprise ( $I_i^{nk}$ ): absolute sales volume; relative market share; market growth rates; profit from product sales, etc.

2. Naturally, in real time for the owner or manager of the enterprise, the role of this or that indicator will not be the same. Therefore, the next step is to assess the relative importance (weight) of each of the individual indicators. –  $q_i$ .

3. Calculation of the integral indicator of competitive ability  $I_u^k$  is executed using the following expression:

$$I_u^k = \sum_{i=1}^n I_i^{nk} \times q_i, \quad (2.2)$$

where:  $n$  – number of indicators taken into account in the calculation  $I_i^{nk}$

It is well known that the competitiveness of an enterprise is a relative indicator and provides for a comparison of the positions it occupies with those of competitors. At first glance, one might get the impression that the proposed methodology ignores this approach. Meanwhile, an in-depth analysis shows that it is possible to increase sales, market share or market growth rates only by squeezing out rivals in the struggle for a benevolent (solvent) attitude of buyers. Note, further, that when developing the above methodology, we tried to achieve maximum simplicity and accessibility for potential users, as well as universalization of its application in enterprises with different forms of ownership, business size and industry.

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## Chapter 3

# INNOVATIONS AND MODERN TECHNOLOGIES IN THE ECONOMIC SYSTEMS MANAGEMENT

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**INNOVATIVE  
ECOSYSTEM AS A  
MODERN PARADIGM OF  
INNOVATIVE  
DEVELOPMENT OF  
UKRAINE**

Openness and accessibility of information sources, the special role of intellectual resources, a manifold increase in the importance of knowledge, the high importance of education, high-tech production, nanotechnology, an innovative way of economic development are integral features of our time.

The key factors in the development of the modern economy are: a favorable macroeconomic structure, modern information infrastructure, human resources development and an effective innovation system. However, in order to achieve the desired level of development, it is necessary to improve the institutional framework of the economy, promote transparency and develop competition. As you know, in a competitive environment, innovation is born. And here the role of the state is not to directly regulate the economy, but to assimilate the development of market mechanisms and create conditions for the introduction of new technologies by companies.

Ecosystem approach is the dominant approach to building an innovative development model worldwide. The basis of this approach is to build relationships between participants in the innovation process similar to the natural ecosystem, the development of which occurs through the interaction of its components.

The concept of «ecosystem» is known to everyone in the course of biology. In the most general form, the ecosystem is «a relatively



stable system of living and inanimate elements of nature, between which there is a constant cycle of substances, and the properties of metabolic processes between them acquire stable links» [1]. Over time, the use of the term «ecosystem» has become appropriate for communities characterized by similar functions and structure.

The ecosystem concept includes the concepts of «business ecosystem» and «innovation ecosystems», which already has a long history of application in the scientific literature. The concept of the innovation ecosystem was developed by the American scientist Dr. Charles W. Wessner. The main purpose of this concept is to transform scientific knowledge into innovation through the cooperation of efforts of various participants in the innovation process: universities, private enterprises, venture funds, etc.

The subjects of the innovation ecosystem are the state, entrepreneurs, researchers and scientists, scientific communities, innovation managers and investors.

An entrepreneur is a subject looking for innovative ideas and responsible for their implementation in practice [2]. According to J. Schumpeter, such an entrepreneur, along with the functions of an innovator, also performs the tasks of a leader.

The main function of universities is educational, upbringing, developmental. The university has advantages over other institutions of higher education, as it is a multidisciplinary or branch institution that conducts innovative educational activities at the level of higher education of bachelor, master, doctor of philosophy, conducts basic or applied research, is a leading scientific and methodological center, has developed infrastructure of educational, scientific, production units, promotes the dissemination of scientific knowledge and conducts cultural and educational activities. Its functions are also to develop skills and abilities in creating appropriate conditions for education and merging of student business projects and startups. The scientific infrastructure of the university should promote the emergence of science-intensive and technological startups, the development of entrepreneurial spirit, include laboratories and research teams. As the practice of advanced countries shows, the importance of universities is constantly growing: software companies should be founded by programmers, media companies – specialists in the field of media, marketing – marketers, etc. In addition, it is the

students who have the advantage of intuitively understanding which market niches will show rapid growth in the near future. An example of a partnership between universities, science and business, an effective innovation ecosystem, is Silicon Valley in the United States, which is characterized by a high density of high-tech companies and leading universities – San Jose, Santa Clara, Stanford, University of California, Santa Cruz.

In Ukraine, the share of people who had completed higher education in 2019 was only 39.4%, while in 2015 it was 39.3%. Instead, the share of people who had primary general education and those who had no education at all – in 2019 increased to 29.2% (by 2.8% compared to 2015).

The share of researchers under the age of 40 in the total number of researchers decreased by 13%. The share of expenditures on research and development in GDP is constantly decreasing: from 0.55% in 2014 to 0.43% in 2019 [3].

In Ukraine today, lifelong learning based on the integration of life and learning is quite trendy.

With the development of innovative technologies and creative industry, we see a clear trend towards the growth of Ukrainian startups. It should be noted that such growth is characterized not only by quantitative indicators, but also by qualitative ones.

Today, the startup ecosystem is a unique environment in which economic players interact in one way or another with the startup industry: entrepreneurs, schools, governments, investors, corporations, and more. The uniqueness of startups lies in their functional nature and is characterized by rapid development, market strength, the highest focus on results, unprecedented interaction and cooperation between economic actors. The more actively and openly the ecosystem actors interact, the more opportunities there are for startups. Despite the pandemic, quarantine restrictions, the economic crisis and other disincentives, domestic startups continue to attract new investment.

A step forward in Ukraine was the creation at the end of 2020 of the Entrepreneurship University initiative with the participation of the network of startup business incubators YEP together with the Ministry of Digital Transformation, the Ministry of Education and Science and the Ukrainian Startup Fund (established in 2018),

supported by USAID Ukraine economy. 64 universities (including the University of Customs and Finance) from 29 cities of Ukraine, 108 teachers and 2,500 students took part in the pilot semester of the 2020-2021 academic year. As a result of the course, at least 10 startups have been created and university entrepreneurship has been brought to a qualitatively new level, as well as a trend to create startups among students [3].

Undoubtedly, the development of startups in Ukraine requires balanced and effective state support for small businesses in the field of innovation and venture investment. By the way, in 2020, five large and well-known existing ones – Venture, Genesis Investments and SMRK – will be joined by five new venture funds. Among the prospects for market development is the fact that the Ukrainian online market is not oversaturated in any segment. This gives Ukrainian companies the opportunity to occupy free niches and conduct successful competitive activities. And the number of domestic startups is growing every year. According to Startup Ranking [4], there are 310 startups in Ukraine today, three positions above the ranking are South Korea (327), Hong Kong (353), Portugal (359) and three positions below – Kenya (305), Hungary (298), Austria (289). In comparison, in the USA – 66318, India – 8933, Great Britain – 5468 startups.

Consultants are third-party, independent specialists in matters that are not within the competence of the entrepreneur.

The development of the nanoindustry will not follow without support at the state level. One of the main functions of the state is to create a favorable innovation environment.

There is a special case of technological entrepreneurship – corporate (internal), in the implementation of which it is corporations that are the main motivator, and most importantly the source of funding. Its goal is to build up intra-industry tools for generating innovations, commercializing them and introducing them into industry.

Capital is a fundamental factor in the further development of an innovative idea.

The ultimate goal of technology entrepreneurship is to replicate an innovative product on the market and, as noted above, customer satisfaction is one of the fundamental foundations of modern

management.

Clusters are a form of interaction, primarily at the technological level of various units in the market to achieve higher goals.

Technoparks are a way of obtaining new technological knowledge and combining existing information at the local organizational and structural levels. Technoparks are a kind of innovative enterprises.

In Ukraine, innovative enterprises also include technopolises, business incubators, and innovation centers.

There are three levels of innovation ecosystems, each of which includes the innovation ecosystem of the previous one: corporate; regional and national levels. The last level is considered from two positions: the national innovation ecosystem, the subjects of which are the sectors – education and science, society, business, state; and as a set of regional ecosystems.

Since the purpose of ecosystem formation is the creation and development of innovative enterprises, it is necessary to understand their place at each of the levels:

- The level of the corporation. All functions of the innovation ecosystem are performed by the company's internal departments, so innovation-active enterprises can exist as absorbed and as those that later became subsidiaries.

- The level of the regional ecosystem. Entities of this level: innovation managers, investors, researchers and scientists. Innovatively active enterprises are carriers of ideas that result from the work of the innovation ecosystem.

- Level of national (state) ecosystem. Innovatively active enterprises exist only by being within the corporate or regional innovation ecosystems that are part of the state.

Successful examples of innovation ecosystems at the national level are the innovation system of Finland, the USA, Canada, and Japan; regional – MIT (University of Massachusetts), Silicon Valley (Stanford University), New Jersey (Princeton University); corporate – IBM, Microsoft, Google, etc.

The experience of foreign countries proves that the key indicators of innovative development of the state are determined by the level of innovation activity of regional systems and economic entities. Analysis of theoretical postulates and scientific concepts allows us to

conclude that the innovative development of the state, industry, region, individual entity is characterized by the process of creating and implementing innovations, and innovative economy is based on the interaction of the triad «science – business – state». Chains of interrelations and mutual relations between participants of innovative activity (spin-off companies, business incubators, small innovative enterprises, educational and scientific organizations, venture business, economic sector, etc.) develop.

The functioning of the multilevel chain creates conditions not only for the formation and for widespread implementation of innovations, but also to ensure the development of innovation infrastructure. The world economy is actively forming a paradigm of innovative development, which is based on the most important economic resources of the modern world – knowledge (information) and innovation, which are a strategic factor in economic growth [5]. The modern paradigm of innovative development of Western countries can be described as one that meets all the conditions of its operation.

In particular, the main features of the innovation economy can be attributed to:

- Informatization of the national economy. Here, economic growth is ensured by high-tech production, the expansion of knowledge-intensive sectors, which ultimately leads to an increase in the share of innovative product in total.

- Innovative continuity, which implies the inexhaustibility of the most important economic resources of the innovative economy - information and knowledge. Innovation continuity determines the process of innovation movement, reduction of their life cycle due to the introduction of other innovations and updated products.

- Changing the status of man in the economy, the demand for creative work and creative thinking, not just physical capabilities.

- The predominance of intangible assets in the economy while qualitative transformation of material production. The use of intangible assets as a mechanism for assessing the commercial value of the results of innovation, intellectual labor and intellectual property allows economic entities to increase the knowledge of new goods and services (which increases their competitive advantage).

In turn, the ecosystem approach considers innovation systems at

all levels as living social organisms, prone to continuous variability under the influence of new motivations of participants and new circumstances. In this perspective, the innovation ecosystem looks not only as a dynamic set of organizations and institutions, but also as a mobile set of their multidimensional internal connections.

The ecosystem approach puts forward a number of important principles for economic policy, which differ from the usual innovation system. That is, if the former are regulated exclusively by the method of the top, by the action of the state on organizations and institutions, the ecosystem has its own, market mechanisms of self-development, it is guided by the method of the bottom, which creates preconditions for continuity of innovation processes. Secondly, the ecosystem approach focuses not so much on the participants of the system, but on the nature and dynamics of their interactions (with each other and with potential participants), emphasizing that collaboration provides the creation and diffusion of knowledge flows, transformation of these flows into innovation and further spread of innovations throughout the economy.

Considering the innovation system through the prism of state development, it should be noted that it has three system levels: the level of goods focused on the world market; the level of the enterprise, which has its own innovation ecosystem, production-oriented; the level of the state, focused on creating conditions for the development of innovation within the system of national interests - the state innovation ecosystem. At the same time, the conditions, mechanisms and tools for the development of the national innovation ecosystem are regulated by the relevant legal framework – which should be flexible and reflect the system of national interests of the state at a specific historical interval. First of all, in order to implement innovative activities designed to ensure the competitiveness of the national economy, it is necessary to form a comprehensive national innovation ecosystem. It can be represented as a basic element and infrastructural components. The basic element is the ideas, and the infrastructural elements ensure their implementation in practice, allow the subjects of innovation to interact, thereby ensuring the innovation process.

In general, the construction of the innovation ecosystem of Ukraine includes: first, changing the nature of the relationship

between the main participants in the innovation process (the transition from competition in the innovation sphere to cooperation and cooperation); secondly – transition from linear model of creation of innovations to nonlinear where dynamic horizontal communications between participants of innovation process dominate; thirdly, the creation of a network society, which provides for equal rights of each of the participants to have equal relations with others, as well as independence from space and time constraints and costs; and the fourth – creation of a collaboration of independent entities, in particular, suppliers, competitors, buyers, etc.

In addition, the values for consumers change due to the penetration of innovations into all spheres of life (Table 3.1). Drawing a parallel between consumer groups (1983 and 2020), we found that the share of innovators among consumers has increased almost fivefold, while the share of consumers who prefer product functionality has almost doubled.

*Table 3.1*

**The results of the EY Future Consumer Index study on the distribution of consumers according to their main priorities (sample – 14.5 thousand people (20 countries of the world), 2020) and distribution of consumers in accordance with the theory of diffusion of innovations by E.M Rogers (1983)**

The main characteristic value for a group of consumers	Share of respondents, %	The main characteristic of the product / service for the group	Consumer groups according to the theory of diffusion of innovations
1. Availability	32	Product functionality	Late perceivers (16%) Late majority (34%) Early majority (34%) Early perceivers (13.5%) Innovators (2.5%)
2. Health	25	Product safety	
3. Planet	16	Environmental friendliness of the product	
4. Society	15	Product development by honest and transparent enterprises	
5. Experience	12	New, interesting, branded	
Total	100	×	100

*Source: [6, 7]*

We note that to launch an innovative model of economic growth requires not only modern infrastructure (research centers, technology parks, development institutes, etc.), but primarily a horizontal – network environment of communication between all sectors and organizations. The presence of such an environment will contribute to the self-education of various innovation ecosystems, the totality of which forms the innovative landscape of the territory, where on the basis of the interweaving of different network environments powerful streams of new knowledge are born and circulate.

It should be noted that innovative ecosystems, despite their level, are always formed at the initiative of participants, and therefore have a high level of self-organization, internal self-regulation mechanism and sufficient potential for self-development resulting from continuous renewal, and are characterized by a decentralized decision-making method. However, in the innovation ecosystem, a relatively autonomous operational unit is an innovation project, which is implemented comprehensively through the interaction of all network participants.

The innovative ecosystem of the enterprise is an indicator of the competitiveness of national innovations and innovations.

In contrast to traditional entrepreneurship, when it is assumed that «demand creates supply», in today's technology entrepreneurship – «supply creates demand» [5].

Technological entrepreneurship can be characterized as the interaction of well-established, related areas – entrepreneurship and technological innovation [8].

Thus, the main idea of forming an innovation ecosystem at the state level, in our case in Ukraine, is that the interaction and consolidation of efforts of all participants in the innovation process ensures the continuous creation of new on the basis of complementary combination of resources, opportunities, competencies in different combinations. building the innovation potential of Ukraine.

Based on the study, the following trends in the development of the innovation ecosystem in Ukraine were identified:

– unlike traditional entrepreneurship, the main motivation for today's technology entrepreneurship is to obtain a new product or technology and the state of «supply creates demand», and not vice



versa, as it was before.

– emphasis is placed on the change in value for consumers due to the penetration of innovations into all spheres of life. The share of innovators among consumers has almost increased fivefold, and the share of consumers who prefer product functionality has almost doubled.

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**MODIFICATION OF  
PRINCIPLES AND  
TASKS OF INNOVATIVE  
ACTIVITY OF  
ENTERPRISES IN THE  
MACROECONOMIC  
ENVIRONMENT**

In conditions of expansion of forms of ownership on means of production, social needs in new technology fill the whole process of reproduction of the means of labor with new meaning. The complexity and versatility of the process of reproduction of the means of labor, the acceleration of the pace of renewal of production require the development of tasks and principles of innovation activity. Methods of managing the process of creation and production of new equipment should be adequate to increase the degree of economic independence, the expansion of the rights of participants in the process of reproduction of means of labor. In these conditions, it is especially important to manage the impact of a set of measures for technical renewal of production on its efficiency and the final economic results of the lower production units.

At the present stage of market economy development in Ukraine, innovation activity is undergoing significant changes due to changes in ownership forms, expansion of the rights of participants – creators of innovative products and technologies, the development of scientific and technological progress worldwide. This process is complicated by the lack of a proper information base of the innovation activity management system of the enterprise. Given the significant limitations of energy resources and the need to increase

the competitiveness of products, it is necessary to use new approaches to the development of Ukraine's economy, meeting consumer demand both in the domestic market and when entering on the international market. The driving force that can reduce energy consumption, create a competitive advantage for companies in the market, is an innovative direction of development of their activities and the economy of the country as a whole.

Currently in Ukraine formed the tendency of the growing lag of the technical, technological and economic level of domestic production from the corresponding indicators of developed countries for 10-20 years [12]. The state of the technical level of production has led to a decrease in the competitiveness of products and the share of progressive new products. Only 5% of Ukrainian enterprises pursue an active innovation policy, while the domestic market is increasingly saturated with foreign goods and services [14]. The problem of achieving the technical and socio-economic effect of innovation is exacerbated by the fact that most domestic enterprises implement, as a rule, already existing products that are uncompetitive.

To counter the trend of declining profitability level due to rising costs, domestic producers face the task of expanding volumes of production and sales, increasing labor productivity, reducing capital intensity of products by bringing to market qualitatively new goods and services, modernizing their production technology. Implementation of sustainable productive and technological innovations involves the inclusion of science and engineering in the system of enterprises activities, their strict focus on accelerating innovation processes. Accordingly, at the present stage of development of the market economy in Ukraine, innovation activity is undergoing significant changes due to changes in ownership forms, expansion of the rights of creators of innovative products and technologies, the development of scientific and technological progress worldwide.

In Ukraine, there are almost no created favorable conditions for implementation of innovation activity and the formation of demand for innovation. The complex of political and legal, financial, organizational, technological problems hinders the implementation of innovation policy, insufficient attention is paid to the legislative

support of innovation activity.

The need to intensify innovation activity in Ukraine is obvious, because stimulating innovation activity of business structures is one of the priorities of economic policy of any state. The transition to an innovative model of development for Ukraine is an integral condition for entering in the world economic system on equal terms. The complexity of the process of innovation activity causes the problem of its organization, as it is necessary to ensure the solution of the following issues: 1) economic growth: to ensure a high standard of living it is necessary to sell goods and provide services in sufficient quantity and high quality; 2) economic efficiency: obtaining the maximum return at the minimum cost of production resources; 3) full employment: jobs should be provided to all who wish to work; 4) trade balance: maintaining a rational socially and economically advantageous balance in international trade and international financial relations; 5) stable price level: it is necessary to exclude a significant increase or decrease in the general price level, i.e. inflation and deflation; 6) fair distribution of income: no category of citizens should be below the poverty line when other citizens live in luxury; 7) economic security: the necessary stable material security of the chronically ill, disabled and other categories of the population who can not provide the necessary standard of living independently.

Innovation is a major factor that provides growth and development of the enterprise. Necessary and sufficient conditions for the development of innovation activity in modern conditions are external and internal factors. External factors are objective in its content: a constant need to maintain a high competitive level of produced products, selling goods and provided services. External factors are determined by the laws of a market economy. Knowledge of public needs and changes in conditions of their satisfaction is a necessary initial basis for considering modern and promising means of labor from the position of their social utility, and allows to evaluate new techniques, depending on which extent it contributes to the satisfaction of public needs. Internal factors are subjective – it is the desire and ability of the company's team headed by the owner to engage in mastering, introduction and distribution of innovations. Internal factor is the level of organization of the process of creating and mastering innovations, including appropriate information

provision of innovation activity, as the lack of proper effect is primarily due to the imperfection of the organization and methodology of accounting and economic analysis in their interconnection with the functions of planning, control and regulation of the innovation activity of the enterprise as a separate sphere of activity; the presence of a stable nucleus of innovations participants; material and moral stimulation of innovators: progressive growth of remuneration; professional and career growth, expansion of the sphere of relations in domestic and international markets. External and internal factors act in aggregate, with internal factors owns a decisive role in creating innovations.

Integration into the management process of functions of accounting and economic analysis in their interdependence and interrelation with other management functions is designed to ensure the technical and socio-economic effect of innovation activity, covering various areas of enterprise activities (capital investment, logistics, energy, technical provision, environmental protection). Given the importance of this issue, we need an appropriate system of accounting and analytical support for innovation activity realization, which requires 1) the allocation of objects of accounting and economic analysis related to innovation activity; 2) development of methodology and organization of accounting and economic analysis of innovation activity of business entities; 3) development of the information function of accounting through the expansion of the analytical level of accounting for innovative products and the process. In general, the provisions for accounting for intangible assets do not differ significantly from their interpretation in International Financial Reporting Standard 38 “Intangible Assets” and the national UAS 8 “Intangible Assets”. However, this approach does not meet the needs of intangible asset management in the course of innovation activity realization. It is advisable to divide intangible assets into two groups: those that do not have a tangible form – intangible assets; and the results that created with the use of material and other resources with clearly expressed material carriers – tangible assets. The Intangible Assets account shows assets that do not have a tangible form, the Innovative Products account shows objects that are carriers of material and other costs. Their use allows to provide the management of intangible assets of tangible and intangible form with information.

The main conditions for successful implementation and

development of innovations include:

1) coordination of economic interests of developers, producers and consumers of innovations on the basis of the corresponding organization of marketing;

2) completion of development, including research and industrial inspection and creation of the necessary equipment, organizational projects, technical and economic standards;

3) training of specialists for implementation and retraining of employees for the use of innovations, creation of a climate of innovations in the staff of employees;

4) the company has spare capacity for technical preparation of production;

5) the responsibility of developers for the actual effectiveness of the innovation, including author's supervision, participation in the establishment, consulting, post-implementation service and transfer of organizational experience.

The mechanism of mobilization of innovations for their commercial use involves systematic work aimed at monitoring market conditions, researching sources of innovation opportunities, identifying promising innovations ready for practical use, making decisions on their implementation by making changes to the range of products that produces an enterprise. A new growth paradigm is being formed on a global economic scale based on the use of knowledge and innovation as the most important economic resources.

Peculiarities of implementation of innovative projects are determined by models of their distribution. Thus, the model of expansion (diffusion) of innovations at the macro level directly depends on the creation of economic, organizational, legal and social conditions by the state through appropriate financial and credit, tax, patent, depreciation and other policies that stimulate both the creation and implementation and speed of distribution innovation. In the conditions of change of tasks and principles of innovative activity in the economic environment allocate two models of innovative process: model of diffusion of innovations at macro level within all economy; model of internal organizational way of innovation at a certain enterprise. The model of diffusion of innovations is characterized by the expansion of previously mastered and

implemented innovation in new conditions or new areas of activity, as well as in new countries. As a result, the number of both producers of innovative products and their consumers is increasing. The rate of expansion (diffusion) is greatly influenced by the state's innovation policy, the availability of information base, mechanisms of science functioning and their relationship with production, the form of making legislative decisions on innovation issues, methods of information transfer, mechanisms to stimulate innovation activity, experience in innovation implementation.

The model of diffusion of innovations is closely related to scientific and technical activities aimed at using and concretizing the results of research and development to expand and update the range and improve product quality with its further effective implementation in the market. The object of scientific and technical activity is the actual diffusion of innovations in the field of engineering, technology, economics, organization and management, i.e. the dissemination and application of scientific and technical knowledge in all fields of science, technology, production. Scientific and technical activities are the basis of innovation, closely related to the process of implementation and dissemination of innovations. State support for innovation activity plays a significant role in the diffusion of innovations and the continuous development of innovation activity of enterprises.

The model of expansion (diffusion) of innovations at the macro level directly depends on the creation by the state of economic, organizational, legal and social conditions, through full financial and credit, tax, patent, depreciation and other policies that stimulate the creation and implementation and rapid spread of innovations. The second model of innovation dissemination, in contrast to the diffusion model, characterizes the internal organizational path of innovation at the level of an individual enterprise. Economic mastering of innovations largely depends on the level of organization of the process of introducing innovations into production. In the management of innovation, the activation of the human factor is of particular importance, as evidenced by the number of annually developed inventions, new technologies and innovative proposals, the degree of their impact on growth of labor productivity and profits, product upgrades, job reconstruction.

In order to effectively concentrate scientific and technical potential for the implementation of priority issues that require attract of significant investment, scientific and technical programs are developed. The purpose of developing such programs is a comprehensive solution of sectoral, intersectoral, regional and state problems in the field of scientific and technological development. The formation of the information base for effective project management is significantly influenced by the program for the management of innovative projects, the use results of which provide analysis and control of the implementation of innovative projects of the enterprise. In order to create conditions for improving the efficiency of innovation activity, the implementation of such programs requires the introduction of project organizational structures of the matrix type with the involvement of accounting staff.

It is expedient to introduce target structures for the management of innovative projects on the basis of structural subdivisions of the enterprise and to involve contractors, in particular foreign partners. Changed conditions for implementation of innovation activity of the enterprise and the lack of theoretical developments and practical developments for its management necessitate the search for opportunities to ensure proper organizational and methodological justification of accounting and analysis functions in their relationship with the functions of planning, control and regulation of innovation activity of the enterprise. The social aspect of the study is that innovation activity in its content not only involves the consumption of information resources, but also the acquisition of innovative knowledge and achievements in various fields of economic, scientific and social activities.

Ensuring a comprehensive management cycle for innovation activity on the basis of internal reporting indicators is possible through the use of a matrix method of management, which involves the creation of appropriate units, which are tasked with execution of all stages of the innovation process: from the evaluation of scientific potential to implementation in the practice or sale of innovation production.

For effective management of innovative activity in the subdivision of the project matrix type the personnel of the corresponding specialization, which involved in it from other



structural subdivisions for the period of realization of the innovative project is concentrated. A necessary condition is the involvement of accounting staff.

In order to ensure the implementation of the development strategy of the enterprise and the country as a whole matrix model of management processes in terms of innovation component is a scientifically sound basis for the development of theoretical and methodological principles of accounting and economic analysis as an information basis for innovation activity management of the enterprises. The specifics of the innovation process, its novelty and lack of practical experience in implementing an innovative product, sensitivity to changes in the external environment require constant analytical justification of management decisions in the field of innovation.

Taking into account the modification of the principles and objectives of innovation activity of enterprises in the macroeconomic environment provided an opportunity to outline the prerequisites for the rational organization of introduction and implementation of innovative projects, in particular in terms of external and internal factors. The main internal factor is the level of information support for innovation activity management, the effect of which is primarily determined by the organization and methodology of accounting and economic analysis in their relationship with the functions of planning, control and regulation of innovation activity of the enterprise as a separate field of activity.

Developing of internal reporting to provide a comprehensive management cycle for innovation activities should be carried out on the basis of a matrix method that is currently not used by business entities due to the lack of theoretical elaborations and practical developments. Relevant developments are the basis for the development of theoretical and methodological principles of accounting and economic analysis as an information basis for managing innovation activities of enterprises.

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**INNOVATIVE  
RESTRUCTURING OF  
THE ENTERPRISE:  
ESSENCE AND  
FEATURES OF  
MANAGEMENT**

Regarding to economic environment, managements of enterprises have to make radical decisions to survive among competitors, improve the records of the economic activity and increase investment attractiveness. Effective work of any enterprise is impossible without transformational changes. For the later decade, any leading corporation in the world hasn't succeeded in avoiding risky and painful radical procedure of the radical restructuring. Slowdown and attempt to do without serious changes led to their destruction. It indicates the relevance and the necessity of studying restructuring of the enterprises issues. Restructuring presupposes implementing not only optimal models of organization of an enterprise, but it also requires solving some problems connected with attracting investors for technological modernization of production and introduction of innovations. After all, it is innovation that allows companies to take leading positions on the market and to conduct a decent competition, while increasing their profits.

The serious disadvantage of the realities of restructuring of domestic enterprises is a lack of innovative orientation of the planned transformations. Accordingly, the development and practical recommendations for the introduction of new mechanisms of innovative restructuring of enterprises become especially relevant.

The definition 'restructuring' of the enterprise in scientific literature is controversial, because there are some divergences in the formation of its essential characteristics, purposes, classifications and methods among scientists.

The analysis of the essence of the concept of 'restructuring' carried out within our research allowed us to conclude that restructuring depending on a state of the enterprise is:

- a process of financial recovery (sanitation) – for enterprises

which are in financial crisis;

- a process of adaptation to changes of (internal, external) environment, maintaining the market, keeping competitive positions, customer base, positive development trends – for enterprises whose condition is satisfactory;

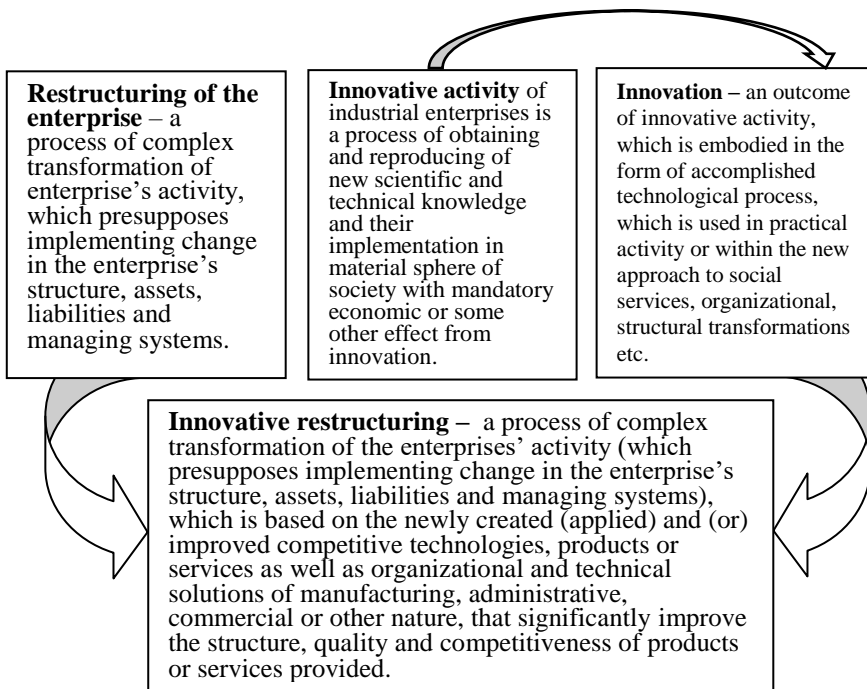
- a process of systematic optimization of the financially sustainable enterprise, done by the implementation of the relevant complex of innovation-oriented measures for restructuring organizational and managerial spheres of an enterprise, which gives an opportunity to ensure sustainability, increase competitiveness, profitability, market value and realization of potential economic development of an enterprise in the long run.

If restructuring of enterprises is a process, which, in a general sense, presupposes changes, then innovation is modern and an effective tool for implementing these changes.

Joseph Schumpeter, the classic of innovation theory, sees innovation in dynamics as innovative processes (production of new product, introduction of a new method, development of a new market, obtaining a new source of raw materials, reorganization) [1]. Therefore, it concerns innovation and its ultimate result. After all, the process of introducing innovations to the market is considered to be complete only when a consumer highly appreciates what has been done and when he or she will consider the product or service produced valuable in relation to his or her needs. Joseph Schumpeter emphasized complexity and dynamism of the innovation system, where innovation should be seen in the context of innovative activity – activity that includes proving scientific and technical ideas, inventions, developing up to a result, which is suitable for practice application.

Innovative activity, according to the Law of Ukraine “On innovation activity” [2], is directed at application and commercialization of the results of the scientific research and development and it leads to a release of new competitive goods and services on the market.

So, to clarify the meaning of the concept of innovative restructuring it is necessary to formalize it by combining the characteristics and essence of concepts “restructuring”, “innovative activity” and “innovation” (Figure 3.1).



**Figure 3.1 The content and formalization of a definition “innovative restructuring”**

Looking at the conducted analysis of the notion of ‘innovative restructuring’, we can conduct that the combination of these two words is not purely formal, because it includes signs of innovation and transfers them to restructuring. As a result, restructuring acquires more complicated and meaningful sense rather than just a change of organizational structure or financial and economical conditions of activity of an object of restructuring.

Therefore, implementation of innovation during restructuring of the enterprises is done due to the industrial enterprise’s adaptation to changes in external economic environment and ensuring the stability of its development with the help of innovative technologies.

The main objective of modern enterprises is their transformation into such subjects of market relations, which are capable of self-preservation and self-development. It is possible to implement it

provided that the new strategic management of an enterprise is introduced, namely, through effective change management in the enterprise, that has strategic importance and is aimed at innovative enterprise development, i.e. innovative restructuring.

Innovative restructuring of the enterprises can be ensured by optimally selected organizational and economic measures, that are formed in the presence of technical and economic substantiation of expediency of their implementation, deciding on the forms and restructuring methods to increase efficiency of enterprises' activity, regional development and national economy as a whole.

The dynamics of innovative processes in Ukraine indicates slowdown and decrease of the volumes of innovative activity of domestic enterprises. The main obstacle on the way of activation of innovative processes and the transition of the domestic economy to the innovative model of development is the absence of the effective organizational and economic management mechanism of innovative restructuring of the enterprise.

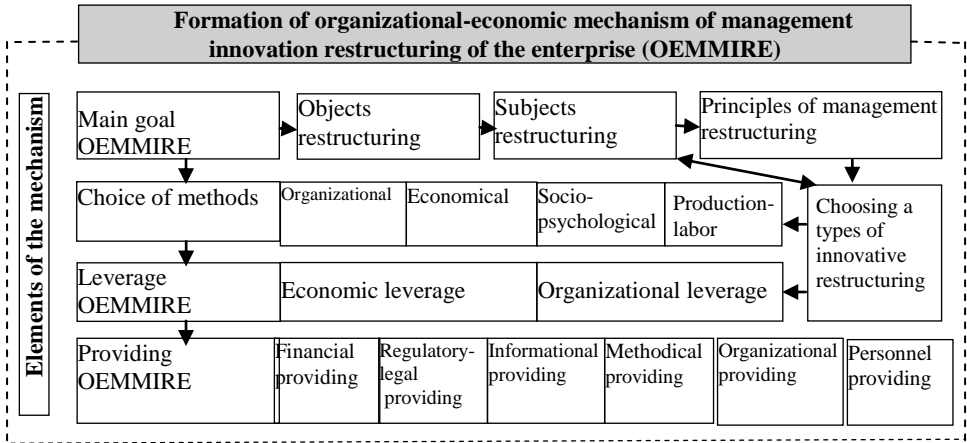
According to the results of the generalization of theoretical and analytical research what concerning the features of the procedure of innovative restructuring, will propose an organizational-economic mechanism for management the innovative restructuring of the enterprise, which includes subsystems of formation and functioning (Figure 3.2).

Organizational-economic mechanism of management innovative restructuring of the enterprise is an integral part of the overall enterprise management system, which, using methods, tools, bases on the observance of certain principles and regularities for its functioning, with the help of instruments and leverage provides an increase of the innovation potential, competitiveness and financial sustainability of the business entity in conditions of economic instability and sharply reduced, both external and internal volumes of investments directed on the development of engineering enterprises [3].

For a more in-depth understanding and scientific justification of the feasibility of developing and implementing an organizational-economic mechanism of management innovation restructuring of the enterprise consider the main components of it.

The main goal of management innovative restructuring is to create such business entities that are able to produce competitive

products, be technically secured and financially-capable at the expense of intensifying innovation activity. Accordingly, the main purpose of the organizational and economical management mechanism of innovative restructuring of enterprises is the transition to the new condition of enterprise, which is characterized by the achievement of the goals of innovative development, the increase of the products' competitiveness and profitability of this enterprise.



**Figure 3.2 Organizational-economic mechanism of management innovation restructuring of the enterprise: formation subsystem**

The objects of innovative restructuring of the enterprise can be: innovative programs and projects; new knowledge and intelligent products; production equipment and processes; infrastructure of production and entrepreneurship; organizational-technical decisions of an industrial, administrative, commercial or other character that significantly improve the structure and quality of production and (or) social sphere; raw materials, means of their extraction and processing; commodity products; mechanisms of formation of the consumer market and sales of commodity products. The subjects in this mechanism can be: owner of the enterprise, management of the enterprise, investors, personnel of the enterprise.

The basis of this mechanism should be the principles of management of innovation restructuring, the observance of which



will ensure the success of its realization, namely, these are the principles of systemic, efficiency, scientific basis, focusing on innovative development, legal substantiality, prudence, existing risk, increasing competitiveness, adaptability.

Organizational-economic mechanism of management innovation restructuring of the enterprise can be conditionally divided into two key blocks: organizational and economic. Effective mechanism of innovative restructuring begins with some effective organizational steps, that are the basis of the organizational mechanism and are aimed at creating and maintaining conditions for innovative development by: promoting the introduction of innovative technologies and producing innovative products at an enterprise; implementation of training and retraining programmes for personnel, who take part in the innovative activities of the enterprise; ensuring economic security of the subjects of innovative activity; deciding on the powers and actions of enterprises' departments involved in the process of innovative restructuring.

The economic block of this mechanism is responsible for the strategic management of innovative development and it is connected with the development of goals, programmes, projects considering the current social and economic condition, state policy of innovative development, innovation and production capacity, external and internal factors and needs of the region and the enterprise itself for innovation. The strategy of innovative development is aimed at combining scientific and technical potential and investment policies, that helps to create innovative products and technology.

Informational support of innovative development is provided with the help of informational infrastructure, which presupposes making sure that the information on innovative products, enterprises' projects, available sources of funding will spread.

In order to ensure the effective realization of the restructuring of enterprises, it is necessary to achieve balanced work of all components of the organizational-economic mechanism.

The Instrumental apparatus contains the levers and methods of management and creates a core of management activity. Management methods consist in the targeted influence of the subject on the object to achieve the goal. Management of the enterprise is carried out by the whole system of methods, because organizational

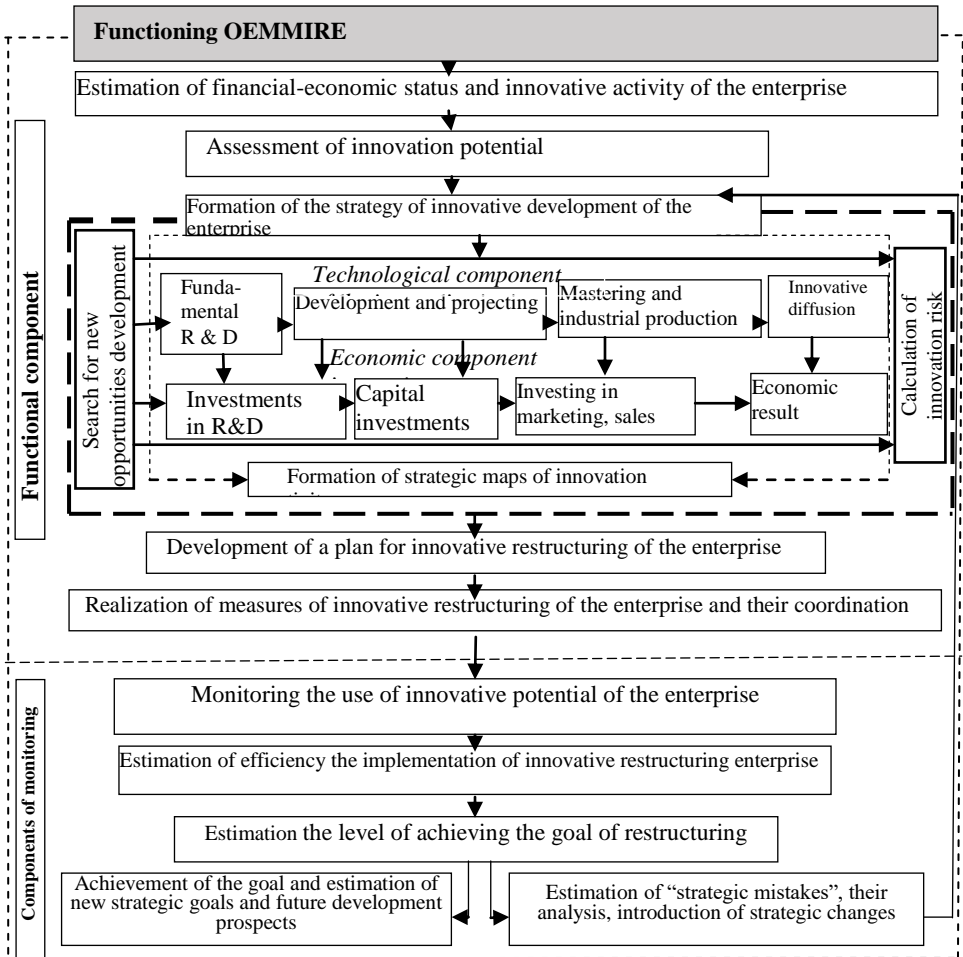
methods create preconditions for the use of economic, and socio-psychological complement them and form the necessary interconnection of tools enterprise management. Proper ownership of all management methods allows improving productivity and profitability of production.

Functioning of the levers of the organizational-economic mechanism is based on at the system of legal norms that are in accordance with the current legislation. The levers of organizational-economic mechanism include: organizational and economic. Organizational content includes: personnel providing, information providing and information protection, organizational-legal form and structure management. Economic leverage includes depreciation and pricing policies, taxation, lending and insurance. The application of organizational and economic mechanisms of the consists in combining the objective and subjective aspects of human activity in the context of continuous development based on the introduction of technological innovations and increasing the efficiency of the use of production potential [4, c. 13].

Organizational-economic mechanism of management innovation restructuring of the enterprise includes a functional component that combines the main tools and processes of restructuring (Figure 3.3).

As tools in the organizational-economic mechanism of management innovation restructuring of the enterprise should be used state and level of enhancement of innovation potential. Achieving the goals in the process of enterprise's restructuring will depend on ability to form an effective system of innovative management and the level of innovative potential of the enterprise – its ability to achieve innovative goals that are set. Implementation of these objectives in the global scope acts as a means of getting a fairly high profit in the long run, enhancement and then increasing of competitive market opportunities, crisis management and problem of survival in general, which is exactly the goal of enterprises' restructuring. The higher the level of innovative potential of enterprises, the more successfully it avoids possible crises situations.

The structural components of innovative potential the enterprise are: organizational-managerial potential; scientific-technical potential; production-technological potential; financial-economic potential; human potential.



**Figure 3.3. Organizational-economic mechanism of management innovation restructuring of the enterprise: function subsystem**

In order to ensure a positive effect from implementation of innovative changes, development and implementation of an effective strategy of innovative restructuring of industrial enterprises is considered to be a necessary condition. The formation of an innovation strategy is a long-term process based on the forecasting of the certain conditions of implementation of investment activities

about the planned innovation. In addition to this, this strategy is not permanent, it needs constant adjustment while taking into account changes in external conditions and opportunities for sustainable development of an enterprise.

Innovative strategy is a part of the general strategy of the economic development of an enterprise. In relation to it, innovative strategy is subordinate and must be consistent with it on the goals and stages of implementation. The following directions must be set in the basis of formation of the strategies of innovative development of an enterprise:

- orientation of the enterprise for specific segments of domestic and foreign markets, where you can get the competitive advantage in the short period of time due to the application of innovative technologies;
- the orientation of the enterprise for increasing the scale and expanding the number of advanced technologies, especially at the final stages of the technological cycle, which provide growth of added value of primary resources.

Planning the process of restructuring the enterprise begins with the formulation of its goals. The importance of this stage is due to the fact that the form goals set will be the basis of further management decisions at various stages of the restructuring process.

The component of the monitoring of the organizational-economic mechanism of management of the innovative restructuring of the enterprise involves determining the level of achievement of the main goal of the restructuring. Depending on the completeness of its achievements, it can be divided into: full achievement of the goal and failure to achieve the goal of restructuring.

The results obtained will influence the adoption of appropriate decisions which stipulate or terminate the process of innovative restructuring in connection with the full achievement of the goal, or termination of it in connection with recognition that the management of the enterprise was unable to effectively use the innovative potential of the enterprise, investments that have been invested in innovative develops and bring the enterprise to a new level of development. In addition, the partial or non-achievement of the goal of restructuring involves the adoption of managerial decisions, which for objective reasons necessitate the continuation of the restructuring

procedure. To do this, it is necessary to define “strategic mistakes”, to carry out their detailed analysis, to analyze the internal and external factors that negatively affected on the results of restructuring. If the enterprise has an innovative potential and the management of the enterprise has taken into account “strategic mistakes”, then it can move to the development of a new strategy of innovation development of the enterprise. This possibility is explained by the presence in the organizational-economic mechanism of management of the innovative restructuring of the enterprise feedback, which is directed to the functional component of the mechanism and involves finding new opportunities for development. This property of the mechanism ensures its adaptability to the constantly changing conditions of the market environment.

As a conclusion, it is worth noting that organizational and economic mechanism can not exist as closed system, it is a dynamic open system that takes into account the influence of many internal and external factors. And, therefore, the mechanism for each enterprise is individual and requires consideration of many aspects, starting from the defining of the objectives of the restructuring and finishing with the implementation of its programme depending on available resources and innovative potential.

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**COORDINATION  
OF BUSINESS  
PROCESS  
MANAGEMENT  
WITH  
STRATEGIC  
DEVELOPMENT  
OF COMPANIES**

In economic-mathematical model researches, for example [1; 2], dating back to the mid XX century, the method of expert estimates was used to build economic models, as well as mathematical statistical ways, while putting stress on the drawbacks of the forementioned approach. Thus, the paper [2, p. 8] showed that “with all the importance and necessity of using the peer review method ... it suffers from at least two disadvantages. The basis of this method is the specialist-expert's experience and “business intuition” of the one who conducts the assessment, i.e. the factors depend to a large extent on the subjective ideas of the person. This method is currently widely used because of the fact that the mathematical and statistical techniques are poorly used in practice, because they have little interaction with the specificity of macromodels of reproduction”.

Building a dynamic model of sustainable development is based on modeling the mode of operation and development of a given economic system as a method of assessment (measurement), which allows to combine the diversity and conditions of the decisions taken, the characteristics of the uncertainty of the economic system with the variety of end results, with the characteristics and properties of uncertainty of this economic system functioning. The idea of building dynamic models for the effective mode of the system implementation functions was first given in the researches done by Prof. I. M. Syroezhina and developed on in the theory of organizational and economic dimensions [2; 3]. The essence of the approach is the following.

The activity of any economic system is the choice and implementation of an arbitrary set of connections from the many potentially possible, as well as maintaining or breaking the existing relationships. A multitude of the implemented connections in the transition of the system from one state to another is characterized by the concept of “mode of activity”. At any given time, the economic entity can be in one of two states (modes): operation mode (stable set of connections) and development mode (set of changing).

The activity mode of the economic system may be represented by a certain number of economic indicators. Each certain indicator can be compared with the the certain mode (taking into account the comparability requirement and the need to include the dynamics elements) and the rate of growth (increase) of indicators.

Using the growth rates rankings, one can build an order that is capable of producing the requirements for the better operational mode and can act as a benchmark. This order is called the regulatory system of indicators that is a system of indicators organized in terms of growth in such a way that maintaining this order for a long period of time provides the best mode of operation of the economic system.

The regulatory system of indicators is a model of the reference mode of functioning of the economic system. Any actual order of indicators can be compared to the normative way of calculating the rank correlation coefficient between them.

The enterprise’s focus on improving its efficiency and stability can be described by developing specific target guidelines. It should be noted at the same time that the requirement to consider the

enterprise as a dynamic system, which brings about the need to formulate not the “goal-state”, but “goal-direction”, such as “to reduce the number” or “to increase working capital”. In this regard, the formulation of the purpose of the economic policy of the enterprise does not require the establishment (at the first stage of decision making) of absolute indicator levels, moreover, it is neither necessary to establish the measures for their movement (growth rates). Target guidelines can be obtained by ordering indicators of the state and performance of the enterprise. The purpose of management will be to maintain this order. By purposefully designing and controlling the indicators' dynamics, it is possible not only to determine the direction of movement of the economic system, but also to manage this movement to achieve the set goals.

Obviously, the criteria for selecting the requirements for the best mode of operation may be different. In particular, such a criterion can be to support the (growth) sustainable development of the enterprise. The developed models of sustainable development should serve as a point of reference when assessing the actual mode of operation of the enterprise, a guideline for the strategic and financial decision making. The principle of comparability requires building such a quantitative model that would allow the comparison of any two modes of operation of the enterprise with each other. The modes are to be compared by calculating the following integral estimate [4]:

$$E = 1 - \frac{\sum_{i=1}^n m_i}{n(n-1)}, \quad (3.1)$$

where:  $E$  is the estimate of the economic system's mode of operation;

$n$  is the number of indicators in the dynamic model of sustainable development;

$m_i$  is the number of inversions in the actual sequence for the indicator with rank  $i$  (taking the  $i$ -th place) in the dynamic model:

$$m_i = \sum_{j=1}^n a_{ij},$$

where:  $a_{ij}$  is a variable indicating the presence / absence in the actual indicator ordering of the "faster" binary ratio between the  $i$ -th  $j$ -th indicators set in the standard ( $i=1, \dots, n; j=1, \dots, n$ ):

$$a_{ij} = 1, \text{ if } r_i > r_j \text{ when } i < j;$$



$a_{ij} = -1$ , if  $r_i < r_j$  when  $i > j$ ;

0 in other instances,

where  $r_i$  and  $r_j$  are the ranks of the  $i$ -th  $j$ -th indicators in the actual arrangement.

If we denote the sum of inversions in the real order of indicators ( $P$ ) relative to the normative order ( $H$ ) given in the dynamic model ( $\sum_{i=1}^n m_i$ ) in the form  $M(P, H)$ , then the expression (3.1) can be given as the formula:

$$E = 1 - \frac{M(P,H)}{n(n-1)}, \quad (3.2)$$

The estimate  $E$  ranges from 0 to 1. The coincidence of the actual and the given normative order of indicators prove the absolute level of implementation of the company's economic strategy, which is aimed at ensuring its maximum stability. In this case, all normatively specified ratios of growth rates of indicators are actually fulfilled, and  $E = 1$ .

The actual order of indicators, opposite to the standard one, gives an estimate of  $E = 0$ . The closer the estimate is to one, the greater the proportion of the set normative ratios between the indicators is implemented in the company's business.

A generalized estimate of the mode of operation of the economic system  $E$  characterizes the degree of approximation to the ideal and does not depend on the results achieved in the past. This is a kind of strategic estimate, as it shows the level of achievement of strategic goals of the economic development, set in the dynamic model of the benchmark mode of functioning of the business system.

When building dynamic models of sustainable development, there are several ways to rank indicators and build a regulatory mode:

- qualitative analysis of indicators and their arrangements;
- building dynamic models of sustainable development based on a constructive representation of the system and its mode of operation;
- a pairwise comparison of indicators and the construction of a dominance matrix;
- building dynamic models of sustainable development based on the “creative profile” model.

In general, we can distinguish the following basic stages of building a benchmark (normative) arrangement of indicators [5]:

- 1) defining a dynamic model of sustainable development in the study of the company's management system;
- 2) identifying the functions and goals of the management system;
- 3) selecting a system of indicators that reflect the level of implementation of the function of the management system;
- 4) building a benchmark arrangement of indicators, taking into account the priority of their growth in order to achieve the goals of functioning of the business system.

Typically, two types of standards are considered – linear and nonlinear, which reflect the corresponding orders of growth of indicators: the type of arrangement is determined depending on the purposes of analysis and features of a particular system [6].

In practical calculations, the dynamic model of sustainable development is more often given in the form of a matrix of normative ratios of indicators' growth rates, that is, in the form of the matrix  $E_{N \times N}$ , the elements of which are determined under the following condition:

$$e_{ij} = \begin{cases} +1 \Leftrightarrow T_i > T_j; \\ -1 \Leftrightarrow T_j > T_i; \\ 0 \Leftrightarrow T_i ? T_j; \end{cases}$$

where:  $T_i, T_j$  are growth rates of “i” and “j” indicators;  
 $T_i > T_j$  is the normative arrangement of the growth rates;  
 $T_i ? T_j$  means the normative ratio hasn't been established.

Formally, a dynamic model of sustainable development is a binary ratio based on a large number of indicators. This ratio can:

- satisfy the condition of transitivity ( $A > B \cup B > C \rightarrow A > C$ );
- not contradict it ( $A > B \cup B > C$  when  $A$  is not equal to  $C$ );
- contradict it ( $A > B \cup B > C$ , but  $C > A$ ).

We will call the dynamic model of sustainable development transit in the first two cases, the first case being called complete transitivity. In order to calculate the estimates for the dynamic model of sustainable development for each analyzed period  $t \in [0; T]$  we

build the  $F_{N \times N}^t$  matrix of actual ratios (growth of indicators), the elements of which are determined under the following condition:

$$f_{ij}^t = \begin{cases} +1 \Leftrightarrow T_i > T_j; \\ -1 \Leftrightarrow T_j > T_i \text{ for } \forall t; \\ 0 \Leftrightarrow T_i = T_j. \end{cases}$$

The calculation of estimates of a dynamic model of sustainable development is based on the idea of calculating the number of inversions between orders of rates. The inversion is meant to be a change of the rank of the rate in one order relative to another.

For each analyzed period  $t \in [0; T]$  we build a matrix of "non-inversions" of the actual and benchmark ratios of the rates  $BtN \times N$ , whose elements are determined by the following condition:

$$b_{ij}^t = \begin{cases} 1 \Leftrightarrow \left| \begin{array}{l} e_{ij} = +1 \text{ if } f_{ij}^t = +1 \\ \text{or } e_{ij} = -1 \text{ if } f_{ij}^t = -1 \text{ for } \forall t; \end{array} \right. \\ 0 \Leftrightarrow \text{in other instances.} \end{cases}$$

The question of the choice of equalities ( $F_{ij} = \pm 1$ ) or inequalities ( $F_{ij} \geq 0$  адо  $\leq 0$ ) in the formula for determining elements of the  $B$  matrix remains open. However, in practical calculations, the cases of equality of growth rates are extremely rare, so the solution to this question is rather more methodical.

The sum of the elements of the matrix  $B$  is equal to the number of normative rate ratios fulfilled (in the analyzed period). Since the number of the established regulatory ratios is equal to the sum of the modulus of the elements of the matrix of the dynamic model of sustainable development, the assessment of stability can be calculated as the proportion of completed regulatory ratios in the total number of established ones:

$$E^t = \frac{\sum_{i=1}^N \sum_{j=1}^N b_{ij}^t}{\sum_{i=1}^N \sum_{j=1}^N |e_{ij}|} \text{ for } \forall t, E \in [0; 1]. \quad (3.3)$$

To build a dynamic model for the sustainable development of a trading company, as noted above, it is necessary to make a ranking of

sustainability indicators. While conducting this research, we formed and ranked a system of indicators, reflecting the level of performing the functions and goals of the business system of trading companies. The method of expert assessments was applied [7]. The respondents (leading trade professionals) were asked to rank the selected sustainability groups (financial, technological, social, information and environmental). The results of the data processing of the expert estimates and their generalization are shown in Table 3.2.

*Table 3.2*

**The companies' sustainable development indicators ranking**

№	Group of indicators of the trading company development sustainability	Indicator rank
1	Indicators of the trading companies' financial sustainability	1
2	Indicators of the trading companies' fixed assets renewal (technological sustainability)	2
3	Indicators of the level of the trading companies employees' wages, their social security (social sustainability)	3
4	Indicators of the level of development of the trading companies' information system (information sustainability)	4
5	Indicators of the trading companies' environmental sustainability	5

Based on the results obtained, we propose the following sequence of ranked growth rates (in other words, the order of their movement or the dynamic standard), which reveals the generalized groups of indicators of the trading companies' sustainability (Table 3.3).

Table 3.3 presents the dynamic ordering of the trading companies' performance indicators which reflect regulatory requirements for sustainability. The general ordering of indicators by the rate of their growth (T) reflects the model of the most sustainable mode of activity of the company. The above growth rates show the changes of the eponymous indicator at the end of the reporting period compared to its value at the beginning of the reporting period or the ratio of the forecast value to the basic one.

Table 3.3

**The dynamic ordering of the trading companies' performance indicators**

Rank	Indicators	Group of indicators	
1	E – equity	Financial sustainability	
2	CFA – current financial assets		
3	FA – financial assets		
4	EA – economic assets		
5	NFA – non-financial assets		
6	NMP – non-monetary property		
7	LC – loan capital		
8	FAS – fixed assets suitability		Technological sustainability
9	FAR – fixed assets renewal		
10	AFA – additions to fixed assets		
11	IFC – investments in fixed capital		
12	CP – commercial products		
13	APFA – active part of fixed assets		
14	FAV – fixed assets value		
15	FAIP – fixed assets for industrial purposes	Social sustainability	
16	PC – production costs		
17	MIF – material incentive fund		
18	PF – payroll fund		
19	NHQP – the number of highly qualified personnel		
20	NTS – the number of technical staff		
21	NSA – the number of shop assistants		
22	PS – staff sustainability		Information sustainability
23	PA – payroll arrears		
24	ENWC – ensuring normal working conditions		
25	NTIIS – the number of tasks that are solved in the integrated information space		
26	SRRC – speed of response to a request or complaint		
27	PEIS – the percentage of employees who use the information system tools and resources in their official duties		
28	RST – resource-saving technologies	Environmental sustainability	
29	EP – environmental pollution		
30	ECM – environmental conservation measures		

*Financial model of the trading company's sustainable development.* When forming a financial model of sustainable development of a trading company, it is advisable to take into account only the internal factors of companies' financial sustainability. The reason for this decrease in the number of factors is explained by the rapidly changing external conditions of trading business. There is no doubt that the growth rate of equity capital should be a maximum value that exceeds other indicators, and the growth rate of borrowed capital, on the contrary, a minimum value.

Thus, we believe that all property ( $EA$ ) should develop at a higher rate than debt capital ( $LC$ ), but slower than equity ( $E$ ):

$$T(E) > T(EA) > T(LC).$$

At the same time, equity ( $E$ ) is directly related to non-financial assets ( $NFA$ ) and all non-monetary assets ( $NMP$ ), and loan capital ( $LC$ ) to financial assets ( $FA$ ) and monetary assets:

$$T(E) > T(NFA) > T(NMP);$$

$$T(E) < T(FA) < T(CFA).$$

Thus, the overall model of growth in financial sustainability can be presented in an expanded form regarding that the proportions and trends of development are distributed from the maximum to the minimum value, and each of the considered indicators gets a corresponding place in the overall chain:

$$T(E) > T(CFA) > T(FA) > T(EA) > T(NFA) > T(NMP) > T(LC).$$

The proposed financial model of a trading firm's sustainable development growth firmly associates its own property with debt, financial assets with non-financial ones, a monetary form with a non-monetary one. A special place is given to its own resources in the form of money and compliance with the condition of financial equilibrium as a key in strengthening the financial position of a trading company.

*Technological model of the trading company's sustainable development.* Based on the requirement to reduce costs associated with the production and sale of goods, the following ratio should be relevant:

$$T(CP) > T(PC).$$

This ratio of indicator dynamics provides the reduction of expenses and, accordingly, opportunities to increase the company's profit. The indicators characterizing the trading company's technical

equipment set are the value of the enterprise's fixed assets (*FAV*), the active part of the fixed assets (*APFA*) and the fixed assets for industrial use (*FAIP*). The indicators characterizing the trading company's technical equipment set are the value of the enterprise's fixed assets (*FAV*), the active part of the fixed assets (*APFA*), the fixed assets for industrial use (*FAIP*). The forward growth of the active part of fixed assets in relation to the overall growth of fixed assets, as well as to the growth of fixed assets for industrial purposes, is better than the backlog, which causes the risks associated with being poorly technically equipped.

Regarding fixed assets for industrial and non-production purposes, it is obvious that their increase in non-production assets should not outstrip the increase in the value of industrial assets, which may cause the risks associated with the inefficient structure of fixed assets.

Given both statements, we obtain the following regulatory ratio:

$$T(APFA) > T(FAIP) > T(FAV).$$

*Information model of the trading company's sustainable development.* The generic indicators that characterize the development of a trading company's information system are the number of tasks that are performed in the integrated information space (*NTIIS*), the speed of response to a request or complaint (*SRRC*), the percentage of employees who use the information system resources while performing their duties (*PEIS*).

The growth rate of the number of tasks that are fulfilled in the integrated Information space (*NTIIS*) in large commercial firms is, in our view, the most important. Fulfilling a large number of tasks in the integrated information space allows achieving the maximum level of coordination for a managed system. The rate of time reduction required to respond to requests or complaints (*SRRC*) typically characterizes the level of a technical equipment set of the information system used by a trading company. The growth rate of the percentage of employees using the resources of the information system  $T(PEIS)$  reflects the level of the trading company's information system technical and software components development:

$$T(NTIIS) > T(SRRC) > T(PEIS).$$

In the course of the research the elements of the organizational and economic mechanism of process management were harmonized

with the strategic priorities of the trading company, while the proposed system of indicators of sustainable development can be adopted as a basic element of the mechanism of the process management for the trading company.

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**MECHANISM OF  
INNOVATION OF  
MANAGEMENT OF  
DEVELOPMENT  
PROCESSES AND ENSURING  
COMPETITIVENESS OF  
ECONOMIC SYSTEMS**

In modern conditions of intensive reforms in the economy of Ukraine, one of the key factors of sustainable development of the enterprise is a professionally built and efficient system of innovation management. It should be focused on continuous support of productive activities of enterprises, increasing the competitiveness of products and stability of development. Existing transformation processes in society motivate to significantly increase the role and participation of managers in solving problems of innovative development, in substantiating the directions of strategies, programs, plans for their development and implementation in the practice of economic activity. Changes in the environment encourage a rethinking of existing, tried and tested approaches to the choice of innovative management levers capable of innovating managed systems through innovative management of economic development.

Increasing highly efficient innovations capable of ensuring current and long-term sustainability of production systems, competitiveness of their products on the market, is carried out by multifaceted management influence of powerful innovative management mechanisms on the processes of innovative economic development in all areas: technical, technological and socio-economic system interaction of their components.

In the conditions of incomplete modernization of public administration in Ukraine, while solving the problems of increasing the competitiveness and sustainability of economic systems and socio-economic development of the country, the importance of solving problems of management efficiency increases significantly. It is a question of an innovative component not only of operating systems of management of economic subjects, but also of innovative

designing of processes of development of economic systems.

The author of the theory of long waves N. Kondratiev believed that economic growth and economic downturn at the stage of attenuation of the life cycle of large production systems should be supported by intensive introduction of technological paradigm, including management technologies, as the first step to economic growth from production technologies to economic development new ideas in management [18].

Attention to the creation of the necessary prerequisites for innovation management is present in the works of P. Drucker (acceleration theory). He stressed that the success of entrepreneurship requires compliance with the mandatory condition – to be systematic and manageable [19]. An important role in creating the emergence of the theory of innovation management is played by the creation of the concept of innovation theory and the allocation of their common feature – the full or indirect ordering of the existing concept of economic development. This suggests that innovation management and issues of its construction and implementation mechanisms should be considered as part of the theory of economic growth and economic development in the context of innovation theory. The effectiveness of management directly affects the state of development of technical, social, environmental progressive changes, which are manifested in the growth of return on capital provided by the rational use of factors of production. It can be argued that it plays the role of a superfactor that creates the conditions for ensuring the positive movement of all processes (organizational, economic, social, communicative and others) that create an environment of competitive economic systems. Innovative management of sustainable development processes is able to provide support, and technical, economic and social efficiency of economic processes that carry out its appropriate mechanisms. Their use creates conditions for the manifestation of the multiplicative effectiveness of innovative changes, generating these changes, anticipating and accelerating their effective action.

Modern research on innovation management and its mechanisms focuses mainly on innovation processes, which are significantly diverse and focus on the following areas: the study of internal order and flow of processes, the choice of innovation, the study of factors

influencing the reduction of innovation, research and evaluation methods of innovation and other characteristics. They represent the formation of localized areas of knowledge and certain research tools that give a clear idea of the objectives, content and direction of innovation management and the formation of its mechanism. To create mechanisms for innovation management systems, it is necessary to form an innovative content of management functions, update management methods and tools and select from them those that will contribute to the stable and continuous growth of economic performance. It is designed to ensure the creation of conditions for the formation of an innovative climate conducive to innovation and achieving the results expected from their application. Innovation management should be based on actions and methods that allow the dissemination of managerial innovations to increase support for the economic state of development of economic entities, which can not be clearly formalized and described, not always obvious and easy to understand. However, without their use, the effect of innovation will be lower. As part of the new aspects of innovation should be considered and mechanisms aimed at qualitatively new connections and new management processes and technologies for their implementation. This motivates to consider the level of innovation of management systems and mechanisms for managing them as leading factors in the overall system of production factors of sustainable development, without which they can not act as factors of economic growth.

Management innovations and mechanisms for their implementation are process innovations. The content of innovation processes directly in the management systems and the limits of their implementation are closely linked to the forms and types of business activities, the implementation of a continuous and continuous process of reproduction of all resources, production of goods (services) and learning new management methods to meet economic, social and environmental needs of society. Therefore, the innovation of management systems should be considered as an important prerequisite for ensuring sustainable economic growth and competitiveness of economic entities. Methodological approaches and prerequisites that should be the basis for the development of conditions for innovative economic management and the

development of mechanisms that accompany and ensure the processes of managing the competitiveness of the economy can be summarized as follows:

- scientific substantiation of increasing the level of competitiveness of managed economic systems and the pace of dynamics of development processes with a bias against the pace of economic downturns;

- forecasting market needs to increase the competitiveness of the market development of the managed system in its external environment;

- identification of new in content and principles of action areas of improvement of management and production activities;

- improvement of substantive, professional, functional, informational and institutional elements of economic systems management;

- identification of ways of innovative development and reproduction of its managerial potential, review of the content of system elements (functions, tasks, processes, forms, connections, mechanisms of interaction) in view of the level of their innovation;

- development and substantiation of projects for the creation of innovative management systems and mechanisms for their organizational, functional, informational, logistical, technical-technological and computer support;

- improvement of mechanisms for implementing projects to increase the innovation of the management system as a set of forms and methods of regulating innovative management activities to ensure targeted impact on the elements of the production system and its processes to ensure the competitiveness of the economy;

- practical development and implementation of innovative management processes and mechanisms for their flow.

When designing innovative management systems, the description of future management objects should be used using a system of indicators and characteristics. In particular, the number of managed subsystems, the number of management levels, the number of employees, the cost of the production system, its total capital, spatial and territorial characteristics, the degree of economic independence, the level of costs and profits and market volumes.

To create systems of innovation management and maintain their

innovative level, an important condition is the continuation of in-depth research of its further scientific support as a basis for solving this problem in modern conditions of transformational change. Therefore, the problems of innovation development and the search for innovative sources of development in the economies of countries are considered by many foreign and Ukrainian scientists for a long period of time.

In the scientific field, the evolutionary path of formation and development of innovative phenomena can be divided into three separate stages. The first stage (1970-1990) is characterized by the emergence of innovations mainly in the practical activities of economic entities in different countries (new equipment, new products, new raw materials, new tools, etc.). The first systematic studies of innovations belonged to J. Schumpeter, G. Mensch, K. Freeman, A. Kleiknecht, B. Twiss, O. Karatayeva, N. Monchev, B. Santo, and others [11; 8; 14]. They considered the creation of the foundations of innovation theory: the conceptual apparatus, the characteristics of innovation, approaches to determining the types of innovation, scope, forms of development and implementation, issues of systematization and others.

The second stage (1990-1995) includes the beginning of innovation research as a separate area of scientific knowledge and as a component of technical progress, which contributed to the intensification of the innovative direction of applied research, ways of innovative development of industries and society as a whole. In Ukraine, there are studies of innovative technologies of production and services, complex radical innovations (technical, economic, social, etc.), which can change the content and working conditions, become the foundation for social change. The Ukrainian authorities are adopting a number of legislative acts, developing strategies and plans for innovative economic development, and providing financial support for measures to innovate economic activity. During this period, fundamental research on innovations is conducted, which can be found in the works of V. Khrutsky, G. Grebnev, A. Anchishin, A. Prigogine and many others. At the same time, scientists stressed the need to pay more attention to the study of innovation development in terms of unreasonable prioritization, lending and promotion, selection and implementation of innovations and development of

areas in which innovations are implemented, the need to intellectualize society, deepen innovation, innovation development view of national security, on other aspects [9; 14].

The third stage began in about 1995 and lasted until 2011. It is characterized not only by the intensification of research, but also the active participation of the state in supporting organizations and administering their developments. The number of scientific works is increasing (V. Geets, L. Fedulova, M. Voronchuk, O. Trofimchuk, V. Kuzmenko, V. Naidenov, Y. Kharazishvili, I. Makarenko, O. Rogozhin, V. Kotsyubynsky, A. Sorokin, T Lomakin, etc.) and developments of research organizations [10, 12; 9]. At the same time, practical achievements in the innovation of Ukraine's economy have remained extremely insufficient. The state and level of development of innovative management of economic activity is influenced by many factors, including – the creation of standardized methodological tools for analysis and evaluation of types, structure, content of innovations and opportunities for innovative development of functional and sectoral enterprises, organizations in various fields, technologies, advanced management mechanisms. development processes, which inhibits the implementation of research results, justification, evaluation and intensification of the flow of innovation processes.

The fourth stage began in 2021 and to this day. It is characterized by intensification of state power of Ukraine in the direction of finding new forms and mechanisms of economic activity through cooperation of public and private sectors of the economy, development of legal framework for joint management of economic development (public administration, local government, civil society institutions). Strategies and programs for economic development are being developed with the use of information technologies and greater independent rights are being granted to the executive authorities of the regions in choosing the ways of their own socio-economic development taking into account the state goals.

At the same time, the analysis of types of implemented innovations at industrial enterprises of Ukraine shows that the state innovation system and its components are not based on complete and orderly information about its state on the generally accepted number of innovation groups – technological, technical, process, product,

marketing and organizational. The mechanisms of their provision are not singled out either. Only technological (process) and product innovations are provided in the statistical report. That is, the vast majority of innovation groups are completely absent or undisclosed. The processes of formation of high-tech large and small enterprises are poorly structured and extremely slow, and the planned capital investments do not reflect their effective direction in priority areas.

It is obvious that the issues of approaching and rapid implementation of innovations in the economy as a whole and the economic systems of its regions and economic entities need an effective internal innovation management system based on innovation mechanisms, transformation of innovative ideas into real implementation in management practice. Their development and implementation are invariably preceded by mechanisms for their implementation, which, of course, must also be innovative. Management innovation should become a part of innovation activity of authorities of all levels and economic entities, which should ensure close interaction of elements of innovation processes, reduction of separate stages of the production cycle of innovative products creation and competitiveness of market entry. The content of innovation functions, mechanisms for their implementation and improvement of other conditions for economic innovation become especially important, and management using innovative mechanisms becomes a strategic lever to ensure the stability of economic growth.

In the current activity, innovation management should be considered as a special organizational economic and social activity aimed at achieving high economic, social, environmental and other results aimed at increasing the competitiveness of the economy. It is necessary to use a set of innovative mechanisms with the specification of functions, tasks, methods, technologies and processes. Their combination should be aimed at transforming innovative development ideas into practical activities of economic entities, starting from the zero stage – the organization of their search, further research, creating conditions and opportunities for organizing the economic results of their application. The organization of their influence is based on the use of innovative content of managerial innovations – innovative methods and technologies for developing management decisions, processes of

their scientific substantiation, application of innovative schemes of organization of their implementation and realization, which are selected individually for each type of innovations.

To distinguish innovation mechanisms in the classification system of innovations as a separate component of innovation management, it is necessary to explore the content, methods and functions of management innovation, management technologies, processes, mechanisms and other tools that today transform new ideas into economic practice. In order to raise the level of innovative development of economic management systems through the introduction of new ideas and their transformation into practice, it is first necessary to analyze the goals of existing management systems to ensure innovation of all processes and operating conditions of key systems of innovation, to evaluate existing forms, structures and mechanisms. management, the level of innovation of the methods, technologies and their ability to influence the intensification of innovation. During the study it is necessary to simultaneously improve the existing classification of innovations by industries and areas of their implementation given their system, perfect reflection of all elements of innovation processes and determine the potential of their possible impact on the final result of economic and social development.

The study of the characteristics of innovative management activities and management mechanisms used, which should be the basis for classification in the analysis of their content, components, nature of influence and regulation of economic processes should be carried out by:

- areas of innovation (scientific, applied, tangible and intangible, economic, industrial, social, environmental);
- fields of activity (science, education, health care, other tangible and intangible fields);
- types of activity (technical, technological, financial, social, organizational, managerial);
- degree of novelty (primary, secondary);
- scientific orientation (fundamental and applied);
- types of efficiency (economic, social, cultural, spiritual, political, social);
- distribution (local, system, process, object, internal, branch,



territorial);

- the amount of innovation potential (opportunities to increase and spread);
- length of life cycle (short, medium, long, etc.);
- level of costs (insignificant, medium, large);
- the level of productivity increase (do not affect, affect slightly, affect significantly);
- the level of innovation of the structure of production and services (corresponds to the established level, exceeds, does not correspond);
- the level of cost efficiency (regulatory, below regulatory);
- the level of cost recovery (meets expectations, below expectations, does not meet);
- the level of impact on the competitiveness of products and services (provides the expected growth, does not provide, exceeds the expected level).

The choice of management mechanisms for each group of innovations requires further research and establishment of the boundaries of innovative qualities, which will improve the mechanisms themselves.

Classification of types of innovations will serve as a basis for deepening the content of management, defining and justifying models and scales of innovation activities, vectors of strategic development, choosing forms of cooperation and interaction of participants in innovation processes, influencing the characteristics and parameters of innovation, infrastructure construction and institutionalization.

Determining the composition of the group of managerial innovations contributes to the development of measures for the design and implementation of management mechanisms for innovative content. They will promote better use of creative potential of participants, introduction of large-scale innovations, expansion of their types taking into account elemental, social, psychological and other innovations, coordination of economic activities, complex systems of motivation, powerful system of innovation of economic development of the country. Such conditions for the organization of innovation activities necessitate the allocation of a new function in the management functions – the function of innovation. Among its

tasks should be distinguished:

- formation of a database of existing innovative ideas and proposals in subject areas and areas of activity, including in the management system, their systematization by types and degree of readiness for use, construction of innovative processes of their implementation;

- systematization and identification of innovations by conditions and features of implementation (time, cost, payback period of capital expenditures, life cycle, performance indicators (growth of innovation share, productivity, competitiveness and product quality, revenue and profit growth, market share and opportunities for future market prospects, etc.));

- improvement of methodological and organizational tasks for the implementation of innovative measures;

- analysis of innovative needs of operation of managed systems and subsystems in own environment, regular and timely monitoring of the content of innovation processes;

- development of sound strategies of internal innovation development and conditions for their implementation through the mobilization of own and borrowed funds for the implementation of innovation potential and others.

Management innovations and mechanisms for their implementation, having a system-forming nature, can be used simultaneously in different areas of activity. They have a much longer period of time to maintain their innovative positions. Management innovations provide systemic benefits to economic entities and have a significant impact on the dynamic development of economic systems and ensure the growth of not only tangible but also intangible assets. Thus, thanks to organizational innovations, American corporations have created new corporate structures: "VISA" (global network of financial institutions), Linux (computer operating systems), DuPont (development of budgeting technology) [13] – and have become not only among the richest, but and the most famous in the world. Management mechanisms play a special role and place in these structures. This category has become widespread in various sciences. Its application allows you to describe the parameters and actions of various phenomena, the structure of their elements, relationships, dependencies, the movement of life

processes and their results. At present, in the economy of economic entities, each existing mechanism is used separately, does not have a sufficient focus on joint dialectical interaction with other mechanisms and does not take into account the variability of systemic changes due to transformation processes.

Studies of the nature, purpose and structural components of the mechanisms of management of processes in various spheres of life with the transition of the country to market conditions were considered in the works of many domestic scientists: B. M. Andrushkiv, O. Ye. Kuzmin, I. A. Blank, O. V. Bil'ska, N. M. Hul'iaiev, A. B. Borysov, N. Yu. Briukhovetska, N. M. Buniak, H. S. Holovach, M. H. Hryshchak, T. O. Hurenko, I. S. Zavad'skyi, T. L. Zheliuk, A. O. Kniazevych, O. V. Kravchuk, M. A. Latynin, V. P. Nesterenko, P. P. Mykytiuk, S. V. Mochernyi, F. I. Khmil, M. Yi. Khorunzhev, L. M. Khudolii, A. A. Chukhno, L. I. Fedulova та ін. [3; 4, pp. 36-46; 5; 6; 7; 8, pp. 175-187]. At the same time, the issues of joint action and increasing the innovation of local governance mechanisms, their improvement and integrated impact in solving problems, require separate research, in-depth analysis and determination of their impact on the management of economic development.

The definition of "management mechanism" has many definitions [3, pp. 104-109], which relate to the power, organizational and functional, organizational and administrative, financial and economic, economic, legal and socio-psychological activities of enterprises. There are a number of mechanisms of state, regional and economic policy, mechanisms for the implementation of scientific and technical, industrial and social policy, and others. This complex economic category is directly related to innovative changes and adaptation of management to support life processes, which harmonizes the challenges and impacts of the external and internal environment on the state of functioning of economic entities.

The content of the most motivated concept of "management mechanism" was provided by the authors [5, pp. 83-145]. It boils down to the following: a mechanism - a set of levers by which the subject influences the object to ensure the achievement of the goal on the basis of goals and functions in compliance with the principles, forms and resources used. To overcome the existing situations in

management, the mechanism of transfer of managerial innovations has the greatest ability. It creates an opportunity to accumulate and analyze information about external influences, to diagnose the capabilities of the enterprise and the problems they must solve to balance the actions of the managed and management systems and develop the necessary measures for their implementation. As a rule, the movement of external influences moves to internal processes and the fight against them requires a comprehensive approach, rapid response and reorientation of management mechanisms to a joint impact on their leveling. Analysis of scientific sources shows that the concept of "management mechanism" is used to denote the effects on certain activities, which have clearly defined characteristics, structure, objectives and methods of their implementation. This allows to ensure the stability of the results of activities in selected areas. At the same time, the separate application of existing mechanisms, the lack of optimal combination of their effects on the full and non-alternative provision of common development goals does not allow to take into account the manifestation of existing problems and ensure systemic transformational transformations. Distributed, dispersed influences on the implementation of individual management goals, no mechanism can overcome. Therefore, the ability of enterprises for timely reproduction of equipment, technology, support of business processes and preservation of their innovative characteristics for stable and economic development should be formed by an innovative management system and its powerful innovative mechanisms. That is, it is obvious that the current management of economic development of enterprises does not yet have the level of innovation that is able to systematically influence the solution of emerging problems. Despite the extensive development of theoretical provisions on the essential characteristics and components of the concept of "management mechanism", attention to their study as innovative elements of innovation systems management is still insufficient, and the concept of "innovative management innovation mechanism" is almost not used. Innovation and management activities in solving management tasks require deepening and updating of knowledge embedded in functional responsibilities, methods, techniques, management technologies and existing mechanisms. It is necessary to significantly expand the

conditions of professional cooperation, effective use of management capacity, optimization of interpersonal relationships, innovation of competencies and knowledge and their transformation into an innovative management resource, in order to use it in the design and application of innovation mechanism.

Existing existing mechanisms are classified by methods of influence, forms and subjects of influence, by the nature of action and influence, by the quality and level of influence, direction and other features [5, pp. 96-99; 6, pp. 39-43]. At the same time, each mechanism is aimed at ensuring a specific goal and has a list of areas of action. Thus, the financial and economic mechanism of enterprise management is aimed at the formation and rational use of economic and monetary interests of production units and divisions, includes tools, methods, planning functions, organization, analysis of financial resources, their rational and efficient use, remuneration, motivation and incentives and management of their high-quality timely solution.

The socio-psychological mechanism uses the principles and measures of moral stimulation, the development of basic social values, the improvement of working conditions, human health, the introduction of social norms and standards.

Organizational-administrative mechanism directs its influence to improve the organizational foundation of management: institutionalization, organizational forms, organizational schemes and processes, development of regulations and implementation of labor standards, administrative actions and effective solution of other organizational tasks [3].

Using a number of mechanisms at the same time the management system should direct them to the expected growth through innovation of own and managed system, production of products and services, their competitiveness in the market, stable dynamics of updating of equipment, technology, structure of production units, management units, forms and methods of activity and to ensure their stable suitability for the implementation of innovations and increase the potential to reduce the deficit of sustainable development capabilities.

Without taking into account the innovativeness of the mechanisms used, the assessment and diagnosis of the existing level

of management systems, their innovation and impact on managed enterprises can not be carried out qualitatively. The level of innovation of mechanisms provides an opportunity to identify "critical points" of technology, technologies and processes of resource use, timely awareness of the depth of problematic issues and get an idea of their own capabilities of mechanisms that implement developed strategies and development plans.

One of the practical methods of obtaining a complete picture of the types and content of the necessary actions to address the list of identified in the management and production of problem situations is to build models of their systemic internal solution. The modeling illustrates the factors influencing the expected changes, their dependence on the state of innovation of the applied mechanisms and their constituent elements, the sequence of occurrence and the need to use integrated innovation levers.

The state of the necessary transformations in economic systems is formed in the organizational, economic, social, financial and other subsystems of the enterprise. There is a certain connection between the existing mechanisms of their management, but the level of their sensitivity and adaptation to changes in the parallel existing and interconnected processes of joint innovation and transformations into key directions of development remains weak. This requires consideration of many options for their improvement, the necessary and timely full adjustment of their components. In the complex contradictory processes of modern social transformations and the need to confront crisis phenomena, this motivates the definition and development of a comprehensive innovation mechanism for management innovation.

In the study, the mechanism of management innovation is considered as a purposeful flexible, mobile powerful lever of direct and indirect management influence on the formation of innovation, adaptability, efficiency and diversification of management activities of the managed system and its managed parts. It contributes to the creation of conditions for economic growth of unconditional and stable competitiveness of products in world markets, acquisition and realization of new potential opportunities for evolutionary qualitative transformations of development processes and positive changes in local and lower level management mechanisms.

Prerequisites and components of construction and design of the chain of creation of the mechanism take into account a complex of processes of innovations, studying of key determinants and progressive factors of development. The set of mechanisms used in management economic processes involves the synthesis of local mechanisms, subordinating and combining them into a single multi-subject and multi-object management mechanism, which will shape the impact on enterprises of all types of processes and resources used and provide comprehensive interaction of all management structural units of their units and the expected economic result of joint activities.

The need for the synthesis of mechanisms is due to the growing complexity and dynamism of the environment, the rapid pace of informatization of society, the development of modern digital technologies and other inventions.

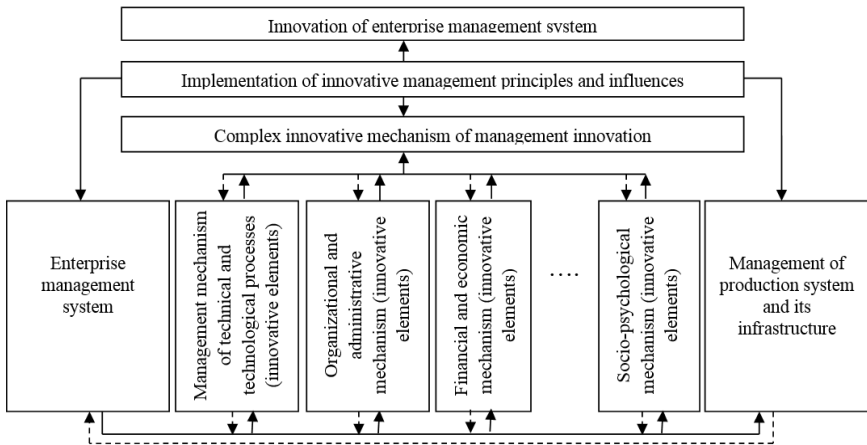
The mission of a comprehensive integrated mechanism of economic management should be to combine innovative methods, technologies and processes of existing local mechanisms of different directions with the use of modern information technologies, update and deepen the potential of their innovative impact on overcoming negative changes in external and internal environment. their production structures due to system-wide managerial changes and increasing the role and influence of management on economic development.

The composition of mechanisms that can be included in the integrated innovation mechanism of management innovation should be formed from the control mechanisms of both the control system itself and the control mechanisms of the production system managed by it. Each mechanism is not closed and is capable of further transformation, renewal or integration. Priority in their composition should be considered organizational and administrative, financial and economic, socio-psychological mechanisms, mechanisms of technological and intellectual transfer, mechanisms of adaptation, self-organization and development.

Each of them has its components, which in the process of their integration, given the similarity of content in the integration mechanism will be combined, enriched, expanded and deepened in order to include them in the action of mastering and implementing

innovative management tools.

Joint action from the impact of a comprehensive innovation mechanism of management innovation should be formed and applied in the sequence of implementation of the management cycle of formation and adoption of strategic and current management decisions, taking into account the specific stages of the life cycle of the managed production system. production system of enterprises. This will shift the centers of their attraction to negative changes and environmental influences towards a stronger component – their own management system by anticipating and timely planned innovative management influence to restore the balance of potential of their systems (Figure 3.4).



**Figure 3.4 Model of construction and application of a complex innovative mechanism of management innovation**

System-wide measures for the development and implementation of an innovative mechanism for innovation management of management systems should be defined in the Program of innovative development of enterprises, which would include methodological, institutional, analytical, organizational, communicative measures, control and regulation measures, measures to form and maintain innovation. mechanism of management innovation and directed to a



new level of economic capacity and competitiveness of the economy.

Building and maintaining new level management systems and innovative quality should be comprehensive, consistent and timely, covering and enhancing organizational and institutional elements of structural changes and changes in the relationship of the system, which will maintain a new level of systemic qualities, ensuring continuous innovation of management influences, acquisition of evolutionary features of management and the anticipatory nature of its resulting actions.

Innovation of the management system and the use of its innovation levers for economic growth as part of a comprehensive innovation mechanism of management innovation should be based on the concept, which includes: purpose, principles, tools, steps of implementation and application, resources, institutional support and others.

The main measures of innovative management of economic development should consider:

- development and substantiation of long-term strategic and current plans of the enterprise according to the established economic goals;

- structuring and assessment of the nature of existing imbalances in the processes of reproduction of structural-component, factor, institutional, spatial and other violations, parametric characteristics of economic, financial and technical-technological security in order to ensure their competitiveness;

- substantiation of processes of innovative management of balanced development and development of mechanisms of modernization and elimination of existing problematic issues for a steady course of economic processes, providing economic growth and realization of opportunities;

- establishing close cooperation between the organizational components of the innovation infrastructure;

- reproduction and expansion of the scope of professional knowledge of employees;

- providing conditions for supporting systemic innovative development of business processes;

- creation of conditions and development of corporate culture, social responsibility and rules of social interaction and cooperation;

- motivation and increase of innovative activity and collective creativity to search of innovative ideas and their use.

The priority, main tasks of innovation management, which will be solved by means of the complex innovative mechanism of innovation of management, should become:

- coordination of approaches to the formation of innovative management technologies and their implementation in management;

- elimination of the system of imbalances, asymmetry and structural deformations of the elements of the management system, which inhibit the flow of economic activity of economic entities;

- iteration of cooperation, coordination, identification and leveling of factor constraints in solving problems of economic development management;

- ensuring the functional and instrumental interaction of structural units in solving problems of further innovative development of enterprises;

- establishment and coordination of interaction between management entities and production system entities during the discussion of joint planning of innovative strategic development priorities, application of management measures and mechanisms for their provision of functional cooperation;

- establishment of processes of generating new knowledge and innovative development of competitive objects, technologies and their transfer to basic technologies;

- formation of organizational forms, institutional and information software, solving innovative tasks of management of economic expansion of management tools;

- cooperation of connections and integration of (horizontal) functions and processes.

The main steps in the formation of a system of innovative management of the economy of enterprises include:

- assessment of the level of innovative development of the management and production system in the areas of joint activities, the system of parameters, indicators and characteristics and the impact on the state of competitiveness of the product;

- assessment of the existing innovation potential, directions and opportunities for its increase;

- determination of existing and expected criteria for assessing the

state of competitiveness of structural components of the system, their elements and poles of influence on innovation;

- analysis of the types of current management mechanisms and clarification of their points of contact in the management of economically feasible use of resources and the processes of their consumption in economic activities;

- definition and balancing of priorities of administrative maintenance of economic, industrial and social processes of subjects and objects of management;

- analysis of possibilities of combining synchronous innovative development of elements and management processes;

- designing a comprehensive integrated innovation mechanism for management innovation;

- creation of resource potential for designing and implementing an innovative mechanism and sources of funding.

Implementation of the project of management innovation and design of a comprehensive innovation mechanism requires reliable financial support. Expected transaction costs include transaction activation and transformation costs for research and development, design and implementation of measures to innovate management systems. The amount of costs will depend on the innovative needs of enterprise management, the complexity of development and quality of the innovation mechanism and the results of the output processes of its implementation.

The list of costs should include the costs of developing a project to innovate management systems, creating intermediate rules and tools to support the designed measures, methods and relationships between them, the cost of adapting elements of all existing mechanisms to their combined action, revision of action plans and coordination in case the emergence of changes and other costs associated with the transformation of the system of processes of innovation interaction and their adaptation to new operating conditions. At the same time, this does not mean that these costs will be permanent. They will be significantly reduced at the time of project implementation, becoming a source of payback and efficiency of the results of innovative development of scientific and technical, organizational, managerial, personnel, financial, logistical and other implemented innovations.

**Conclusions.** Innovative transformations in the management of the use of economic and other types of resources, in order to increase the efficiency of transformation processes at the present stage becomes a priority of socio-economic development of many enterprises, industries and Ukraine in general. It is obvious that the main condition for the country's development is the use of the innovation path, the expansion of innovation in all spheres of life and, above all, the management of industrial enterprises. The main ideas of development should include determining the path of development of management systems and their structural units according to the selected priority features.

The awareness of the need to introduce innovations in all life processes for the sustainable development of economic entities has appeared for a long time, but activities in this direction have not yet been thoroughly established. One of the reasons for this is the lack of attention to the innovation of management systems, the activities of which precede production activities. Management itself must transform the implementation of scientific ideas into techniques, technology, methods and means of production, economic, financial, social and other activities, organize and adjust the flow of processes of innovative development. To accomplish these tasks, management systems at all levels must be innovative and capable of innovative management and innovation in managed systems. The solution of this problem is especially acute in the changing environment of society, the emergence of economic, social and organizational changes and unpredictable risks.

Creation and application of the complex innovative mechanism of innovation of management will allow to combine efforts of authorities of various levels, industrial and administrative systems in formation and realization of innovative processes, their development, coordination, control and regulation of innovative activity, will allow to identify their joint cooperation, forms and spheres of its application. , institutional and instrumental activity and innovation infrastructure of enterprises in the economic systems of economic entities of the regions of the country.

Further scientific research of conditions of designing and realization of the complex innovative mechanism of innovation of management should become researches of scientific bases of

information-analytical and technological maintenance of development of projects of innovation, revision and improvement of parameters, algorithms of technologies and logical chains of their use.

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**METHODS AND  
MECHANISMS OF  
MANAGEMENT OF  
INNOVATIVE  
ACTIVITY AT THE  
ENTERPRISES:  
WORLD  
EXPERIENCE AND  
PRACTICE OF  
APPLICATION**

Abroad, the problems of innovative development, as well as the main mechanism of its implementation – the innovative activities of enterprises, are given considerable attention by the state, scientific and business communities. [1].

The issues of implementation of innovative activities were most developed in the EU countries, where the implementation of measures to enhance and develop this activity is carried out in two directions [1; 2; 3; 4]:

The first direction, initiated by the state, is associated with the development of systems of administrative and economic motivation and support for enterprises, and the creation of an innovative infrastructure, methodology and tools that allow effective innovation. In order to form and develop an innovative infrastructure, a number

of projects have been implemented in the EU countries, including:

1. The Europe INNOVA project, initiated with the aim of improving the mechanisms and tools for the implementation of innovation in enterprises, enabling them to successfully and quickly create and implement new solutions [1; 3]. Europe INNOVA is a network and platform for learning, sharing experiences, best practices and knowledge. The platform brings together public and private enterprises, including business incubators, venture capital and other innovative structures. Europe INNOVA contributes to the identification of driving forces, barriers to innovation in specific sectors, the design and implementation of targeted government interventions, the development of new services, etc. aimed at helping enterprises in innovations.

2. Leonardo da Vinci Pilot Project, carried out by enterprises from various industries, who provided data on the level of development of their innovation processes and the methodology they use in this area [2; 5]. The result of the project was the development of a manual aimed at providing methodological support for enterprises engaged in innovative activities, which is educational in nature and contains an overview of the most effective tools and methods for innovation management [5].

3. EU project IMP3rove (Improving the efficiency of innovation management through sustainable impact "IMP3rove", improving the performance of innovation management for sustainable development). A project that assists enterprises in optimizing innovative activities [6; 7]. The long-term goal of the IMP3rove program was to establish a unified approach and create a standardized platform for analyzing innovation and assessing the effectiveness of innovation activities of enterprises.

In the future, all projects provide for the specification of the results obtained in relation to various sectors of the economy [1]. At the same time, it is noted that the implementation of innovative activities by the EU countries will require coordinated efforts of the state and business, scientific institutions specializing in innovation agencies, as well as private and public financial institutions.

In Europe, work is underway to create and improve methods and tools for innovation management [2; 3; 8]. The fundamental methodological document that forms the conceptual basis of

innovation is the Oslo Guidelines: Proposed Guidelines for Collecting and Interpreting Technological Innovation. The document was prepared by the Organization for Economic Cooperation and Development and Eurostat and allows an in-depth study, quantitative and qualitative measurement of innovation and its cross-country comparisons [8].

Foreign experience of innovative development of national economies indicates that it is managed by three main methods [9, p. 137]:

- at the initial stage of management of innovative development is carried out mainly by public administration methods and from the state budget;

- at the second stage, the management of the process of innovative development is transferred to non-state financial structures. The role of the state is reduced to defining strategic innovations and providing tax preferences to innovative enterprises;

- at the stage of a developed industrial society, the role of the state and its institutions is reduced to the coordinator of the innovation process by determining priority areas, financing the system of training specialists and financing global research, the profitability of which is delayed in time. The main producer and source of financing for innovations at this stage are business structures and their associations, and market mechanisms are the regulator of the process.

The policy of each of the modern countries – leaders of the world economy in the field of innovation was marked by separate evolutionary (cause-and-effect) changes and revolutionary steps. The effectiveness of the process of enhancing innovation in different countries of the world is influenced in different ways by individual factors of the external and internal environment, which causes a significant differentiation of the mechanisms of state support and makes it impossible to unify it. That is why, when forming the national doctrine of innovative development of Ukraine, it is a mistake to simply copy the experience of individual states, it is more expedient to study it in detail, establish causal relationships, filter out the most valuable and effective mechanisms that can be adapted to the existing conditions and opportunities of the domestic economy [10, p. 104].



The methods and tools used to manage innovations, innovation portfolios that are currently used are numerous. Among them are specially created and taking into account the need to minimize the uncertainty and risk inherent in innovation and universal tools and methods used in various areas of enterprise management, forecasting, marketing, strategic management, investment project evaluation and others (Table 3.4).

*Table 3.4*

**The most common tools and innovative management methods in the world**

Scope of tools and methods	Basic tools and methods of innovation management
1	2
Forecasting technological development	<ul style="list-style-type: none"> <li>- Critical Technologies;</li> <li>- Scenario building;</li> <li>- Delphi Method;</li> <li>- Method Foresight</li> </ul>
Strategic planning of innovative technological development	<ul style="list-style-type: none"> <li>- Road mapping technique</li> </ul>
Identification of technical, technological and organizational development needs and setting goals	<ul style="list-style-type: none"> <li>- External and internal analysis;</li> <li>- SWOT-analysis;</li> <li>- Technology audit;</li> <li>- Benchmarking</li> </ul>
Assessment of innovation activity	<ul style="list-style-type: none"> <li>- EFQM audits;</li> <li>- Balanced scorecard (BSC)</li> </ul>
Generating ideas and activating thinking	<ul style="list-style-type: none"> <li>- Brainstorming;</li> <li>- TRIZ methodology</li> </ul>
Organization of accumulation, multiplication and use of knowledge	<ul style="list-style-type: none"> <li>- Knowledge Management</li> </ul>
Selection of innovative projects	<ul style="list-style-type: none"> <li>- Checklists (1/0 pricing models);</li> <li>- Ballroom models;</li> <li>- Value adding model;</li> <li>- Models based on cash flows (net income, net present value, internal rate of return, need for additional funding, payback period);</li> <li>- Expected Commercial Value;</li> <li>- Bubble Diagrams;</li> <li>- Cash curves</li> </ul>

Table 3.4 (continued)

1	2
Effective management of a set of projects, resources and risk to achieve goals and implement a strategy	- Portfolio management; - Program management technology
Identification, collection, analysis, dissemination and use of information within the company	- Technology watch
Moving scientific and technical knowledge and achievements on a commercial and pro bono basis	- Technology transfer
New product development	- Stage-Gate methodology; - NPD-process
Development of new products, business processes and business models, valuation methods, expansion projects, acquisitions of assets or companies	- The Innovation Pipeline

Source: compiled on the basis of [2; 3; 11; 12; 13; 14]

Among the tools specially developed for managing the innovation process at an enterprise, the most common abroad include:

1. Stage-Gate-process is a technology that represents a management plan for the development of a new product from the formation of an idea to its commercialization [4; 11]. The process includes several predefined "stages", each of which consists of a set of predefined actions. Their successful completion is necessary for the transition of the process of developing a new product to the next stage of development. The entrance to each stage is a gate that controls the process and serves as decision points.

Stage-Gate-process is a technology that allows selection of innovative ideas and projects at all stages of their life cycle. Its application is notable for its considerable complexity and laboriousness, therefore, as an alternative to Stage-Gate- process, The Innovation Pipeline technology is proposed [11; 15; 16].

2. The Innovation Pipeline is a technology for managing the flow of innovations that has a wider scope than the Stage-Gate process, from new products, business processes and business models to expansion projects, acquisitions of assets or enterprises.

Distinctive features of the Innovation Pipeline from the Stage-Gate-

process include a clearly defined strategic context of the technology, its integration with the portfolio management process and the procedure for phased financial planning and control of the enterprise's activities [16].

3. NPD process (New Product Development). The technology is widely used abroad. The NPD process has significant similarities with the Stage-Gate technology, but it focuses not only on the development of the product itself, but also on the process of its production [2; 3; 5].

At the same time, in the development of methods for managing the innovative activities of enterprises, a number of problems are noted, associated, first of all, with the strategic planning of this activity, its measurement and evaluation.

The presence of these problems is largely determined by the need for the formation of appropriate methods of accounting for policies and the goals of creating and applying innovations at enterprises, as a way to implement their strategy.

The second direction, developing in Europe, is associated with the organization of innovative activities at enterprises and the development of their innovative potential. The analysis of the methods of implementing innovative activities at enterprises abroad made it possible to single out several approaches in this area:

1. "Project approach", in which innovation at the enterprise is considered as a set of innovative projects managed within the project management methodology or using other tools (for example, Stage-Gate-process, the Innovation Pipeline). In this case, projects are combined as part of the innovation portfolio or may not be related to each other [17].

2. A "programmatic approach" based on the application of program management used to manage large-scale innovation transformations. Program management is ensured through the integration management (development and control) of the projects included in its composition and consists of a number of management activities related to the development and planning of the program, its implementation and evaluation in terms of creating value for the enterprise and stakeholders. Program management requires the creation of special organizational structures at the enterprise, functioning for a long time, but of a temporary nature, and providing program management in addition to managing individual projects in its composition [4; 17; 18].

3 An approach based on the creation of research, development and innovation management systems (Research, Development and Innovation (R&D&I)) in accordance with the requirements of national

standards. At the same time, innovative activity is considered as a relatively independent direction or process of the enterprise's activity, integrated into its management system. [19; 20; 21; 22].

The number of enterprises that transform innovation into a process built into the management system is constantly growing abroad. This approach is generally accepted in factories in Europe, since standardized work is a tool that ensures process stability, continuous improvement, organizational learning and experience. Its purpose is to structure and systematize innovation at the enterprise level, to determine the structure and composition of requirements for its elements [19].

National standards for R&D&I management systems are currently developed in a number of European countries, such as Spain, Portugal, France and Great Britain, Germany. These standards are used as a basis for the development of a corresponding European standard [23].

French standards are aimed at ensuring the quality of scientific research and related R&D&I projects, in accordance with the international standard (hereinafter – MS) ISO 9001 [23].

The UK R&D&I Management Guide, which contains recommendations for managing innovation programs and projects, is intended to implement the planning of new products, services and their development in the enterprise for sustainable development [23; 24].

The standards developed in Spain and Portugal contain requirements for the management of innovative projects as well as R&D&I management systems. At the same time, the family of standards in Spain includes requirements for the formation of a technological monitoring system at the enterprise, Portugal – for the competence of auditors and assessment of R&D&I management [23; 25].

Portuguese Standard NP 4457:2007 “R&D&I Management. Requirements for the R & D & I management system "uses the PDC(S)A (Plan-Do-Check(Study – Act) cycle as a methodological basis, which includes the main management functions: forecasting and planning, organization and management, control, accounting, analysis, assessment activities and improvement.

More perfect from the point of view of using modern approaches used in management is the Spanish standard of the same name UNE 166002:2006 [25]. His methodology, in addition to the PDC(S) A cycle, is based on the process and system approaches [26].

The requirements of UNE 66002:2006 are applied by industrial enterprises in Spain for the management of R&D&I. The R&D&I management systems of such enterprises are in accordance with the

generally accepted practice in the field of conformity assessment of management systems, certified in accordance with the requirements of UNE 166002:2006 by the Spanish Association for Standards and Certification (AENOR).

Compliance with standards, along with an independent technological audit, is considered in Europe as a mechanism for confirming the innovative potential of an enterprise, the effectiveness of its implementation of innovative activities [1; 19; 22; 27]. The presence of certificates of conformity in European countries is used by the state to stimulate the innovative activity of enterprises by providing them with tax incentives and the ability to apply for other measures of financial support [19; 20].

The creation and effective functioning of an appropriate management system at the enterprise also contributes to increasing the trust and support of stakeholders in the implementation of innovative transformations by the enterprise [18].

A similar model for managing innovation has been proposed by the Japan Standards Institute. He developed TR Q 0005 – a standard that deepens the provisions of ISO 9001 in terms of innovation and is focused on increasing competitiveness as the foundation of the economic sustainability of an enterprise, provided on the basis of a balance of interests of business, personnel, society and future generations [14].

The considered methodological approaches to enterprise management – process, system and PDC(S) A cycle, are currently used in the management systems of most enterprises. They are used to improve the management activities of enterprises in such areas as quality management, environmental management, management of occupational safety and health, and others.

The advantage of using these approaches for the implementation of innovative activities at enterprises is confirmed by foreign experience in R&D&I management. In addition, the repeated use of MS allowed enterprises to accumulate experience and create the necessary competencies of personnel, to form a regulatory and methodological base for the application of the process, systematic approaches and the RBS cycle (8) A.

Among the main disadvantages of the standardized approach, one should highlight the insufficient attention paid to the issues of strategic management of innovation, the importance of which is emphasized by its long-term orientation, uncertainty and risk, and the multivariancy of

achieving the strategic goals of enterprises. In addition, taking into account the peculiarities of the innovative development of Ukraine, the processes of strategic management should take into account the need for a comprehensive solution to the problems of modernization and innovative development of enterprises.

Significant attention is paid to innovation activity, as the main factor in the formation of competitive advantages of enterprises, industries, economies of technologically developed countries, abroad, where significant experience in innovative development of production has been accumulated, which requires analysis and can be used to implement innovative activities at enterprises in Ukraine.

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**BLOCKCHAIN AS A  
DRIVER OF  
DIGITALIZATION:  
ESSENCE,  
COMPETITIVE  
ADVANTAGES AND  
APPROACHES TO  
REGULATION IN  
THE WORLD AND  
UKRAINE**

The modern world is already digital, and this trend will continue to spread. Of course, the digital economy is a data economy. And it is a blockchain technology as a new concept that changes the order of transmission, processing, and protection of data of consumers and organizations, and is part of the digitalization process. This technology is as revolutionary as the Internet, which has moved us from regular mail to e-mail. In the coming decades, the blockchain will change its approach to logistics chain management, commercial operations, and the exchange of financial assets. That is blockchain technology as a new model of collecting, storing and processing information is one of the key elements of modern economic development in the face of globalization challenges.

Blockchain technologies are transforming economic, managerial, financial, and other spheres and have a huge potential, requiring further study. Using a blockchain is an opportunity to reduce the cost of transactions, increase transparency and trust in the system, as well



as reduce the cost of processes [1].

Technological issues and concepts of blockchain application were covered in the works of M. Swan, W. Moghair, A. Tapscott and D. Tapscott, S. Raval, L. Lela, M. Casey, and P. Vinha. Also, some aspects of the development of the blockchain technology market were studied in the works of I. Dronin, O. Makovoz, T. Perederiy, G. Pochechuk, S. Khoruzh, L. Nosach, and K. Velychko, Y. Popyvnyak, L. Hidong, R. Radeiko, N. Yushchenko and others.

Today digitalization determines the trajectory of modern business and it is a logical stage in the development of society, which in the field of economic relations is manifested in the concept of Industry 4.0. The growth of data, the dynamization, and transformation of its payment, the issue of cybersecurity accelerates and enhances the impact of digital technologies, which causes changes in the business models of companies. Digitalization processes are becoming identical to strategic advantages. For companies, as subjects of market relations, gaining a competitive advantage is the most important point in achieving a stable competitive position on the market. The mechanism of competitive advantages formation is based on effective interaction of conditions of the enterprise functioning and the factors forming its resource potential (intellectual capital of the enterprise, experience, and knowledge, unique skills, competitive opportunities, market achievements, etc.). Of course, competition in the market is strong, so the introduction of new technologies will contribute to the formation of the company strategic advantage. Such technologies include blockchain (distribution registry technology).

Blockchain is an innovative concept, a transparent and secure platform for secure storage, transmission, and processing of confidential and valuable data. It is a kind of digital accounting book, which is replenishing gradually with new records. This "book" is decentralized and protected by encryption. The data is transmitted on a large-scale distributed computer network, not exposed to the human factor, and the backup data can be interacted with in real-time without intermediaries. The blockchain network does not use traditional IT infrastructures – they are closed and have low manageability.

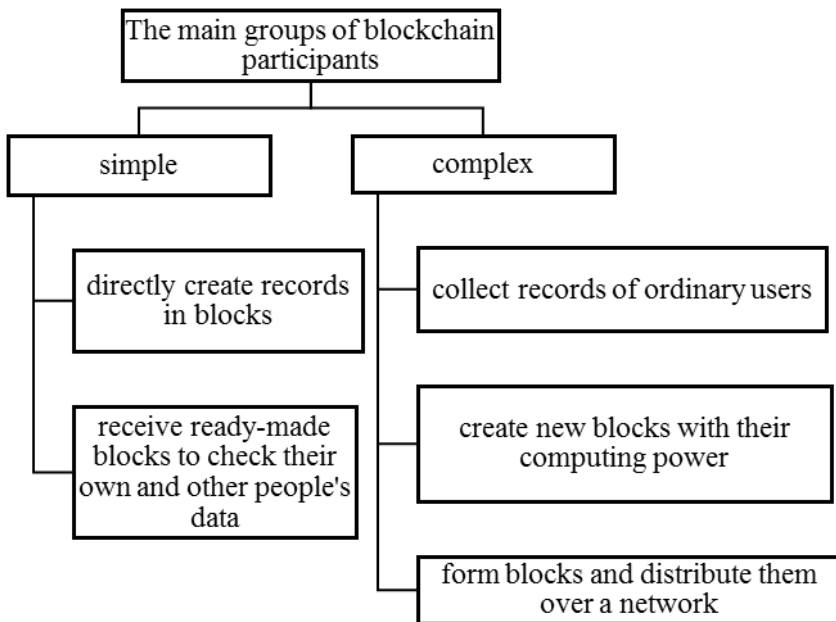
The founder of blockchain technology is the inventor of bitcoin – Satoshi Nakamoto. Blockchain comes from two English words – block and chain and is a kind of chain of blocks, a database consisting of blocks. A distinctive feature of the blockchain is the decentralization of stored information, and this fact has led to the rapid development of this technology.

Blockchain is not just a technology for storing and exchanging data, but a real revolutionary technological breakthrough. It is known that bitcoin and all other cryptocurrencies are built on blockchain technology. The practical application of the blockchain is much broader than financial transactions. In the blocks that make up the blockchain, you can write various information that is stored in paper form (property rights, land cadastres, credit histories, medical data about patients, etc.).

In 2015 the following definition was proposed at the World Economic Forum: blockchain – a new technology that eliminates the need for third parties to ensure confidence in financial, contractual, and elective actions [4]. Because it is a technical process, there are technocratic definitions, namely: "a blockchain is a consistent database of information that is protected by cryptographic proof methods and offers an alternative to classic financial books" [10]. Or "blockchain – a public database of all transactions of various types within a single system, which are lined up in a certain way and from them a chain of blocks is formed" [1]. Blockchain can be used in various areas, such as money transfers, micropayments, smart contracts, identification of physical objects and assets, public administration, defense and security, international activities, etc. Therefore, blockchain technology can be a driver of systemic change in a wide range of industries, business models, social and operational processes.

Anyone with a computer can join the blockchain system. All users have the same rights, which significantly distinguishes the system from those already existing in the monetary and financial sector.

This system is designed in such a way that provides only two groups of participants: simple and complex. Schematically, their essence is shown in Figure 3.5.



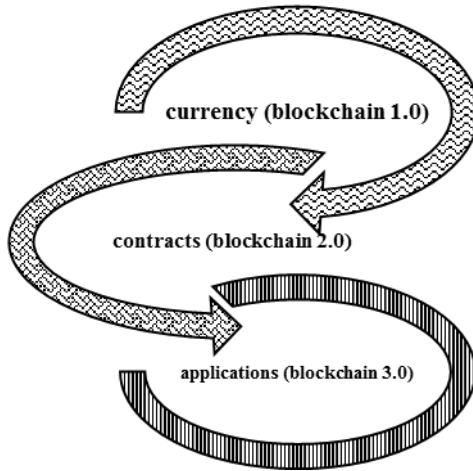
**Figure 3.5 The main groups of blockchain participants**

In modern conditions, three main areas of blockchain implementation have been formed:

- cryptocurrency (used in various areas related to money, such as digital transfer and payment systems. As of March 1, 2019, 2097 cryptocurrencies were registered in the world, and their total capitalization amounted to 130 billion USD. Bitcoin retains the first position – more than 52% of the total capitalization, and in the second place is Ethereum, with a share of 11% [3];

- smart contracts (whole classes of economic, market, and financial transactions based on blockchain technology, work with different types of financial instruments – stocks, futures, bonds, mortgages, legal titles, "smart" assets, and "smart" contracts);

- IT applications (digital platforms) are technologies whose scope goes beyond cash, finance, and markets. They apply to the spheres of public administration, health care, science, education, cultural, and artistic spheres (Figure 3.6).



**Figure 3.6 The main directions of blockchain implementation**

There are the five main blockchain platforms [2].

The Emc SSH platform is key management. It allows you to store, process, protect and give access to a database of keys (passwords) by a specific user.

The Emc SSL platform is an extension of the SSL protocol. This platform stores digital fingerprints of individual users or entire organizations.

The Emc Info Card platform uses a system of business (electronic) cards that are associated with SSL certificates. The main distinguishing feature of such a system is that the information stored in it can be edited.

Emc TTS is a system that allows you to record the time, date (imprint) of any posted documents at the time of publication. This technology allows you to solve many issues related to the authenticity of the document, contract, and patents.

The Emc DPO system can confirm to the user based on numbers, characteristics that are presented in physical or intellectual form, ownership of land, programs, cars, and so on.

Emc Atom – a system that allows you to enter transactions without the participation of third parties and intermediaries. That is, there is a technology that allows you to not go to a notary, law firm, bank, or other organization.

Thus, we can distinguish 5 large groups of blockchain use in production (Table 3.5).

*Table 3.5*

**Enlarged blockchain groups**

Group	Remarks	Current status
Network administration	Responsible for security	Used by a small number of organizations
Storage of digital certificates	Responsible for certificate protection	There exist several platforms
Proof of property rights	Responsible for the transfer of property rights	Used by most companies
Creating a DNS system	Responsible for confidentiality and secure access to the database	Actively used abroad
Identification and confirmation of access rights	Responsible for domain names	There exist working technologies

*Source: compiled based on [2, 5]*

Blockchain allows getting access to certain data from a large database collected by the Internet of Things, which will be available to a particular user. No node or computer will be able to change the information contained in the database. Each node can only check the records. All these processes occur automatically, i.e., without human intervention.

According to experts, the cost of the blockchain will only increase and in 2023 will amount to 14.4 billion USD. In addition, most experts attribute the growth of GDP to the introduction of innovations, namely in the use of blockchain technology. In Sweden, GDP growth due to the blockchain may reach 3% by 2030, in Luxembourg – 2.6%, in Germany – 2.4% [3].

The well-known company Pricewaterhouse Coopers (PwC), which specializes in professional services in the field of consulting and auditing, conducted analytical research and concluded that blockchain technology can ensure global GDP growth of 1.76 trillion USD in the next 10 years [10].

According to PwC’s conclusions, presented in the report "Time for trust: The trillion-dollar reason to rethink blockchain", five key areas of application of blockchain technology were analyzed, which

were presented based on the possibilities of economic benefits in the modern period (from the largest to the smallest) [6]:

1. Tracking and monitoring of goods and services, which have become a new priority for most companies in the management of supply chains during the COVID-19 pandemic, have the greatest economic potential (962 billion USD). Blockchain technologies have a wide range of applications. They can be applied to companies in a variety of industries, from heavy industry to the fashion industry, in response to increased public and investor attention to issues of social and environmental responsibility and the ethics of supplier selection.

2. It is possible to use blockchain technology to make payments and provide financial services, including using digital currency, or to expand access to financial services through cross-border payments and transfers (433 billion USD).

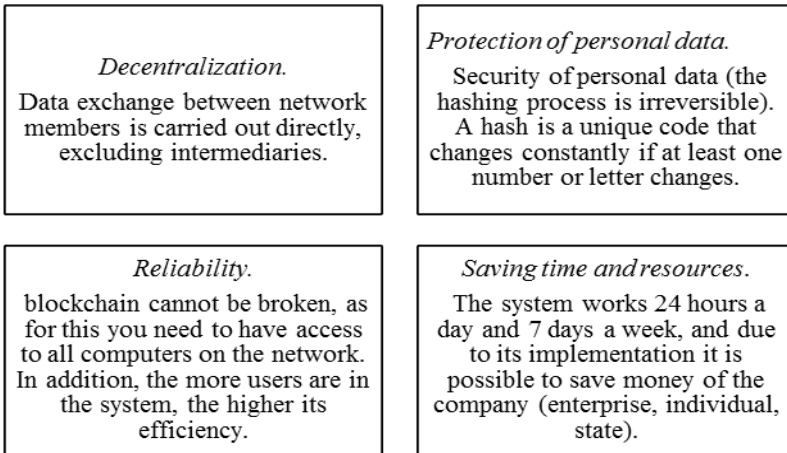
3. Blockchain technologies can also be used to manage identification information (224 billion USD), including personal identifiers, professional qualifications, and certificates, to prevent fraud.

4. Blockchain technologies can be used to contract and resolve disputes (73 billion USD), as well as to attract customers (54 billion USD). Also, the use of blockchain in loyalty programs expands its capabilities for use in the public and private sectors.

In addition, the report notes that Asia is likely to reap the greatest economic benefits from blockchain technology. And the maximum potential net profit from the blockchain can get China (440 billion USD) and the United States (407 billion USD). Other countries, including Germany, Japan, the United Kingdom, India, and France, could also generate a net income of more than 50 billion USD [6].

The practice of using blockchain makes it possible to identify the main advantages of blockchain technologies (Figure 3.7).

It is worth noting that blockchain technology has disadvantages, the main of which is the high cost at the implementation stage. Therefore, the issue of regulating and supporting the implementation of blockchain technologies is important. The world experience of blockchain technology regulation shows the following: some countries have remained in the existing legal field, regulating only certain specific problems of the blockchain, others have developed or are developing special legislation for the blockchain.



**Figure 3.7 The main advantages of using blockchain technologies**

*Source: [5; 9]*

An example of state regulation of the blockchain according to certain rules of law is demonstrated by China. Under such conditions, special laws and regulations are developed to regulate blockchain technologies. At the same time, state regulation of blockchain technologies is implemented at the federal level – the government and ministries (macro-level) and the regional level – government bodies of the provinces of China. The State Council of the People’s Republic of China (PRC) has adopted China’s National Information Development Plan (13th Five-Year Plan), which focuses on the development of blockchain technologies and the blockchain industry. The Ministry of Industry and Information Technology of the PRC issued a so-called "White Paper" on the blockchain industry in 2018, which contains an in-depth analysis of the current state of China’s blockchain industry, forecast trends in this area, and standards for blockchain technology. The White Paper states that the blockchain is a leading area of global technological development, will continue to be widely used in the Chinese economy and will be the main support for building a digital China [8].

The United States follows the second model in matters of state regulation of the blockchain. Blockchain technology is regulated in the country at the macro level by the federal government and federal agencies, and at the micro-level by state governments directly. Uniform standards for regulating the development of blockchain technologies in the United States have not been approved yet, so state regulation is implemented at the level of US federal agencies within their competence. However, US authorities also adopt local regulations and rules for the application of the blockchain. The main vector of regulation of blockchain technologies here is the integration of this regulation into the already existing system of securities regulation, as well as money circulation and taxation.

Singapore is actively supporting the development of the cryptocurrency market and blockchain projects. Special regulation on cryptocurrencies has not yet been adopted in the country, but a bill on payment services has been developed to regulate the infrastructure related to the issuance and exchange of cryptocurrencies (to be adopted by parliament). The cryptocurrencies field is controlled by the explanations of the regulator. The requirements of the legislation on investment services and securities apply to the issuance and circulation of certain cryptographic tokens if they meet the definition of securities. Cryptocurrency – tokens used as a means of exchange or payment for tax purposes – belongs to the group of services, which leads to the collection of VAT when conducting transactions with cryptocurrency. The Monetary Authority of Singapore requires cryptocurrency exchanges to comply with the basic requirements of anti-money laundering legislation (customer identification, reporting of suspicious transactions, etc.).

The experience of Estonia as a one of leaders in the application of blockchain technologies, where the e-Estonia program works, is worth regarding as well. Blockchain here is completely legal. In particular, the blockchain is used in the system of personal identification of citizens. Through this technology, Estonian elections to the government are held and there exists a possibility to pay taxes and register businesses.

In Ukraine the Ministry of Digital Transformation operates, which stressed that the implementation of blockchain technologies and their application in public administration and the development of



virtual assets are urgent. Also, Ukraine is among the top 14 countries in the world in terms of the introduction of blockchain technologies, while cryptocurrencies make up 2.5% of GDP (2.5 billion USD) [7]. Of course, today the state must actively participate in the transformation process by forming effective mechanisms of state regulation of the blockchain industry.

The digital transformation of key business operations and processes is one of the priorities for most businesses in the face of globalization challenges. For example, the COVID-19 pandemic has further shaped the demand from the state and business for new technological solutions. Blockchain can bring the activities of a business and a state system to a qualitatively new level. The advantage of blockchain is that this technology increases the security of basic data, which, in turn, allows companies to avoid violating data protection laws. Thus, the blockchain opens the possibility for a paradigm shift in terms of storage and use of personal data, which can eliminate the central points of failure and give people the opportunity to control and monetize their data.

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## Chapter 4

# DEVELOPING AND IMPLEMENTATION OF STRATEGIES FOR THE ECONOMIC SYSTEMS MANAGEMENT IN CERTAIN SECTORS OF THE ECONOMY

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## AGRICULTURE IN BULGARIA: FROM EUROPEAN UNION ACCESSION TO THE COVID-19 PANDEMIC

### **Introduction**

Agriculture in Bulgaria is one of sectors country's economy in which significant changes have taken place over the past three decades: in the field of economic relations, the structure of farms, the size and production activity of enterprises, income and profit. These changes are due to the agrarian reform carried out in the 1990s, accession Bulgaria to the European Union, and the implementation of measures and mechanisms of the Common Agricultural Policy (CAP). In the period before accession Bulgaria to the European Union (1997-2007) there were significant changes in the

organization of agricultural sector of the economy, the formation of statistics, harmonization with European agricultural legislation, adaptation to dynamic changes in the environment. During the period of accession Bulgaria to the European Union, the conditions for functioning of agriculture relate to the formation of necessary mechanisms (organizational, financial, administrative, legal, informational, etc.) and successful adaptation to new realities. Bulgaria's agriculture underwent significant changes during the COVID-19 pandemic, prompting the developing of appropriate financial support policies by the state and the European Union.

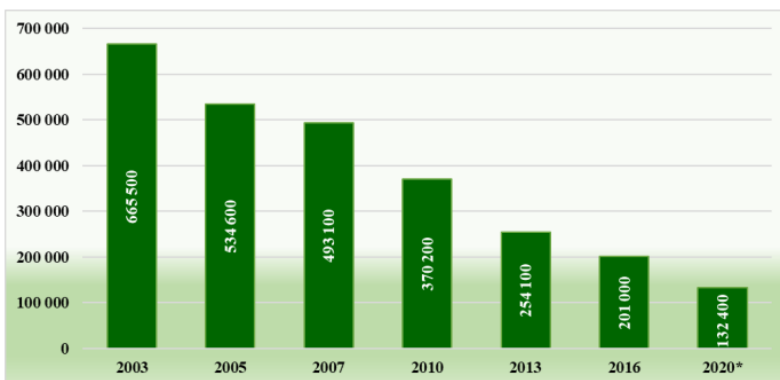
For Bulgaria, agriculture is an important sector of the national economy for several reasons. First, it provides the population with food, on the quantitative and qualitative measurement of which depends the national food security of the country, raw materials for the food industry and resources for export. Secondly, favorable climatic conditions are suitable for growing various crops and farm animals. Third, agriculture accounts for 11.0% of gross domestic product, 12.5% of gross value added and employs 25.1% of the population.

## **Methodology**

The economic processes in Bulgarian agriculture during the country's accession to the European Union and the COVID-19 pandemic are analyzed. An assessment of the economic indicators of agricultural enterprises in Bulgaria. A study of the impact of positive and negative factors on agriculture in Bulgaria. Mechanisms for counteracting the destructive impact of environmental changes and counteracting the COVID-19 pandemic have been proposed.

## **Research results**

In Bulgaria as a whole, there is a general tendency to decrease the number of agricultural enterprises with an increase in agricultural land. The dynamics of the number of agricultural enterprises in Bulgaria is presented in Figure 4.1. According to the figure, the number of agricultural enterprises in Bulgaria in 2020 amounted to 132400 units and decreased by 80.1% compared to 2003 and by 73.1% before the accession to the European Union, during the COVID-19 pandemic reduction of 34.1%.

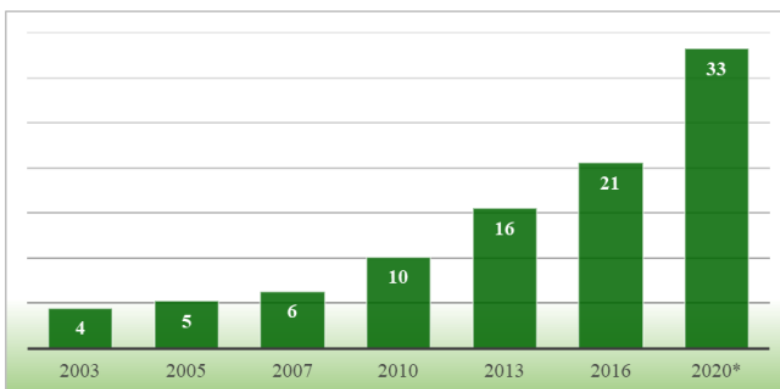


**Figure 4.1 Number of agricultural enterprises in Bulgaria, 2003-2020, units**

*Note: data for 2020 are preliminary*

*Source: calculated by the authors according to the data Ministry of Agriculture, Food and Forestry*

In 2020, the average area of agricultural land used by one farm reached 33 hectares and increased 8.3 times compared to 2009 and 5.5 times compared to 2007 (Figure 4.2).



**Figure 4.2 Average area of agricultural land per farm in Bulgaria, 2003-2020, hectares**

*Note: data for 2020 are preliminary*

*Source: calculated by the authors according to the data Ministry of Agriculture, Food and Forestry*

In 2020, the number of agricultural enterprises with land areas less than 10 hectares significantly decreases compared to 2003 and 2010. The largest decrease (10 times compared to 2003 and 5 times compared to 2010) is the number of agricultural enterprises with land areas up to 1 hectare. About 8% of agricultural enterprises (with 50 hectares or more of land areas) manage 85% of agricultural land. In 2020, their number increased by 28% compared to 2010 (Table 4.1).

Table 4.1

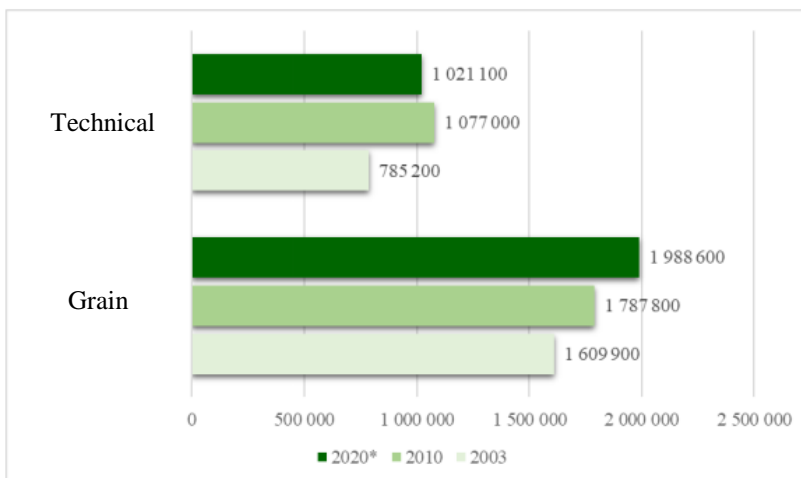
**Distribution of agricultural land by size and number of enterprises in Bulgaria, 2003-2020**

Year	The size of the area of agricultural land									
	>0 thous. ha. and <1 thous. ha.		≥1 thous. ha. and <2 thous. ha.		≥2 thous. ha. and <10 thous. ha.		≥10 thous. ha. and <50 thous. ha.		≥50 thous. ha.	
	number of agricultural enterprises, thousand units	area of agricultural land, thousand hectares	number of agricultural enterprises, thousand units	area of agricultural land, thousand hectares	number of agricultural enterprises, thousand units	area of agricultural land, thousand hectares	number of agricultural enterprises, thousand units	area of agricultural land, thousand hectares	number of agricultural enterprises, thousand units	area of agricultural land, thousand hectares
2003	501,7	192,6	90,0	120,2	51,6	185,9	6,4	126,9	5,1	2278,9
2010	248,0	81,6	46,9	62,6	41,1	163,1	12,8	278,6	8,2	3031,0
2020	49,9	16,3	15,4	21,1	25,1	115,5	18,1	438,1	10,5	3366,2

*Note: data for 2020 are preliminary*

*Source: calculated by the authors according to the data Ministry of Agriculture, Food and Forestry*

Grain accounts for 60% of agricultural land, and technical crops – 31% (Figure 4.3). The tendency to increase the area of grain crops during the study period. In 2020, the area agricultural land increased by 24% compared to 2003 and by 11% compared to 2010. Of cereals, the largest is the relative share of wheat, and of technical – sunflower.



**Figure 4.3. The main groups of crops on agricultural land in Bulgaria, 2003-2020, hectares**

*Note: data for 2020 are preliminary*

*Source: calculated by the authors according to the data Ministry of Agriculture, Food and Forestry*

During the study period, most sown areas of agricultural land were allocated for growing wheat and sunflower (in 2020, 34.6% and 25.5%, respectively). In 2020, the size of areas for growing wheat increased by 6.2 thousand hectares compared to 2017, and corn – by 181.3 thousand hectares. The size of sown areas for barley and sunflower from 2017 to 2020 decreased. During the pandemic period, there were no significant changes in the area of agricultural land under main crops in Bulgaria (Table 4.2).

In 2020, there will be about 71500 livestock farms in Bulgaria, raising farm animals, birds and bee families. About 31000 farms raise 608600 cattle, 12000 farms – 244000 goats, 22000 farms – 1276800 sheep and just over 3000 farms raise 642000 pigs. The number of cattle increases by 6% in 2020 compared to 2010. In 2020, the average number of livestock on farms is much higher than in previous periods. The average number of cattle raised reached 20 animals, goats up to 21, sheep up to 58 and pigs up to 190 (Figure 4.4).

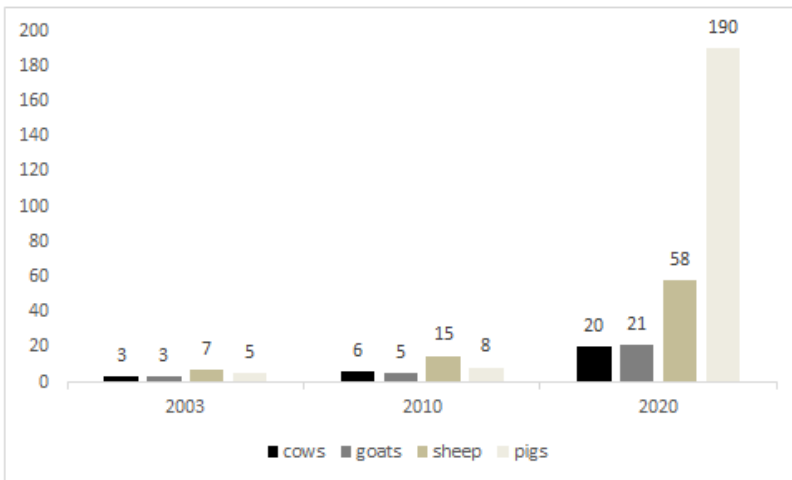
Table 4.2

**Sown area for major crops in Bulgaria, 2017-2020, thousand hectares**

Crops	2017		2018		2019		2020	
	Area, thous. ha	% of arable land	Area, thous. ha	% of arable land	Area, thous. ha	% of arable land	Area, thous. ha	% of arable land
Wheat	1197,8	34,5	1237,7	35,7	1250,5	36,1	1204,0	34,6
Barley	138,1	4,0	115,8	3,3	112,3	3,2	131,3	3,8
Corn	461,1	13,3	478,4	13,8	641,6	18,5	642,4	18,5
Sunflower	934,7	26,9	859,9	24,8	789,6	22,8	888,2	25,5

Note: data for 2020 are preliminary

Source: calculated by the authors according to the data Ministry of Agriculture, Food and Forestry



**Figure 4.4 Average number of animals kept on farms in Bulgaria, 2003-2020, units**

Note: data for 2020 are preliminary

Source: calculated by the authors according to the data Ministry of Agriculture, Food and Forestry

The total number and structure of the main species of poultry on agricultural enterprises in Bulgaria are presented in Table 4.3. The data table show that in the period from 2010 to 2020 there was a decrease in the number of poultry in general and by type. In 2020,



compared to 2010, the total number of poultry decreased by 12.4% and chickens by 14.6%. A significant decrease is observed in species – turkeys and geese (7.5 times and 7.0 times, respectively). During the pandemic period, the total number of poultry in Bulgaria increased compared to 2017.

*Table 4.3*

**The main species of poultry in Bulgaria, 2010-2020, thousand pieces**

Year	Laying hens and young	Chickens for meat	Chickens in general	Turkeys	Ducks	Geese	Other poultry	The poultry in general
2010	7800	6263	14063	158	1628	56	29	15934
2011	6627	6522	13150	84	1343	50	29	14656
2012	6338	7499	13837	47	1297	26	53	15260
2013	6592	5074	11665	43	1440	23	42	13213
2014	6815	6155	12970	45	1517	21	56	14609
2015	6980	7278	14258	28	1229	16	69	15600
2016	7158	5290	12448	32	1128	17	75	13700
2017	6898	5966	12864	30	1666	16	180	14756
2018	6951	6921	13872	35	1408	13	191	15519
2019	7107	6635	13742	23	1573	36	191	15565
2020	7062	5349	12411	21	1360	8	164	13964

*Note: data for 2020 are preliminary*

*Source: calculated by the authors according to the data Ministry of Agriculture, Food and Forestry*

In 2018, the total volume of milk production in Bulgaria amounted to 995023 thousand liters, or 6.1% less than in the previous year. The decrease is due to a reduction in cow's milk production and, to a lesser extent, a decrease in goat's milk production. The annual milk yield of buffaloes and sheep's milk increases (Table 4.4). According to the data table, there is a relative preservation of sheep (-0.4%) and an increase in average milk yield (3.4%) compared to 2017, which causes an increase of 3.1% in milk yield in 2018 (69117 thousand liters). Goat milk production in 2018 is 41921 thousand liters – almost 1% less annually. The increase in the number of reared goats by 4.7% in 2018 was partially offset by lower (5.4%) average milk yields during the year. Buffalo milk

production increased by 13.3% compared to the previous year, but remained relatively small – 11389 thousand liters.

*Table 4.4*

**Number of animals and milk production in Bulgaria, 2016-2018**

Indicators	Units of measurement	2016	2017	2018	Changes, 2018/2017
Cow's milk					
Dairy cows	pieces	271329	252056	234055	-7,1%
Production	thousand liters	988900	939978	872596	-7,2%
	tons	1018567	968177	898774	-7,2%
Medium yield	liters / year	3645	3729	3728	-0,03%
Buffalo milk					
Buffaloes	pieces	7589	8720	10309	18,2%
Production	thousand liters	9184	10053	11389	13,3%
	tons	9478	10375	11753	13,3%
Medium yield	liters / year	1210	1153	1105	-4,2%
Sheep's milk					
Sheep	pieces	1026221	992069	988386	-0,4%
Production	thousand liters	76986	67029	69117	3,1%
	tons	79681	69375	71536	3,1%
Medium yield	liters / year	75	68	70	3,4%
Goat's milk					
Goats	pieces	199438	220866	231250	4,7%
Production	thousand liters	39776	42316	41921	-0,9%
	tons	40930	43543	43137	-0,9%
Medium yield	liters / year	199	192	181	-5,4%
Milk production, in general	thousand liters	1114846	1059376	995023	-6,1%
	tons	1148656	1091470	1025200	-6,1%

*Source: calculated by the authors according to the data Ministry of Agriculture, Food and Forestry*

The growth was due to an increase in the number of buffaloes (by 18%), while the average milk yield decreased by 4.2%. There is a tendency to reduce the number of cows, mainly due to weaning from small farms and increasing the number of barren cows. On the other hand, with the gradual consolidation of farms, a certain increase in average milk productivity can be expected.

In 2020, the agricultural sector of Bulgaria retains its importance in the country's foreign trade, forming 15.0% of total trade for the year, including 17.1% of total exports and 13.0% of total imports (Table 4.5).

*Table 4.5*

**Foreign trade in agricultural products in Bulgaria, 2019-2020,  
thousand EUR**

Indicators	2019		The share of the agricultural sector,%	2020		The share of the agricultural sector,%
	together across the country	agricultural sector		together across the country	agricultural sector	
Export, FOB	29889833	4793025	16,0	27968670	4775294	17,1
Import, CIF	33740128	3702996	11,0	30730003	3997112	13,0
Foreign trade	63629961	8496021	13,3	58698673	8772406	15,0

*Note: data for 2020 are preliminary*

*Source: calculated by the authors according to the data Ministry of Agriculture, Food and Forestry*

In 2020, agricultural trade in Bulgaria will amount to 8772.4 million EUR, which is 3.3% more annually. Exports of agricultural products decreased slightly by 0.4% compared to the previous year, to 4775.3 million EUR. At the same time, agricultural imports increased by 7.9% to 3997.1 million EUR. In 2020, we have a positive trade balance of Bulgaria, which amounts to 778.2 million EUR, which is 28.6% less than in 2019. Most of the exports and imports of agricultural products in Bulgaria are sold within the European Union countries.

During 2015-2020, producer prices for agricultural products changed (Table 4.6). In 2020, prices of grain increased by 5.9% compared to 2019 (wheat – by 6.1%). In 2019-2020, prices for technical and oilseeds corps increased. Prices of vegetable have similar dynamics. In 2020, compared to the previous year, prices of fruits (by 9.4%) and berries (by 21.5%) went up. In general, in 2020 compared to 2019 in the prices of crop sector increased by 6.3%. In the livestock sector, prices grew at a slower pace. Thus, in the industry as a whole in 2020, prices increased by 1.1% compared to the previous year.

*Table 4.6*

**Agricultural producer price indices in Bulgaria, 2015-2020**  
(%, previous year = 100)

Agricultural products	2015	2016	2017	2018	2019	2020
Grain crops	98,0	92,2	100,9	104,0	98,0	105,9
Wheat	97,7	87,9	102,2	105,9	97,7	106,1
Technical crops	102,0	97,7	90,8	94,2	102,0	108,5
Oilseeds	102,9	98,3	89,0	93,1	102,9	112,3
Vegetables – total	104,4	88,3	97,3	98,7	104,4	101,7
Tomatoes	115,2	84,4	90,7	91,9	115,2	107,3
Cucumbers and gherkins	96,6	86,3	99,4	106,5	96,6	94,4
Fruit – total	98,4	105,5	101,4	107,3	98,4	109,4
Apples	92,8	97,5	102,2	113,1	92,8	115,8
Pears	86,3	129,4	73,0	126,8	86,3	93,2
Cherries	108,9	151,0	125,5	108,4	108,9	120,7
Plums	95,5	93,9	108,9	109,8	95,5	99,5
Berries	89,3	73,7	66,0	122,0	89,3	121,5
Nuts	100,3	82,1	79,8	122,5	100,3	65,7
Raspberry	106,8	93,5	78,3	96,3	106,8	110,4
Grapes – from the vine	93,7	92,9	95,3	102,3	93,7	110,4
Dessert grapes – from a vine	125,5	96,5	150,7	69,0	125,5	122,7
Vegetables and fruits – total	101,4	122,1	99,7	103,3	101,4	105,1
Crop production – total	100,2	95,1	97,3	100,2	100,2	106,3
Live animals	108,4	93,1	99,4	92,5	108,4	103,8
Cow's milk	102,1	94,0	115,1	100,2	102,1	98,0
Buffalo's milk	91,2	102,1	104,1	104,6	91,2	97,3
Sheep's milk	99,4	95,1	96,5	98,5	99,4	104,1
Goat's milk	109,1	102,1	97,7	107,6	109,1	105,5
Eggs	96,2	87,5	113,4	103,5	96,2	98,3
Livestock – total	104,8	93,8	106,1	97,4	104,8	101,1
Agriculture – total	101,3	94,8	99,3	99,5	101,3	105,1

*Note: data for 2020 are preliminary*

*Source: calculated by the authors according to the data Ministry of Agriculture, Food and Forestry*

Prices for some livestock products have dropped – cow's and buffalo's milk, eggs. In general, the prices for agriculture in Bulgaria

in 2020 increased by 5.1% compared to the previous year. Prior to the pandemic period (2016-2018), agricultural prices were declining.

We will conduct a SWOT-analysis of the activities of agricultural enterprises in Bulgaria in 2020 (Figure 4.5).

Given the strengths and opportunities for agricultural enterprises in Bulgaria, further development of farms will be implemented through the association and consolidation of small farms, improving their structure. Otherwise, a significant part of agricultural enterprises will not be able to operate independently and stably, which may lead to bankruptcy. There will also be the closure of small and medium-sized agricultural enterprises that receive subsidies for a certain period, after which they will cease to exist.

Agricultural sector in Bulgaria is heavily dependent on subsidies, the state, changing social, economic and political conditions, which will lead to further shocks in the farm support system. Costs in agricultural production are constantly rising, sales products are becoming increasingly difficult against the background of falling food prices and unregulated imports and dumping from neighboring countries.

It is necessary to allocate funds for the modernization of new machinery for agriculture in Bulgaria, the introduction of modern knowledge and skills of farmers themselves, increasing the activity of scientific, educational and consulting activities. It is necessary to establish a permanent relation between them and synchronize them in order to achieve the modernization of agriculture in Bulgaria and achieve better results in this sector. This will increase the level of innovation in agricultural enterprises, stimulate technological and investment progress, as well as risk management using modern methods and scientific approaches.

## **Conclusions**

Given the state and trends of agricultural development in Bulgaria since the accession country to the European Union, several important conclusions can be drawn:

– starting from low positions, after a long and exhausting for the Bulgarian economy agrarian reform, the process of its gradual recovery continues;

<p><b>Strengths</b></p> <ol style="list-style-type: none"> <li>1. Increasing the level of specialization and concentration production at agricultural enterprises.</li> <li>2. Improving the market orientation of agricultural enterprises.</li> <li>3. Increasing labor productivity in agricultural enterprises.</li> <li>4. Specialized farms that grow cereals, pigs and poultry have high economic results.</li> <li>5. Large farms have comparative advantages and can respond to current market trends in terms of competitive prices and volumes of activity.</li> <li>6. Improving the structure and consolidation of large agricultural enterprises at an accelerated pace compared to the EU average.</li> </ol>	<p><b>Weaknesses</b></p> <ol style="list-style-type: none"> <li>1. There are a small number of large and medium-sized agricultural enterprises and a large number of small ones.</li> <li>2. Low stocking density per unit area compared to the EU average.</li> <li>3. Livestock farms in the country are much smaller than the EU average.</li> <li>4. The average economic potential of the country's farms is lower than the EU average.</li> <li>5. Significant difference in economic potential by types of farms depending on their specialization.</li> <li>6. Incomes are lower than the average in specialized farms of crop and livestock complexes.</li> <li>7. Industrial insurance as one of the ways to manage risks is extremely weak among farmers.</li> <li>8. Smaller size and lower incomes of agricultural enterprises in mountainous areas.</li> <li>9. Low level of specialized training of employees.</li> <li>10. Low level of innovation in agriculture.</li> </ol>
<p><b>Opportunities</b></p> <ol style="list-style-type: none"> <li>1. Stabilization incomes of agricultural with the help of CAP instruments.</li> <li>2. Increasing potential and improving economic indicators small and medium-size agricultural enterprises.</li> <li>3. Improving the adaptation of agricultural enterprises to market changes, institutional and natural environment through the introduction of a risk management system.</li> <li>4. Modernization of enterprises and introduction of new technologies for agricultural activities.</li> </ol>	<p><b>Threats</b></p> <ol style="list-style-type: none"> <li>1. Lower profitability of agriculture compared to the average level of the country's economy.</li> <li>2. Rising costs as a result of rising resource prices.</li> <li>3. The inability of some agricultural enterprises to improve their business environment and be market-oriented.</li> <li>4. Fluctuations in income of agricultural enterprises under the influence of changes in the market, sanitary, institutional and natural environment.</li> <li>5. Decrease in production and decrease in the number of agricultural enterprises in mountainous areas.</li> <li>6. Abandonment of agricultural land in mountainous areas.</li> </ol>

**Figure 4.5 SWOT-analysis of the activities of agricultural enterprises in Bulgaria in 2020**

*Source: researched by the authors*

– CAP will continue to be the main driving force for sustainable agricultural development, but at the same time it is necessary to formulate and implement an adequate national policy to complement and further develop European measures and mechanisms;

– it is necessary to look for a more balanced development between different subsectors, making maximum use of the various soil and climatic conditions of the country, the experience and traditions that it had until recently, such as, for example, the production of vegetables and fruits;

– there is a need to diversify agricultural production and search for new directions of development, such as the expansion of organic production, production of high quality food and products with high added value.

Thus, agricultural sector in Bulgaria has undergone a difficult period of reform since accession to the European Union, survived the pandemic period. In the future, can to be competitive at regional and European levels, provide employment, create conditions for rural revitalization and increase national contributions economy.

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**PRIORITIES FOR ENVIRONMENTAL SAFETY IN THE AGRICULTURAL SECTOR**

Agrarian policy sets a general target orientation in terms of the implementation of state functions to address pressing issues in the field of agricultural nature management and environmental safety in particular. To achieve sustainable development of agriculture and consistent implementation of agricultural policy, it is necessary to identify among the priorities of environmentally balanced development of the agricultural sector of the economy. The current state policy of agricultural production in Ukraine does not provide for a comprehensive approach to solving environmental and socio-economic problems. Therefore, the inclusion in regulations of provisions that enshrine the principles of sustainable development in the strategic foundations of state agricultural policy is a prerequisite for a single approach to the implementation of rational nature management and environmental protection in the agricultural sector.

Special attention is paid to agricultural production and rural development by international organizations, in particular the World Bank and the Food and Agriculture Organization of the United Nations (FAO), to the fact that rural territorial units are based exclusively on traditional activities, agriculture, forestry, beekeeping, fishing and fishing.

European practice of regulation of agrarian economy, which is based on the program-target method, determines the main direction and activities in the field of environmental protection in agriculture through program documents. The basic documents of the EU in this area include programs that are part of the EU's Common Agricultural Policy (CAP) and the Union's General Environmental Action Program until 2020. "Live well within the limited resources of our planet" [1]. In general, today SAP is a policy that regulates the amount of responsibility for

environmental protection, compliance of production activities with established standards, which ensures sustainable development of rural areas. The emergence of the main direction of SAP, which is expressed in a comprehensive approach to the relationship between financial support and standards of environmental protection, quality and safety of food, began in 2004 [2]. Environmental protection has been recognized as a necessary component of economic activity through the adoption of the Agenda 2000 (Agenda, 2000), and sustainable development has been an integral part of it. The main goal of SAP is to create ecologically safe and high-quality products while preserving the state of the environment due to the focus on renewable resources. The tasks of development and reform of SAP include the introduction of the principles of balanced management and rational use of natural resources in the process of agricultural production [3; 4]. The implementation of the above programs involves the operation of incentive mechanisms for the implementation of the principles of sustainable development in agricultural activities through the use of all opportunities of public policy to ensure environmentally friendly agricultural production. The main instruments of SAP are payments in the form of subsidies to economic entities that implement environmentally friendly production methods, thereby implementing the principles of environmental protection. Based on the common agricultural policy of the European Union, each state forms its own environmental policy.

The obvious relationship between agriculture and rural development requires coordinated management and should be implemented in parallel with economic problems to solve more social - environmental - both purely sectoral and rural development, providing a synergistic effect. Ukraine has adopted a number of programs that establish the basis of rational use of nature in agriculture, the main of which is the State target program for the development of the agricultural sector of the economy for the period up to 2022 [5]. Also, the current provisions of state policy in the field of environmental protection are defined by environmental legislation and are the basis of relations between government agencies and international organizations, local governments and agricultural associations to ensure joint solutions to sustainable nature management and environmental protection through integrated approach [6]. At the same time, it is obvious that the current economic conditions in the agricultural sector of the economy require not so much the improvement of existing environmental policy strategies, as the transfer of greening processes into existing agricultural policy. The current agricultural



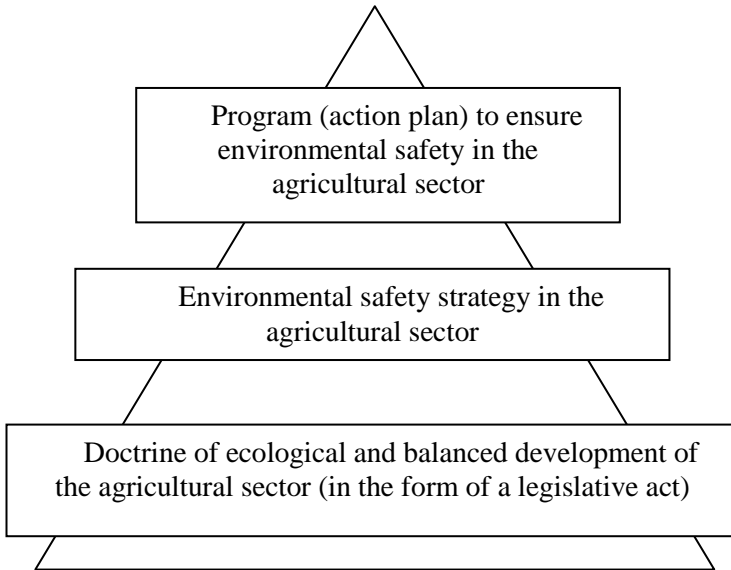
policy of the state should take into account the priorities of environmental safety and in the process of its implementation should be based on a unified approach to ensuring the rational use of nature and environmental protection in agriculture. It is important to ensure the necessary linking of conceptual and software developments to ensure environmental safety with existing concepts and programs of socio-economic development, environmental protection programs and other materials. The urgent need to implement a balanced use of nature and ensure environmental safety in the process of agricultural activity is a strong argument in favor of the formation and implementation of a unified comprehensive regulatory document, which should combine into one legislative act existing provisions governing all aspects of greening [7]. The creation of such a document requires a combination of a single set of environmental, economic and social problems, which need to be solved by a single integrated method based on a program-targeted approach.

Environmental security of the agricultural sector can be achieved if the most important strategic directions of its provision within this doctrine are determined, a clear logical scheme of timely detection and elimination of possible dangers and threats, reduction of consequences is built [7; 8]. This requires that the most important part of the environmental safety management system be forecasting and analytical documents, namely, the strategy and program of environmental safety in the agricultural sector, which should become a tool for implementing environmental policy in the country and regions. In general, the ratio of the considered documents can be represented schematically (Figure 4.6).

Thus, the analysis of ensuring the strategic development of the agricultural sector at the national and international levels indicates the need to create a fundamentally new system of regulations governing environmental safety in the agricultural sector. In view of the above, the adoption of the Law of Ukraine "On Sustainable Development of the Agrarian Sector of Ukraine", which will be the main legislative act that will regulate agricultural relations aimed at sustainable development of agriculture and become a doctrine of environmentally sustainable development in the agricultural sector.

As ensuring environmental safety in the agricultural sector is one of the activities to ensure national security in general, the proposed law should include provisions on environmental protection and environmental safety in agricultural activities. An important step in working out the main ways of structural transformation of the agricultural economy and the

deployment of productive forces, taking into account the imperatives of sustainable development and environmental safety in the agricultural sector is the development of Environmental Safety Strategy in the agricultural sector, which should include a set of most important solutions. Level of security and become a basic document of strategic planning in the field of development of the system of environmental safety in the agricultural sector and defines a set of interrelated priorities, goals, objectives and measures.



**Figure 4.6 The ratio of strategic documents for the implementation of environmental policy in the agricultural sector**

As ensuring environmental safety in the agricultural sector is one of the activities to ensure national security in general, the proposed law should include provisions on environmental protection and environmental safety in agricultural activities. An important step in working out the main ways of structural transformation of the agricultural economy and the deployment of productive forces, taking into account the imperatives of sustainable development and environmental safety in the agricultural sector is the development of Environmental Safety Strategy in the agricultural sector, which

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According to strategic priorities, the main objectives of agricultural policy in the field of environmental safety should be: the formation and maintenance of sustainable agro-ecosystems, sufficient for favorable living conditions and agricultural activities in a man-made environment and the impact of various natural factors. ; formation and development of a system of balanced nature management, which provides an opportunity to provide society with all kinds of necessary natural resources.

One of the most important prerequisites for the efficiency and effectiveness of the system of environmental safety in the agricultural sector is the choice of a strategic course that will ensure the achievement of the main goal of this system – a sustainable level of environmental safety.

The need to form and choose strategies to ensure environmental safety is determined by the economic realities of our country today. After all, the lack of a balanced strategic course of environmental security at the national and regional levels, aimed at preventing the emergence of destabilizing natural factors in the balance, led to chaos, inconsistency, low efficiency of environmental policy, and led to a threatening and dangerous state of the environment [9; 10].

The formation of any strategy is a process that must go through certain stages. The strategy of ensuring environmental safety in the agricultural sector and the tools of strategic management in this area should take into account certain stages:

1. Identification of threats and risks to environmental safety;
2. Diagnosis of the level of environmental safety;
3. Assessment of the impact of threats and risks on the level of environmental safety, taking into account the assimilation potential;
4. Forecasting environmental safety scenarios;
5. Choice of environmental safety management strategy in the agricultural sector;
6. Evaluation of the effectiveness of the chosen strategy of environmental safety management and control over its

implementation.

In a market economy, the decisive role in the formation and implementation of the principles of environmental safety is assigned to government agencies, as businesses try to avoid the implementation of those costs that do not bring them the appropriate income. However, the state with the aim of saving their own resources, translates most of these costs on business entities. In terms of determining the optimal natural resource proportions and opportunities to combine resources in different combinations in the production of different types of products, they can choose alternative development options. In order to effectively implement the principles of environmental safety, businesses must have a clear understanding: increasing the cost of solving environmental problems will in the future increase production efficiency and strengthen competitive advantages. This approach will increase the share of environmentally friendly enterprises [11].

The balance of agricultural production on the basis of its greening is ensured by increasing the efficiency of natural resource potential by supporting and intensifying natural processes in agroecosystems. The defining condition is the expanded reproduction of soil fertility and increase the efficiency of production through the maximum involvement of biological factors in the rational use of natural resources. This leads to the modernization not only of the cost structure, but also the revision of the entire environmental policy, the implementation of new methods of regulation, a comprehensive approach to the greening of agricultural production, taking into account environmental risks in business planning. The contradictions between economic feasibility and environmental security require a revision of the concept of development of the agricultural sector of the economy, which necessitates the development of environmental strategies aimed at a coordinated solution of economic and environmental problems in agricultural enterprises. It should be noted that high requirements for agricultural products and compliance with environmental standards in their production may be an obstacle to further exports of Ukrainian products to the EU market. This is one of the key markets, the loss of which could negatively affect the country's economy. While the issue of food quality requirements is gradually being addressed, there are currently

no environmental standards in the field of agricultural production in Ukraine. There are already problems with the export of corn and rapeseed, for which Ukraine has a leading position in the world. Ukraine ranks 4<sup>th</sup> and 2<sup>nd</sup> in world exports of these crops in physical terms, respectively.

The solution of this issue is possible due to the development of agricultural production based on environmental management, which in the agricultural sector of the economy is a systemic type of management focused on the formation and development of ecologically balanced agricultural production taking into account the multifunctional nature of nature in agriculture. It must be built on harmonious ecological and economic relations.

At the present stage of development of the agricultural sector of the economy, the degree of food and environmental security is significantly due to alternative technologies in agriculture and the conservation of natural resources of the agricultural sphere. Today, among such systems, the most developed is organic agriculture, which is practiced at the commercial level in many countries around the world. According to the definition of the International Federation of Organic Agriculture Movements (IFOAM): "Organic agriculture is a production system that supports the health of soils, ecosystems and people" [7]. It depends on environmental processes, biodiversity and natural cycles specific to local conditions, when no harmful resources are used that can have adverse effects.

According to the rules of organic agriculture, it should be based on the following principles: health (organic agriculture should support and improve the health of soil, plants, animals, humans and the planet as a single and indivisible whole); ecology (organic agriculture should be based on living ecological systems and cycles, work, coexist with them and support them); justice (organic agriculture should be based on relations that guarantee justice, taking into account the general state of the environment and living opportunities); care (management of organic agriculture should be precautionary and responsible and be focused on protecting the health and well-being of present, future generations and the environment).

Organic agriculture provides an opportunity to harmonize and harmonize environmental, economic and social goals in the

agricultural sector of the economy. In particular, the advantages of organic agricultural production include: minimization of negative impact on the environment; independence from mineral fertilizers and pesticides and their producers, and as a consequence of reducing the energy intensity of the national economy; creation of additional jobs in rural areas, prospects for farms; production of useful, biologically complete and ecologically safe food products. Organic agriculture, in essence, can be defined as a holistic management system of agroecosystems, which includes assessment of environmental threats and risks to environmental safety in agriculture and establishes the order of relations of economic entities in the production of organic agricultural products. The concept of organic agriculture is to replicate as accurately as possible the "production" in natural agroecosystems, based on ecological processes, biodiversity and, adapted to economic conditions, to combine traditions, innovations and achievements of science for the benefit of the environment and improving the quality of life of all participants.

Organic agricultural production can be promising for sustainable development of small business in rural areas. Rural areas are socio-spatial entities that combine organizational, production and economic, socio-economic and natural resource components through a set of functions performed by them, as well as provide diversified development and create a living environment for the rural population. The model of organic agriculture contributes not only to the improvement of the social infrastructure of rural areas, but also to their balanced development.

Today in Ukraine there is a significant potential for the development of organic agriculture. Ecological and economic analysis of the current state of production of organic agricultural products indicates the gradual development, namely: increasing certified areas, increasing the domestic consumer market, increasing sales of manufactured products. So, with and according to the Ministry of Economy, in 2019 the total area of agricultural land to organic status and the transition was about 468 thousand. Ha (1.1% of the total area of agricultural land Ukraine). There were 617 operators of the organic market, of which 470 were agricultural producers [12]. Ukraine ranks 20th in the world and 11th in Europe in the area of land used for organic agricultural production.

Currently, Ukraine ranks second in terms of exports of organic products to the Ukraine ranks 20<sup>th</sup> in the world and 11<sup>th</sup> in Europe in the area of land used for organic agricultural production. Currently, Ukraine ranks second in terms of exports of organic products to the EU and this market continues to grow rapidly worldwide. The export-oriented nature of organic production in Ukraine to the EU markets presupposes the achievement of equivalence in the legal regulation of organic production and circulation of organic products and the development of national peculiarities in regulation in this area.

The strategic goal of the development of the organic sector of the domestic economy is the implementation of the main directions of the state policy of organic agriculture, aimed at ensuring environmental safety of the agricultural sector, improving the quality of agricultural products, preserving and improving soil fertility, environmental protection and biodiversity balanced development of rural areas.

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**DEVELOPMENT OF  
MULTIMODAL  
TRANSPORT  
CORRIDORS TO  
ENSURE  
ECONOMIC  
GROWTH IN  
UKRAINE**

The openness of Ukraine’s economy, its integration into the global economic space and internationalization have caused profound structural changes, accompanied with increased vulnerability to external factors. In this sense, the issue of studying modern approaches to the development of multimodal transport corridors (MTC) as a driver of sustainable economic growth of the country becomes relevant. Ultimately, economic growth at this stage of world civilization depends on the ability of nations to implement



their economic development strategy, provide technological re-equipment, strengthen competitiveness in the international and global environment and ensure general economic prosperity.

One of the most important drivers of economic growth in a global environment is international trade and an efficient transport system. In the context of digitalization, international trade involves not only the exchange of goods, services and intellectual property rights, but also deeper relationships between businesses in the production, investment and financial areas, which form and mediate the process of trade at the international and global levels. The participation of countries in the international division of labor reflects the type of their international production and trade specialization, given their inherent relative factor availability and dominant production technology. In modern conditions, international trade occurs between countries not only on the differences in relative factors availability and production technology (and hence differences in relative factor and commodity prices), but also in the context of integration factors, when cross-border movement of capital and labor and the creation of liberal business environment create a large common market between countries.

An important task for the scientific world is to find a methodological and empirical justification for the potential and drivers of sustainable economic growth, in particular the relevant relationship between economic growth and the development of multimodal transport corridors. Based on the existing results of economic scientific thought, we should look for new scientific approaches to explain this relationship taking into account, on the one hand, the rational needs of the national economy and domestic business, and on the other hand, new social values aimed at overcoming negative cultural, socio-economic and ecological effects caused by economic processes under the influence of the current philosophy of increasing economic growth rates and transport traffic.

Problems of economic growth have been studied by various scientific schools in the West. The evolution of scientific thought in this direction dates back to the times of A. Smith, D. Ricardo and J. S. Mill.

The first fundamental research belonged to the representatives of the early Keynesian school (R. Harrod, E. Domar, 1942) and the

neoclassical school of the 1950s-1960s (R. Solow, T. Swan (1956), F. Ramsey, D. Cass, T. Koopmans). J. Schumpeter's and S. Kuznets's interpretation of economic growth is of scientific interest. Later, the theory of exogenous economic growth was studied by M. Frenkel, L. Arnold, R. Barro, X. Sala-i-Martin, G. Mankiw and others. The theory of endogenous economic growth belongs to P. Romer (1980s), which continued to be developed by economists P. Aghion and P. Howitt, S. Parente. In the 1980s, J. Simon criticized the philosophy of economic growth with his work "Marginal [final] resources", and in the 2000s there was a concept of stationary growth H. Daly, which emphasized the perniciousness of the idea of economic growth and GDP growth per capita, leading to environmental catastrophe and social imbalances. Among the Ukrainian scientists who dealt with issues of economic growth are V. Bazylevych, A. Chukhno, V. Heets, A. Halchynskyi, V. Osetskyi.

The aim of the research is to reveal the relationship between economic growth and development of multimodal transport corridors in the country, to clarify the historical preconditions for the emergence and development of multimodal transport corridors, and to outline the principles of practical implementation of multimodal transport corridors in Ukraine by developing an effective set of macroeconomic and structural regulation at the national, supranational and global levels.

Research methods are: logical-theoretical, historical, synthesis and analysis, method of systematization, systemic and synergetic approaches.

In the Investopedia, the term "economic growth" is defined as an increase in the capacity of the economy to produce goods and services, comparing one time period with another. Economic growth can be measured in nominal terms, including inflation, or in real terms, excluding inflation. Economic growth is usually associated with technological change. Economic growth is not only an increase in production capacity, but also an improvement in the quality of life of the people of this economy.

In economics, "economic growth" or "theory of economic growth" usually refers to the growth of potential output, ie production at full employment, due to growing aggregate demand or total output. As a field of research, economic growth differs from the

economics of development according to J. Schumpeter [1].

The Kyiv School of Economic Theory of Taras Shevchenko National University of Kyiv determines economic growth from the following positions:

- as a term that serves as a generalizing expression of the efficiency of production development [2].

- as an incremental increase in the real amount of gross domestic product (GDP), gross national product (GNP) or national income (NI) due to the increase in the quantity and (or) quality of resources used without disequilibrium in the short-run;

- as an increase in real GDP (GNP or ND) per capita [3].

The economy is experiencing cyclical short-term economic changes (business cycles) and long-term economic growth. The business cycle consists of booms and falls in production, which can last from several months to several years. An example of a business cycle was the global boom, which began in 2002 and ended with the rupture of the financial bubble in 2008-2009. Economists attribute the ups and downs in the economic activity for a number of reasons, including: overproduction, followed with accumulation of large stocks; excessive use of credits, which leads to debt accumulation, which in turn slows purchases, speculative bubbles, shocks such as war, political upheavals, etc. The economic crisis of 2020, which unfolded against the backdrop of the COVID-2019 pandemic, had deep socio-economic causes and, according to many economists, arose as a result of the end of the long economic cycle and the transition to a new phase of human existence.

In the context of globalization and global integration processes, the development of multimodal transport corridors (MTC) is one of the areas to implement the global transport policy, in particular by organizing their operation and involvement in the international transport network.

The set of MTCs, consisting of multimodal transport hubs and multimodal transport routes, forms a multimodal transport network (MTN) and is considering as a part of a single transport network of the country, which should meet the needs of socially-oriented economic development and requirements of society in qualitative and competitive transport services. MTN provides an opportunity to solve strategic tasks for the development of the country's unified

transport network on the main transit and export routes, promotes the successful integration of Ukraine into the world transport system and strengthens its role in shaping world transport policy.

Communications of interacting transport modes, which take place in the MTC, have an additional economic effect. At the regional level, MTCs are designed to promote economic development by providing transport and logistics services to cities and countries along the corridor. Thus, the development of MTN, in particular MTC, can become one of the significant sources of government revenues.

There are many definitions of "transport corridor", "international transport corridor", in particular:

- It is a mainline, which is represented by transport ways of different transport modes, passing in parallel, oriented in one direction and can stretch in a strip hundreds of kilometers wide [4];
- It is a part of the national or international transport system, which provides significant freight traffic between certain geographical areas [5].

The "International Transport Corridor" is determined as:

- the availability of road, rail, water and combined modes of transport, which operate in close proximity to each other or many kilometers away, but oriented in one general direction (as defined by the European Commission Working Group on Transport Corridors);
- integrated land and water ways with appropriate infrastructure in a certain direction, including ancillary facilities, access roads, border crossings, service points, freight and passenger terminals, traffic control equipment, organizational and technical measures, laws and regulations that ensure the carriage of goods and passengers at a level that meets the requirements of the European Community [6].

MTC is characterized by a high concentration of traffic flows, as well as maximum capacity and a high level of development of multimodal transport infrastructure. It is a set of technically equipped main communications of several universal modes of transport with appropriate equipment of customs, border, telecommunications, service and other necessary infrastructure that provide transportation of goods in domestic and international traffic in the areas of their greatest concentration [7].

Modern systems of transport corridors began to be actively formed in the 70's of the twentieth century in order to create conditions for cost-effective movement of vehicles in a certain direction, ensuring trade in a globalized economy. The network of transport corridors has developed intensively in European countries: the EU transport corridor system (TEN-T), the pan-European system (mainly the countries of Central and Eastern Europe). The countries of North America within the framework of the NAFTA agreement create and develop transport corridors (Canada, the USA, and Mexico). One of the tasks of formation and development of transport corridors of Asian countries is access to European transport communications (for example, TRACECA).

There is a clear trend in the world market to create or expand existing MTCs. Thus, in 2017, Bulgaria and Greece agreed to expand the perimeter of the MTC from the Bulgarian port of Varna and Bourgas to the Greek port of Kavala and Alexandroupolis. The multimodality of the corridor is achieved through the use of road, rail, sea and river transport (Danube river). In July 2019, Iran, Iraq and Syria agreed to establish the MTC, given the actual and potential opportunities. This agreement envisages, first of all, cooperation between Iran and Iraq on the implementation of the Shelamche (Iran) – Basra (Iraq) railway development project with further accession to the Syrian railways.

In November 2017, Afghanistan, Azerbaijan, Georgia, Turkey and Turkmenistan signed an agreement on the creation of a transit transport corridor Lapis lazuli ("Lazurite"). Sea, air, road and rail transport will be involved in the transportation of goods. This agreement allows for duty-free and tax-free transit of goods, which will help reduce prices for various goods, allow its members to enter the international market and improve the economic situation in the region. In March 2020, a multimodal corridor (land-sea) to Europe was opened in Western China. The new route is 10 days shorter than the existing shipments from Chongqing to Europe (Italy, Turkey, the Netherlands). China's seaports are a large port area and the most important transport corridor through which trade with the countries of the Association of South East Asian Nations (ASEAN) takes place. The target for the annual volume of multimodal traffic by 2025 should be 500 thousand TEU.

In January 2020, a bilateral agreement on the development of a multimodal transport corridor between Uzbekistan and China was signed. This agreement provides for the provision of tariff preferences, the formation of block trains, the regulation of container traffic on the MTC. In June 2020, a new MTC China-Kyrgyzstan-Uzbekistan was opened, which was the first part of the international corridor from China to Europe without transit through Kazakhstan and Russia. The combined line of transportation (rail-car-rail) was named "Zhongju". The way through Kyrgyzstan is shorter by 295 km than through Horgos, time saving will be 5 days. The second part of the MTC passes through Turkmenistan, the Caspian Sea, Turkey, Europe.

In accordance with the State Strategy for Regional Development for 2021-2027 of 05.08.2020, the system of international transport corridors in Ukraine includes transport corridors with routes through Ukraine: Pan-European Transport Corridors №3 (railway section); №5 (railway and road section); №7 Danube (water section), №9 (railway and road section); International Transport Corridor Baltic Sea – Black Sea (railway and road section); Transport corridor Europe – Caucasus – Asia (TRACECA) (railway, road, water section); Europe-Asia International Transport Corridor (railway and road section); North-South; Organization of Black Sea Economic Cooperation (BSEC) [8].

Insufficient level of transport infrastructure development and competitiveness of Ukrainian transport service providers significantly complicates Ukraine's involvement in the world transport network, and as a result, reduces the state's ability to generate revenues from the export of transport services. European countries are interested in having convenient transport routes and open markets for goods. China, whose economy is the most dynamic in the world, is interested in convenient logistics. Due to its geographical location as a transit country, Ukraine is at the junction of export-oriented flows from the EU and China.

Taken into account the growing trade flows, there is a need to form a developed transit infrastructure, which will increase the margin of Ukraine as a transit country from 1-2% to more than 10%. Multimodal and intermodal transportation in Ukraine accounts for only 0.5% of the transport market, which is very low compared to the

EU and other developed countries, where this figure is near about 10-15% [9].

The problem of MTC development in the eastern direction is related to political factors. The Russian Federation is blocking transit. One way to solve this problem is to participate in the Chinese concept of the New Silk Road. The Viking train (Baltic-Black Sea region) combined transport project should be continued. New projects are being developed to organize ferry traffic from Turkey and the Caucasus by forming new transport links through the Kherson and Skadovsk seaports (it is estimated that the volume of transshipment through the port of Skadovsk may be 300-500 thousand tons per year). The issue of resumption of river navigation on the Dnieper is becoming relevant, which will provide an opportunity to form an industrial and logistics cluster Belarus-Black Sea and unite the Dnieper transport corridor and the Black Sea ports. The implementation of this project will save \$1.5 per ton-kilometer.

The development of multimodal transport corridors provides an opportunity to solve the transport problems of both the state and individual regions. This is consistent with the basic initiatives of the National Transport Strategy of Ukraine up to 2030 (NTSU 2030).

One of the priorities of NTSU 2030 is to provide quality transport services and integration of the transport complex of Ukraine into the international transport network, primarily through the development of transport communication with the EU, the development of international transport corridors and transit (Table 4.7) [10].

Taken into account the economic importance of the development and operation of the MTC, the availability of transit potential of Ukraine, it is necessary to provide state support for the development of territories under the MTC, as well as to develop multimodal transport and logistics infrastructure at the regional level. The adoption of the Law "On Multimodal Transportation" by the Verkhovna Rada needs to be completed, and the domestic legal framework governing the formation and operation of international transport corridors in order to successfully integrate Ukraine into the international transport system needs to be harmonized.

Table 4.7

**Priorities of NTSU 2030 on the Integration of the Transport Complex of Ukraine into the International Transport Network**

Issues to be resolved	Expected results
<ul style="list-style-type: none"> <li>- increasing the efficiency of internal logistics operations of freight transport by removing existing barriers and improving the relevant infrastructure, as well as its connection with the international and Trans-European Transport Network (TEN-T);</li> <li>- ensuring the development of multimodal transport technologies and infrastructure complexes to support the interaction of different modes of transport;</li> <li>- creating the route network of regular container / multimodal freight trains, synchronized with the routes of trains of EU member states;</li> <li>- creating the network of multimodal transport and logistics clusters and basic logistics centers, "dry ports", terminals, specialized transshipment complexes;</li> <li>- implementing the long-term financial planning for the implementation of infrastructure projects in the transport sector in accordance with the strategic priorities, the period of realization and the life cycle of transport facilities with the prioritization of projects related to the TEN-T network.</li> </ul>	<ul style="list-style-type: none"> <li>- reconstructing the main roads, which meets the standards of the TEN-T network and connects the regional centers between itself and Kyiv city to increase regional mobility;</li> <li>- ensuring interoperability of the national transport system with the multimodal world transport network;</li> <li>- creating the cargo and logistics infrastructure complexes as an integral part of multimodal clusters, in particular by constructing a system of multimodal transport and logistics clusters and logistics centers at borders, ports and airports inside the country;</li> <li>- increasing the traffic of containers, general and bulk cargoes through the territory of Ukraine, in particular within the framework of development of transport routes: EU countries – China ("New Silk Road"), EU countries – Iran, India, EU countries – Turkey and others (not less than 1 million TEU in 2025 and 2 million TEU in 2030);</li> <li>- Ukraine's participation in international transport projects;</li> <li>- Ukraine's accession to the maritime "Blue Belt" around Europe, the provision of surveillance of ships and cargo ("blue belt") and the establishment of appropriate port facilities ("blue stripes").</li> </ul>



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**STRATEGIC  
INNOVATIVE  
SOLUTIONS IN THE  
SYSTEM OF  
ENTERPRISE  
ACTIVITY  
PLANNING**

In modern conditions of globalization and intellectualization of socio-economic development, domestic agro-industrial enterprises face an unresolved part of the problem of satisfying social demand for domestic products, taking into account the values and priorities of society, taking into account and ensuring the regulatory norms established by law in the process of in-depth analysis of the environment of the enterprise. In extremely important conditions for the development of the information society, the priority strategic tasks of a business entity are aimed at developing such a system of strategic management that would fully meet consumer social requirements, namely, [208, p. 136]:

- ensuring business activity within the boundaries defined by the norms of ethics and the interests of society;
- positive response to social priorities and demands of society;
- constant readiness to take regulatory measures;
- maintaining a balance between the interests of shareholders and society as a whole;
- ensuring a stable competitive position of agro-industrial enterprises in the information society.

The idea of social adaptation of a certain business entity is the basis for the task of formalizing the company's strategic mission for the long term. At the same time, each management strategy of the enterprise should meet the requirements of the industry as much as

possible and be competitive in the conditions of environment. The valuation activity of enterprises on internal and external factors of influence is directly important when choosing a strategic market position. At the stage of deciding on the unattractiveness of the industry in certain market conditions, the company's activities in the direction of innovative development tend to resolve this situation by reorienting investment resources to a more attractive area of industry activity.

The application and implementation of innovative technologies aims to protect the competitive positions of the enterprise, which will ultimately lead to a review of its own management and development strategies. Taking into account the potential of the enterprise and, in the context of this, the existing threats to the external environment are the key factors influencing the development of the strategy. After all, a reasonable approach to justifying the strategic goals and capabilities of the enterprise aims to provide potential competence opportunities for dynamic growth in the conditions of protecting its strategic position from threatening risks of an endogenous and exogenous nature.

The development of strategic development benchmarks should take into account the key capabilities of the enterprise related to ensuring sustainable competitive stability in both domestic and foreign markets. The foregoing is reflected in the planned development of offensive measures for the implementation of the most promising competitive opportunities in order to purposefully long-term development of the business entity for the long term.

The process of developing certain strategic benchmarks for the development of the enterprise is a system of general economic measures, in which the main criterion for choosing components is promising areas of economic activity, because each of the strategies should be correlated in accordance with the strengths and weaknesses of the company. The strengths of the enterprise enhance strategic opportunities, thereby increasing the likelihood of their implementation. Instead, weaknesses and, accordingly, weak competitiveness increase the risk of implementing certain innovative operating strategies.

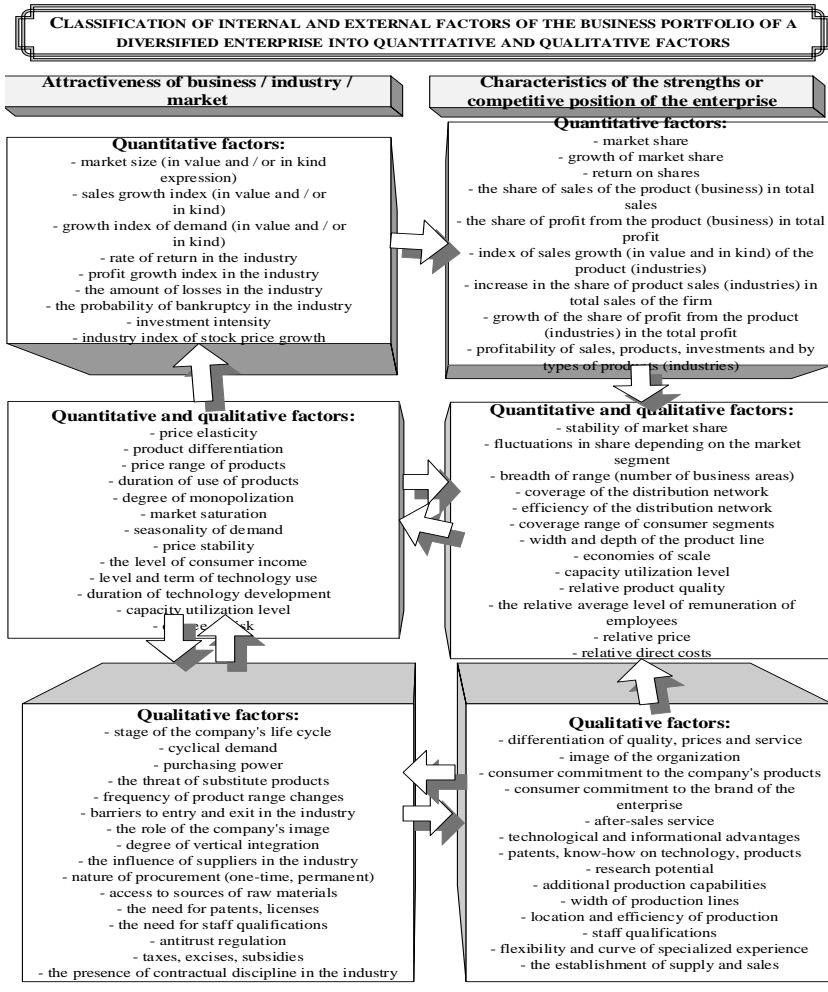
Taking into account entrepreneurial risks in the system of development of strategic innovative guidelines is ensured by the activities of those organizations that are able to take risks and not lose benefits. Such activities are aimed at finding alternative directions and ways to achieve high indicators of economic efficiency.

The gradual strategic actions of the enterprise in the direction of strategic activity planning of direction reflect its cultural and managerial values, which sometimes have a dominant role in the choice of strategic tasks. The result of such activity is the established value of strategic decisions, which is the dominant feature of choosing one or another effective strategic direction of the enterprise activity.

The enhanced impact of such values is partially visible in the activities of companies that have achieved advantages in innovative developments, the latest IT technologies, high global product quality standards with simultaneous human factor orientation, which is key in developing a strategy of developing optimal effective ways to meet consumer needs. The responsibilities of the enterprise, in the context of developing these strategic solutions, include flexible pricing policy, additional consumer preferences, increasing productivity and production efficiency using modern IT technologies in the system of effective IT solutions.

The fundamental basis of the whole process of development of strategic innovative solutions should be considered a comprehensive integral system, the components of which are reflected in the coordinated work of socio-economic, scientific and technical, information, production and financial systems. The set of all subsystems operates in a dynamic, multi-criteria external environment and aims to implement effective strategies taking into account effective IT solutions in the context of market variability. The formation of a set of strategic solutions is ensured by a comprehensive multi-aspectual portfolio analysis, which involves the formation of a set of portfolio matrices (including from combined groups of indicators), the most distinctive of the object and the purpose of the study on the basis of the completeness of the available

internal and external information [12, p. 876] (Figure 4.7).



**Figure 4.7 Comprehensive classification of factors forming the portfolio of the enterprise**

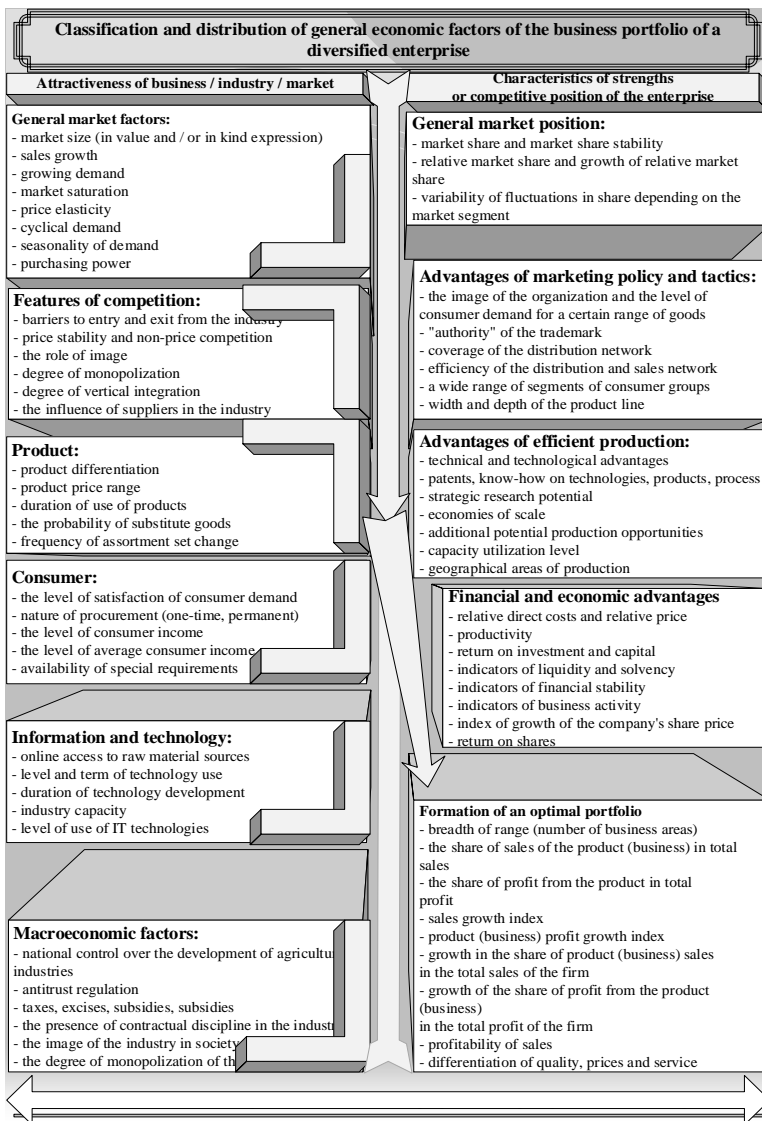
*Source: author's own development*

Analysis of certain connections between separate portfolio matrices and stages of the life cycle of the enterprise allows to track the dynamics of different types of lifecycle curves, will also provide analysis of different types of business (markets): highly concentrated, high-tech, venture, capital-intensive, dynamic, innovative, outsourcing, insourcing and virtual.

Thus, the multilateral and multifactorial study of the research object on the basis of the formed set of portfolio matrices allows to take into account the maximum number of factors of strategic development, to form an optimal portfolio and, on the basis of this, to determine a complex of strategic decisions on the effectiveness of the enterprise.

Nowadays, many agro-industrial enterprises in Ukraine lack the mechanisms and tools of a comprehensive system for collecting and accumulating informational data. Some of the reasons for this phenomenon are financial instability of enterprises, psychological barriers, technical and technological obsolete and unpreparedness for the development and implementation of comprehensive corporate information systems and technologies. The most important strategic directions of enterprise development are improving the quality of products, reducing costs, efficient loading of production capacities.

Changing or choosing a new development strategy in most cases involves planning a partial or significant change of the enterprise management structure. The strategy defines the structure, which is characterized by the features of conformity between the structural organization and the environment in which the enterprise functions. Considerable attention of the top management of the enterprise is paid to operational activities, its principles and methods of work, as a high level of organizational culture, starting from the functional unit of management determines the effectiveness of implementation of enterprise development strategies for the long term. The effectiveness of strategic planning at the enterprise is largely determined by the analysis and consideration of all possible options for enterprise strategies, and therefore there is a need for a complex grouping of strategies of the enterprise activity (Figure 4.8).



**Figure 4.8 Classification and distribution of general economic factors of the business portfolio of the enterprise**

*Source: author's own development*

Group classification of enterprise strategies means their distribution into specific groups according to certain criteria (grounds). The classification of enterprise strategies should ultimately provide an opportunity to draw adequate conclusions about the optimality of a particular scheme of strategic planning.

In the general case, the main, in our opinion, are the following criteria (grounds) for the formation of the classification of enterprise strategies [453, p. 271]:

- ✓ by the level of hierarchy and the degree of decomposition;
- ✓ by methods of distribution of construction;
- ✓ by the degree of implementation;
- ✓ by orientation;
- ✓ by the degree of concretization;
- ✓ by the degree of consistency;
- ✓ by the degree of activity;
- ✓ by the degree of globalization processes;
- ✓ by the level of information development of social production and economic processes.

The classification of factors and strategies of portfolio analysis is mostly related to the corporate level of the enterprise. When analyzing the investment climate of industries (regions), the two-dimensional matrix can be represented on the basis of two groups of complex indicators: investment attractiveness and investment activity of industries (regions) or investment risk and investment potential of industries (regions). To determine the investment attractiveness of industries based on the principles of systems theory, the following most significant indicators were taken [453, p. 283]:

- ✓ share of new types of property in the industry;
- ✓ level of monopolization of production;
- ✓ rates of change in production volumes;
- ✓ the level of export orientation of the industry;
- ✓ provision of production with a portfolio of orders;
- ✓ profitability of industry products;
- ✓ return on assets of enterprises in the industry;
- ✓ share of profitable enterprises in the industry;
- ✓ stock activity index;



- ✓ the level of self-financing of enterprises in the industry;
- ✓ relative level of emissions of harmful substances into the atmosphere; the relative level of wastewater discharge into surface water bodies;
- ✓ level of development of information technology system;
- ✓ availability of strategically-oriented resource-competence potential;
- ✓ level of investment non-commercial security.

Thus, the set of these indicators characterizes various aspects of the state of the industry: macroeconomic, financial and economic, production, social, ecological, political, information and personnel. Leading positions in strategic development today are those companies that are able to implement innovative management strategies in an unstable socio-economic environment, rapid change, reorientation and recovery of modern IT technologies, fierce competition in domestic and foreign markets. Conceptual conditions for increasing the variability of the external environment encourage agro-industrial enterprises to the extreme need to plan and develop innovative operating strategies. Due to such business conditions, companies have the opportunity to avoid financial losses, thereby localizing threats and increasing the resilience of companies to risk.

From these positions, the development of strategic forecasts of enterprises aims to analyze the strategic potential and prospects for long-term operation. The strategic scenario of innovative development provides for the analysis of strategic positions of enterprises with the subsequent choice of strategic actions in the languages of globalization changes in the market economy.

At the same time, the strategic planning of the companies' portfolio provides wide perspective opportunities for establishing and substantiating the priorities and directions of developing innovative business strategies. In this aspect, it should be noted that the processes of strategic planning determine the planning methodology – a set of methods of organizing activities in accordance with the selected groups of innovation strategies. In the context of these issues, as well as taking into account the uncertainty of the external environment, it is optimal to quickly implement long-

term strategic plans of enterprises, the need for which determines the company's ability to flexibility and ability to adjust strategic actions.

The task of each stage of strategic planning is the choice of optimal ways to implement innovative strategies, strategic opportunities of agro-industrial enterprises in accordance with the typology of their information and technological renewal in modern information society. Thus, in the conditions of relative economic stability of internal and external environments at direct presence at the enterprises of innovative IT decisions which would correspond to branch features and directions, it is necessary to take as a basis use and introduction of groups of offensive and leading strategies of development. Operative and consistent formation of new competencies, equipment and technologies in general does not ensure the implementation of long-term goals of the organization. In this regard, the globalization of long-term strategic management is a set of actions to assess and analyze the current state of the enterprise. Activities to develop successive stages of strategic planning for the development of innovation strategies should be based on accurate analysis of forecast situations, and, at the same time, on the process of forming an optimal sample of certain strategies through the rational use of analysis data for the most appropriate group of innovation strategies.

The choice of a particular group of strategies is characterized by further management actions to implement this group of strategies. Conversely, in the case of instability of the functioning environment and the dominance of rapid scientific, technological and socio-economic development, it is important to make decisions on the sound implementation of the offensive group of innovation strategies. In the current situation, the company's activities should be aimed at finding alternative opportunities to follow the strategic activities of leadership.

A wide range of modern information technologies in the system of effective IT solutions that can be effectively used in agro-industrial enterprises, grouping and ranking of these technologies on a classification basis is taken into account in the development of systemic strategic plans. However, for the implementation of these

IT solutions in the context of methodological approaches to strategic planning and forecasting are key and the type and nature of innovative technology, as well as the effective compatibility of this technology among the advanced IT technologies of agro-industrial production. In the case of inefficient use of existing IT technologies, production productivity is reduced, which leads to an imbalance in the production capacity of the enterprise.

In the development and implementation of innovation strategies, an important role is given to the issue of taking into account the competitive position of the enterprise in the target market. It is well known that the impact of the rapid development of scientific and technological progress is fully included in the globalization of world economic processes. On the other hand, the question of the strategic sphere of realization of groups of strategies of functioning in certain market conditions of any strategic economic unit is important. In fact, the strategic sphere of the enterprise is the sphere of influence of endogenous and exogenous factors, which, in turn, provide and form an alternative development of certain strategic business segments, which the enterprise considers optimal in the conditions of dynamic market changes. The key tasks of providing innovative resource potential of the enterprise are a set of mutually coordinated actions of all parts of the economic process, which are able to provide the enterprise with strategic innovative resources. This, in turn, provides key opportunities for innovative development in the direction of developing strategies for successful development, the implementation of which will contribute to the coverage of target strategic markets in accordance with the pace of development of science and technology.

Taking into account the key conceptual features of the functioning of enterprises in modern market conditions and the effectiveness of strategic aspects of long-term planning and forecasting indicate the complexity of the formation of innovative development strategies. Therefore, such a basic characteristic as the multicriteria of the main elements is due to the variety of strategic objectives and goals of the enterprise on the way to achieving the strategic goal. Hence the question of the complexity of the

coordination of innovation strategies. In terms of the main purpose of innovative development of the enterprise, such complex processes begin with the definition of strategic goals and objectives within the industry level of innovation strategies. In this situation, the company increases its strategic capabilities to focus on promising innovative developments that have no analogues. At the stage of ranking the sequence of innovation strategic processes in the aspect of the existing diversity of knowledge-intensive high technologies, the process of selecting optimal strategic plans for the development of certain innovation strategies takes place. The fact of dynamic development of promising activities of enterprises, as a rule, depends on their abilities in the context of implementation and development of advanced IT technologies, new market segments, as well as the generation and integration of knowledge in the system of human capital formation. At the same time, in the conditions of realization of globalization processes of world social and economic systems it is extremely important to observe the established interrelation "technology-science-information breakthrough".

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## Chapter 5

# MECHANISMS FOR ENSURING THE COMPETITIVENESS AND DEVELOPMENT OF ECONOMIC SYSTEMS

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## MODELLING COMPANY'S SUSTAINABILITY: FROM UTOPIA TO REALITY

### **1. Introduction**

Sustainable development is a long term strategy for society's evolution mostly driven by rapidly changing environment. Climate change, increasing number of people living on this planet, deteriorating environmental conditions and depleting resources raise concern of politicians, business and academic communities. It drives the discussions on significance and necessity of sustainable development principles and how they could be implemented on a country, region or company levels. Problems occurring in the pursuit of sustainable development reflect incompatibilities or inequalities in expansion processes which may threaten the stability of the socio-economical system and need to be analyzed. Issues encountered by individual companies are highly significant as sustainable development of a country or a region is unimaginable without input from individual companies. Globalization, digitalization of economy and technological innovations drive companies to seek for novel managing tactics and models that would enable them to compete in the market on a global scale. It would allow companies to use state-of-the-art technologies to

create products that are able to address people's needs while taking into consideration the growing awareness of the planet's health status. As this is a rather newly developing trend, those companies that choose sustainability earlier would gain advantage over non-sustainable companies in the eyes of their stakeholder therefore increasing the value of company's image and paving way for long-term success.

Increasing number of research studies are now focusing on sustainable development, comprehension of its problems and discussions on how to solve them. Various aspects of sustainable development evaluations are especially highlighted. Most frequently researchers assess the company's sustainability based on the three traditional aspects – economic, social and environmental. However, there is a lack of studies analyzing paths through which sustainability can be achieved for the newly established companies or how activities should be re-oriented in already operational enterprises to ensure that development is accomplished in a sustainable way. In order to define these actions, several things have to be discussed. Firstly, how a company itself understands sustainability, in which forms or contexts sustainability is expressed in day to day activities? What exactly has to be sustainable, why is it needed and how should it be implemented? Since sustainable development is a rather complex subject consisting of different dimensions with specific contents, the variety of interpretations of definition of sustainable development explaining this phenomenon leaves plenty of room for potential speculations. Every researcher can interpret the contents of sustainable development based on personal interests, qualifications and understanding which would lead to increase in assessment bias. As a company developing in a sustainable manner is not a self-occurring process it requires certain managerial means and models. Therefore, a need for the scientific community to categorize the contents of dimensions highlighting the factors that could later become the base points orienting companies through their journey towards sustainability, arises. Secondly, changing environmental conditions and technological breakthroughs force researchers to step out of traditional three dimensions and assess the significance of technologies to sustainable development. Thirdly, companies are an



inseparable part of society's fabric yet their input into global problem solutions remains negligible. Sustainable development goals for 2030 provide guidelines how companies could increase their input into solving global issues, nevertheless it is still unclear how these goals could be integrated into company's everyday activities and its strategy. Current management solutions are not able to address the above mentioned concerns and that fuels the need for the design of new management solutions that would systemically reflect the phenomenon of sustainable development at micro level and would enable decision makers to choose the most suitable course for the implementation of sustainable development principles in the company.

The aim of research is to design a model of company's sustainable development and evaluate the applicability of the designed model in practice. The designing of the model was divided into several stages. Firstly, to determine the factors and sub-factors of sustainable development using the analyzed contents of each dimension demonstrating their functionality in company's sustainable development model. Secondly, to design a model of sustainable development that would combine the identified factors and sub-factors into one unit for every dimension separately, which could be applied in the process of decision making. Thirdly, to combine all five models of different dimensions into company's sustainable development model that would enable a company to integrate the principles of sustainable development into daily company's activities and make a contribution into implementation of sustainable development goals.

## **2. Research methodology**

Systematic analysis of scientific literature, methods of semantics and contents analysis were used to determine the dimensions, their factors and sub-factors and justify their functionality in the context of sustainable development. Chosen modelling conception allowed to combine the factors and sub-factors of all five dimensions and integrate it into a company's sustainable development model. Multiple Criteria Simple Additive Weighting (SAW) method, expert

evaluation and structural interviews were used to evaluate the applicability of the designed model in practice. Expert evaluation were used to determine the significance of assessment criteria. Interviews with CEOs of several companies allowed to assess the importance of each sub-factor in the model. Multiple Criteria Simple Additive Weighting (SAW) method was used to assign numerical values to sub-factors and determine their place in the ranking system. Based on final calculated sub-factor significance values the level of sustainability of each company was determined. When the model of company's sustainability was developed the authors created a methodology for the practical applicability of the model and, in 2019 carried out empirical research in three medium-sized enterprises within the hospitality, construction and manufacturing industries.

### **3. Insights into Theoretical Aspects of Company's Sustainable Development**

The concept of sustainable development has been prioritized and criticized but its domination in present day science discussions has proven that it is indeed relevant. Systematic analysis of scientific literature enables the authors to discern the following debatable theoretical aspects: variety of interpretations of definition of sustainable development (Luchsinger 2009; Danciu 2013; Goswami 2014), variable number of dimensions, Dyllick, Hockerts 2002; Garbie 2014; Dyllick, Muff 2015; Huang 2017; Liczmanska-Kopcewicz *et al.* 2019), the significance of different dimensions, challenges encountered when assessing the sustainability and its practical implementation (Veleva, Ellenbecker 2001; Krajnc, Glavic 2005; Lu 2014; Dyllick, Muff 2015; Singh 2016; Hasan *et al.* 2017; Moldavska, Welo 2019). In a broad sense companies are complex economic – social systems that operate in a certain environment and use available resources to meet the expectations of stakeholders. One of those expectations is the generation of profit that is to be returned to investors or used to further improvement of the company. Yet Elkington (1997) defines sustainable company as one that provides economic, social and environmentally protective benefits while also contributing to society's wellbeing. Company's activities shall be

considered sustainable if together with its pursuit for profit it will take into consideration the boundaries of its biophysical surroundings, social needs of the society and will actively participate in the implementation of sustainable development goals. Conducted analysis of research studies enabled the justification of the need for the companies to choose the path of development in sustainably manner. Factors that promote sustainability as well as the obstacles that are encountered on the way, are identified. The most effective factors that promote the sustainability are profits, productivity, growth, trust, social justice, expectations of stakeholders and limited access to the resources (Bhanota *et al.* 2015; Lozano 2015). The greatest obstacles encountered by companies seeking sustainable growth include the following: lack of awareness of sustainable development concept, extra expenses that are too high, financial risk, lack of values and absence of a strict long-term juridical regulations system (Laukkanen, Patala 2014; Bhanota *et al.* 2015). Discussions among the members of scientific community stress the benefits provided by the sustainable development that include: reduction in used resources, improvement in company's image and its reputation, formation of positive society's approach and increase in trust from the controlling institutions and consumers (Seay 2015; Cici, D'Isanto 2017). It may be easier to comprehend the utility of sustainable development if it is expressed in a quantifiable manner. Even mathematical equations were proposed that would allow to calculate the benefits for the company and other stakeholder if they decide to switch to sustainability. Analysis of currently available sustainable development models' indicated that sustainable development is most frequently approached as a construct of three dimensions – social, economic and environmental. Rarely one can find a model that includes institutional or technological dimensions. It was also observed that scientists interpret the contents of sustainable development subjectively, mostly based on their interests, previous scientific experiences, the depth of the knowledge of the concept and qualities of object under investigation. For these reasons, it is necessary to systematize the information about sustainability regarding the contents of dimensions, while also assigning principal

factors that could be used as basis for support by those companies that seek sustainability. It forms assumptions for the creation of a new model that would be based on holistic approach and would also be justified by such theories as sustainable development, stakeholders, social responsibility and accountability. The theoretical contribution of this paper is twofold. First, new model would combine mentioned theories with environmental, social, economic, technological and performance management dimensions. Second, would provide detailed list of activities that should be undertaken by the companies to implement sustainable development principles. Integration of these principles into company's daily processes would provide access to new markets, increase the competitiveness and profits. Applicability of the new model would enable companies to contribute to implementation of sustainable development goals set to year 2030 (Transforming Our World 2015), as creation of society well-being.

#### **4. Designing a model for company's sustainable development**

A model itself is a reflection of conceptual phenomenon with particular highlights on one or several aspects. Lozano (2015) states that theories are not sufficient to enable the automatic creation of algorithms therefore the creation of a model can be considered as a form of art rather than just a mechanical procedure. Martinelli (2013) suggests that modelling should include business processes observed presently and foreseen to take place in the future, the continuity of actions should be documented with clear factors on what kind of process it should be and also answering such questions as what, when, where and how should be performed.

Jochem (2011); Schaltegger *et al.* (2011); Bocken *et al.* (2013); Moldavska, Welo (2019) state that the method of modelling is exceptionally suitable for the analysis of sustainable development concept. According to Todorov, Marinova (2010) the model will be useful if it will be a simplified representation of actual phenomenon in its conceptuality, complexity, proved effectiveness and easiness to follow. An in-depth analysis of scientific literature allowed the identification of factors and sub-factors expressing their content,

which were later combined into a separate model for each dimension. We will discuss the development of a model for each dimension below.

#### **4.1. Environmental sustainability**

In 2019, the European Commission published the European Green Deal – an ambitious growth strategy which sets out a plan for an economy-wide transition to achieve climate neutrality in Europe by the year 2050. The reasons pushing for the plan's creation are based upon the environmental issues such as climate change, a loss of biodiversity, ozone depletion, water pollution, urban stress, waste production.

The aim for creation of environmental model is to identify the typical factors and sub-factors which would contribute most to sustainability of the company. According to Genc (2013), Rigo *et al.* (2020), protection of the environment is expressed in company's activities as effective and responsible resource usage, choosing materials that can be recycled or producing goods that require less resources and energy, willingness to protect biodiversity. Paul *et al.* (2014) adds that environmental protection can be oriented either towards products or towards processes. Orientation towards products ensure high quality and help protect the image of the company by preventing usage of not environment-friendly materials. Orientation towards processes entail reduction in rates of waste production and installation of technologies directed at prevention of pollution. Factors and sub-factors that are assigned to environmental dimension of sustainable development are given in Table 5.1.

Prioritizing which activities are mostly needed for implementation is a complex challenge. Decision is based on how effective the activity is from environmental viewpoint as well as on technical and financial capabilities of the company.

Environmental sustainability model requires inclusion of factors that entail reduction in usage of resources and energy as well as in waste production and pollution levels. Model should also include one component that accounts for search of opportunities together with result assessment and another one dedicated to strategic

decision making based on acquired evaluation results. The results of this assessment would allow companies to choose the most appropriate actions for their current situation (Drejeris, Ozeliene, 2019). The model for environmental sustainability is presented in Figure 5.1.

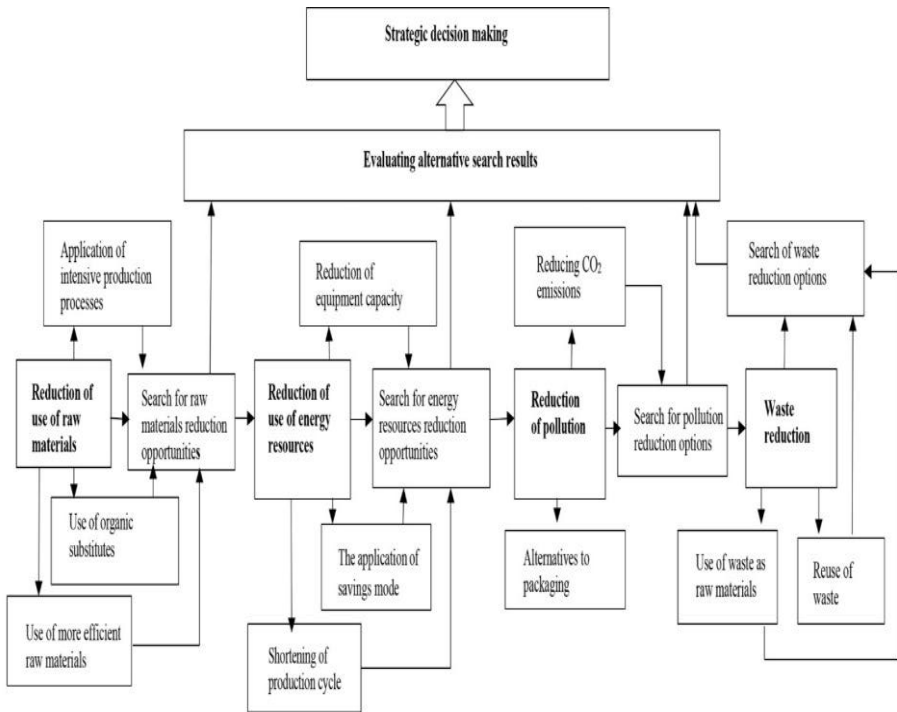
*Table 5.1*

**Factors and sub-factors of sustainable development  
environmental dimension**

Factors	Sub-factors	The authors
Reduction of use of raw materials	Use of more efficient raw materials Use of organic substitutes Application of intensive production processes	Vevelka, Ellenbecker 2001; Garetti, Taisch 2012; Russell, Shiang 2013; Kinderytė 2013; Dornfeld <i>et al.</i> 2013; Genc 2013; Garbie 2014; Gecevska <i>et al.</i> 2016; Tietenberg, Lewis 2018.
Reduction of use of energy resources	The application of savings mode Reduction of equipment capacity Shortening of production cycle	Vevelka, Ellenbecker 2001; Russell, Shiang 2013; Dornfeld <i>et al.</i> 2013; Kinderytė 2013; 2013; Garbie 2014; Tietenberg, Lewis 2018. Rigo <i>et al.</i> 2020.
Reduction of pollution	Reducing CO <sub>2</sub> emissions Alternatives to packaging	Hart 1995; Garetti, Taisch 2012; Barbien 2013; Kshatri, Chouksey 2014; Singh 2016; Staniškis <i>et al.</i> 2017.
Waste reduction	Use of waste as raw materials Reuse of waste	Genc 2013; Barbien 2013; Dornfeld <i>et al.</i> 2013; Kshatri, Chouksey 2014; Xiaolin, Yongmei 2014; Elsaid, Aghezzaf 2015; Staniškis <i>et al.</i> 2017; Huang, Badurdeena 2017.

*Source: composed by the authors*

Decreased expenditure for the resources would increase the profit margin and thus, the company would progress towards higher degree of sustainability. It can be arguing that a company that implements all activities listed in the model would become sustainable from environmental perspective.



**Figure 5.1 Model of environmental sustainability**

*Source: composed by the authors*

## 4.2. Social sustainability

Social dimension of sustainable development is underrated in scientific research studies as it is mostly portrayed as contiguous to economic and environmental dimensions.

Seventeen goals have been raised in Sustainable Development Agenda up to 2030, six of them directly relate to the solution of social problems in the world. This is a significant justification of the relevance of the social dimension. The list of objectives begins with the commitment to eliminate all forms of poverty, hunger, to ensure healthy lifestyle, quality lifelong education of equal quality, gender equality, and reducing inequalities between countries (Transforming Our World, 2015).

Business sector has been avoiding active involvement in search for solutions of society social problems for a long time. According to Friedman (2007) it has been justified simply because the only responsibility of a business is to generate profit. Companies have neither resources nor competences required for social problem solutions. However, the idea of mutual value creation put forth by Porter, Kramer (2011) proves that solving social problems could benefit both sides. On one side of the scale one could put improvement in the quality of life among members of society while on the other side done could have an increase in company's financial results. International documentation describes social dimension of sustainable development in terms of decrease in poverty, human rights, ethic employment practice, public health, education, etc. (UN Principles of Global Compact 2000; OECD guidelines for companies 2011; GRI standard 2018).

The purpose of social sustainability is to ensure human rights and fulfill the basic human needs. Systemic analysis of the research studies allowed to distinguish most prominent factors of social dimension. These factors form a complementary axis and consists of employee – customer – society. Factors and sub-factors are provided in details in Table 5.2.

Drucker (2007) states that a company is really its people their knowledge, capabilities, and relationships. Company's employees become an intellectual property of the company and the engine of economic progress. Investments in education and training determine skills and abilities, that lead to an increase of individual's income and productivity of the company.

A higher level of education in society reduces social fragmentation, crime rate and extends life expectancy.

Survey carried out within 250 global companies has shown that investing in human resources is financially beneficial for businesses. Companies that invest in employees increase its profit 4.2 times, profit per employee 4, earnings per employee – 2.8, and average revenue – 2.1 times (Harvard Business Review, 2017).



Table 5.2

**Factors and sub-factors of sustainable development social dimension (composed by the authors)**

Factors	Sub-factors	The authors
Implementation of responsible work practices	<p>Creating employee well-being, fostering a creative work environment</p> <p>Ensuring occupational safety and health</p> <p>Development of professional competences of employees</p>	<p>Kocmanova, Simberova 2012; Taylor 2013; Garbie 2014; Yeo, Tjandra, Song 2015; Oertwing, Wintrich, Jochem 2015; Butnariua, Avasilcai 2015; Hasan <i>et al.</i> 2017; Vevelka, Ellenbecker 2001; Kinderytė 2013; Singh <i>et al.</i> 2013; Seay 2015; Huang, Badurdeena 2017; Callado, Fensterseifer 2011; Husgafvel <i>et al.</i> 2017; Shaaban, Scheffran 2017; Chaudhary 2017; Edgeman <i>et al.</i> 2016; GRI Standard 2018.</p>
Respect for human rights	<p>Ensuring equal opportunities</p> <p>Intolerance to discrimination</p>	<p>Murphy 2012; Garbie 2014; Mejri, Bhatli 2014; Almeida <i>et al.</i> 2015; Blau, Kahn 2016; Calabrese <i>et al.</i> 2016; Goryunova <i>et al.</i> 2017; Longman 2018; Oliveira <i>et al.</i> 2018; GRI Standard 2018; Sundstrom <i>et al.</i> 2019.</p>
Collaboration with customers	<p>Increasing customer satisfaction</p> <p>Responsible marketing and product labeling</p>	<p>Garbie 2014; Hess 2014; Yeo, Tjandra, Song 2015; Seay 2015; Kalendera, Vayvaya 2016; Huang, Badurdeena 2017; Chaudhary 2017; Madariagaa, Rivera 2017; GRI Standard 2018.</p>
Collaboration with society	<p>Engagement in local community activities</p> <p>Development of charity and philanthropy</p> <p>Strengthening of social responsibility</p>	<p>Veleva 2012; Michelini 2012; Murphy 2012; Garza 2013; Singh <i>et al.</i> 2013; Garbie 2014; Yeo, Tjandra, Song 2015; Butnariua, Avasilcai 2015; Husgafvel <i>et al.</i> 2017; Huang, Badurdeena 2017; GRI Standard 2018.</p>

Source: composed by the authors

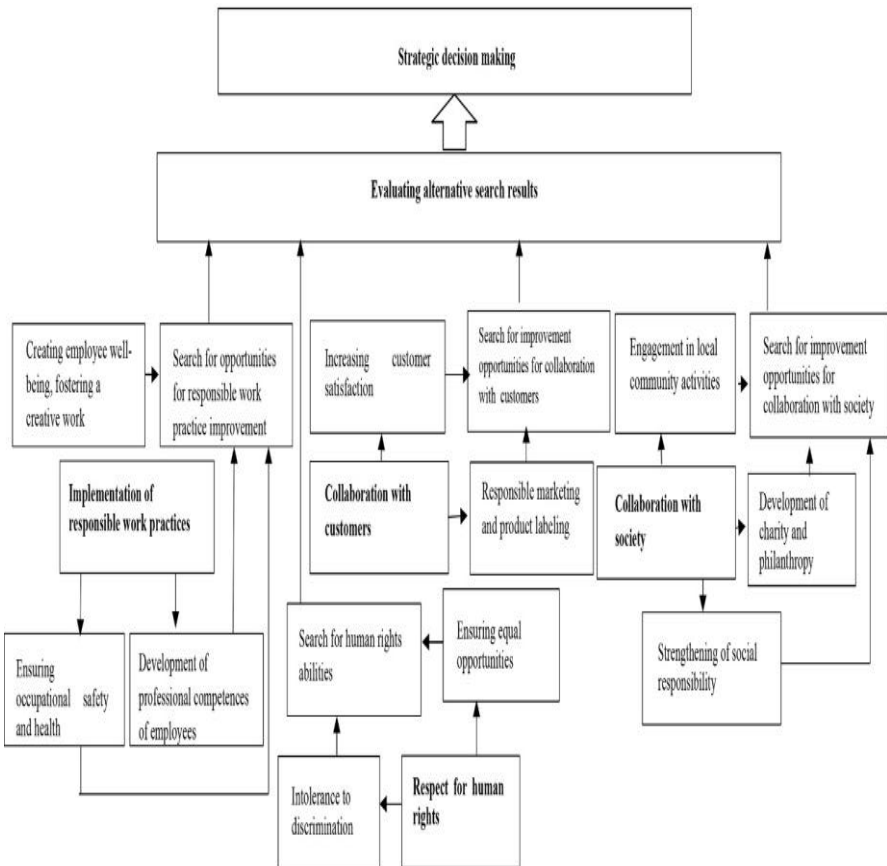
According to Butnariua, Avasilcai (2015), Shaaban, Scheffran (2017) a work friendly environment today is understood as ergonomic workplaces, advanced technologies, safe and healthy environments, flexible work schedules, work-friendly microclimate, gender equality, respect for human rights. The standardized management system ISO 45001, the social responsibility standard SA 8000, the ISO 26000 guidelines ensure occupational safety and health of employee's and help companies to achieve sustainable development. However, are often criticized for being overly complex and requiring additional resources for their implementation.

Company guarantees to provide consumers with high quality products or services. Drucker (2007) states that modern customer is no longer a passive receiver of products but is engaged in designing and refining them. Therefore, management can make the relationship that force the company to understand customer values. Managers must determine which needs of a customer in target market are unsatisfied and then further determine whether they can step up to provide value. Value is based on ability to connect with the customers and know more about their needs and desires than they can articulate.

Businesses exist to deliver value to society. In this context companies should be interested in the health of the population, appropriate education and good relations with the local community, since most of the employees in the company are from a local labor market. More and more executives of the company recognize the benefits of employees' involvement in the social activities and the ability to attract and retain talented employees. Employees of current generation want to work in a company that fosters solid values and is not afraid of obligations to the public. Veleva et al. (2012) explored the benefits of employee volunteering to business and found out that employees involved in volunteering are more satisfied with their work, are more proud of their company, believe in the mission of the company, and have a higher morale. In addition, the study showed the positive impact of volunteering on the company's performance.

To sum up model of social sustainability should include the following factors: responsible work practice implementation,

complying to human rights regulations, cooperation with customers and society, evaluation of possibilities to implement previously listed factors together with processing of obtained results and making an appropriate decision regarding the strategic expansion. The interaction of these factors and sub-factors is visually represented in Figure 5.2.



**Figure 5.2 Model of social sustainability**

*Source: composed by the authors*

Model contributes to clearer understanding of what the social dimension of sustainable development means in general and how it relates to company activities as well. The developed model can be used to make managerial decisions in the social field and to assess the social performance of the company in the context of sustainable development.

### **4.3. Technological dimension**

Advanced technologies are potentially a powerful drive towards sustainable development goals and has a major effect on companies, forcing latter to reevaluate and adapt such processes as: production, sales and marketing, resource management, decision making and even attitudes and behavior of the customers. Technology has opened the way for doing business innovatively thus more and more businesses are going digital.

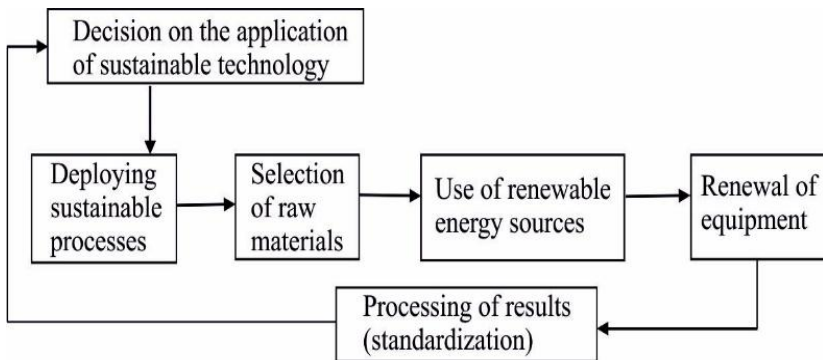
Technological dimension is not included in the classical concept of sustainable development, therefore in order to add it to newly designed model some logical arguments supporting this selection are expected. As a result of systemic analysis of scientific studies the following features are accentuated as proving the need to include technological dimension into the newly designed model:

- Link between the technologies and results of company's activities (Ma Degong *et al.* 2018; Cheng, W. Li 2018),
- Link between the technologies and business model (Bohnsack, Kolk 2014; Kavadias *et al.* 2017),
- Link among technological and remaining dimensions (Eschenfelder *et al.* 2016, Sammalisto *et al.* 2015),
- Link between the sustainable development and industry 4.0 (Schwab, Vanham, 2021).

Drejeris, Ozeliene (2019) explains in detail the above mentioned links and provides arguments about the importance of technology in the system of sustainability. The highlighted arguments prove the evident need for the technological dimension as an axis that determines the contents of other sustainability dimensions.

Benefits that arise when advanced technologies are introduced into various processes at a company's level include: rationalization

of operations, increase in effectiveness of activities and profits, reduction in expenses and amounts of generated waste (Marinagia *et al.* 2014; Hagel *et al.* 2015; Ma Degong *et al.* 2018), increase in quality of services that are offered to customers, more potential customers being attracted and business connections being established with them (Stock, Seliger 2016; Schilling 2017), involvement of the client into business management and stimulated communications with all stakeholders of the company. A question arises – what kind of technology is considered sustainable and which factors are necessary to be included in the model of sustainable technology? Stock, Seliger (2016) and Schilling (2017), claim that technology can be considered sustainable if it is oriented towards preservation of resources, its re-use and recycling as well as increase in effectiveness of energy used, reduction in pollution rates and negative environmental impact. The purpose of newly designed model is to distinguish principal factors that would be common for all companies and would reflect the essence of sustainable technology. Suggested model of technological dimension should entail installation of sustainable processes, selection of resources/materials, usage of renewable energy, equipment updates, result standardization and decision making for application of sustainable technology (Figure 5.3).



**Figure 5.3 Model of technological dimension**

*Source: composed by the authors*

Due to diversity of technologies and also differences in the services or products provided by companies the model highlights several common factors. These factors answer questions debating whether there is a possibility to use environmentally friendly materials, renewable energy resources, equipment should be updated or renewed. The only way for companies to achieve sustainability in environment, social and economic aspects is through dynamic changes occurring upon installation of innovative and advanced technologies. These technologies drive company to sustainability while the usage of advanced technologies in the face of globalization turn sustainably developing company from utopia to reality.

#### **4.4. Performance management dimension**

Klimek, Jedrych (2021) states that management of an enterprise is a constant process of striving to achieve a goals, and balancing the level of the capitals within the enterprise. Prevalent concept of sustainable development rarely draws attention to institutional management, which is rarely positioned as a separate dimension. Tan *et al.* 2015 refers to this dimension at a company's level as performance management dimension. Since management itself is a highly specific feature of any company. L'Huillier (2014); Engert *et al.* (2016); Liczmanska-Kopcewicz (2019); Zheng, Kouwenberg (2019) argues that performance management dimension could be coordinating the remaining dimensions and would speed up the implementation of sustainable development principles. It is commonly observed that companies have a tendency not to engage in continuity of activities required for achieved sustainability. They take single use measures and do not put forth any long term goals. One of identified reasons is that companies do not know where to start, how the principles of sustainable development can be integrated in their mission, vision, targets, strategy and daily operations. Danciu (2013); Baumgartner (2014); Engert *et al.* (2016) claim that first of all, sustainable development should become an integral part of business strategy and later on – a part of business processes. Taylor (2013) agrees that principles of sustainable development should be integrated first, doing it systematically and

starting with vision and targets, gradually moving on to planning, decision making and corrections of strategy. Table 5.3 provides the factors and sub-factors representing sustainable development performance management at a company's level.

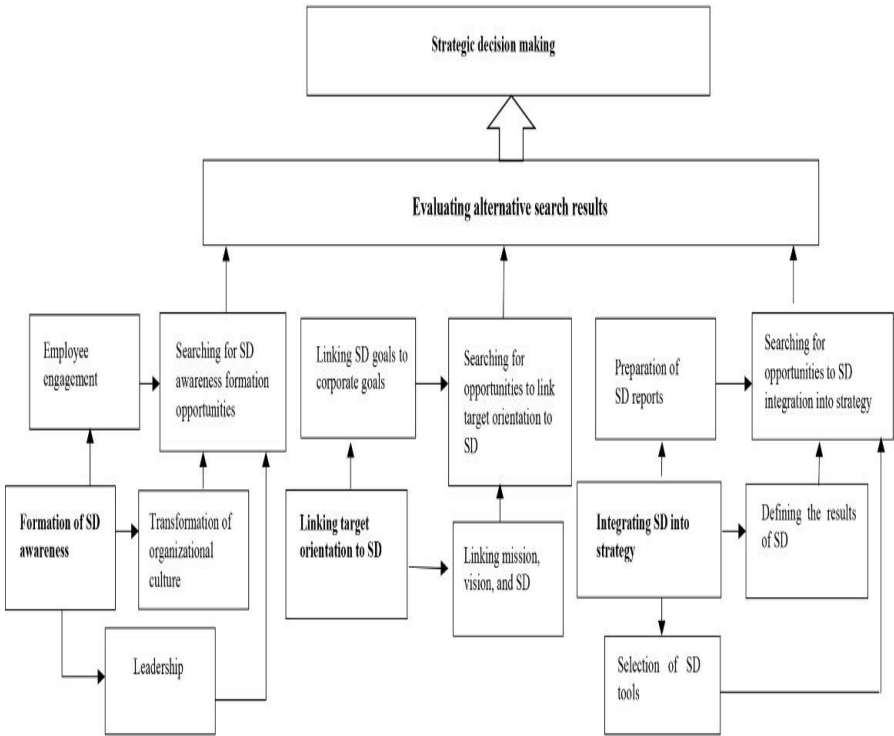
*Table 5.3*

**Factors and sub-factors of performance management dimension**

Factors	Sub- factors	The authors
Formation of sustainable development awareness	Leadership Employee engagement Transformation of organizational culture	Kocmanova, Simberova 2012; Genc 2013; Danciu 2013; Mohammed, Muff 2014; Muff, Mayenfisch 2014; Baumgartner 2014; Muff, Dyllick 2015; Engert <i>et al.</i> 2016.; Sakalas <i>et.al</i> 2016; Marcouse <i>et al.</i> 2017; Urban 2017; Chaudhary 2017; Miska <i>et al.</i> 2018.
Linking Target Orientation to sustainable development	Linking mission, vision, and sustainable development  Linking sustainable development goals to corporate goals	Hirota <i>et al.</i> 2010; Yozgat, Karat 2011; Altioka 2011; Genc 2013; Danciu 2013; Candemir, Zalluhoglu 2013; Baumgartner 2014; Mohammed, Muff 2014; Seay 2015; McKinsey, Company 2017; Marcouse <i>et al.</i> 2017; Mansi <i>et al.</i> 2017; Ponte <i>et al.</i> 2017; Fleming <i>et al.</i> 2017; E-Vahdati <i>et al.</i> 2018; Sundstrom <i>et al.</i> 2019.
Integrating sustainable development into Strategy	Selection of sustainable development tools Defining the results of sustainable development Preparation of sustainable development reports	Jochem 2011; Altioka 2011; Porter, Kramer 2011; Callado, Fensterseifer 2011; Kocmanova, Simberova 2012; Taylor 2013; Singh <i>et al.</i> 2013; Dagilienè 2014; Garbie 2014; Tan <i>et al.</i> 2015; Szekely, Brocke 2017; Huang, Badurdeena 2017; Husgafvel <i>et al.</i> 2017; Shaaban, Scheffran 2017; Chaudhary 2017; Edgeman <i>et al.</i> 2016; GRI Standrad 2018.

*Source: composed by the authors*

The purpose of newly designed model is to identify most significant factors for the company so that these features would guide the company through introduction of principles of sustainability into daily activities. Figure 5.4 shows the created model of performance management.



**Figure 5.4 Model of performance management (institutional) dimension**

*Source: composed by the authors*

This model includes such components as formation of sustainable development concept comprehension, linking the orientation towards sustainability with sustainable development integration into the



strategy. In the next stage of model design, the succession of mentioned sub-factors has to be determined. Authors assumes that indeed the factors of the model should be implemented in continuity starting with formation of sustainable development concept comprehension, then mission, vision and linking the targets to sustainable development.

Process would be ended with integration of sustainable development principles into company's strategy.

#### **4.5. Economic sustainability**

The purpose of economic sustainability is to generate income, ensure profits (Dyllick, Muff 2015, Klimek, Jędrych 2021) and maintain quality of life (Danciu 2013). Elements assigned to economic dimension include globalization, manufacturing reorganization, innovation, competitiveness (Garbie 2014), production expenditures (Lu 2014; Huang 2017), product quality, reaction to product creation/manufacturing/time of order (Singh 2016) and money flow (income, outcome, taxes, salaries, debts) (Slaper, Hall 2011; Tan *et al.* 2015; Hasan 2017). Results of extensive analysis of elements in economic dimension are provided in the Table 5.4.

Modelling of company's economic activities should highlight the significance of improving financial results, increasing the effectiveness of activities thus ensuring the longevity of the company. Factors that support company's existence in the market are growth and expansion (Pacurami 2012) while good financial and economic results generated by the company enable the decision making regarding the growth of the company in the future and possibilities for it to become sustainable. Therefore, company's sustainable development model should present factors and sub-factors that influence growth and expansion as shown in Figure 5.5.

Klimek, Jędrych (2021) highlights that profit the increase in the value of assets, or the share of sales in the market cannot be the only goal of an enterprise. However, good company's financial status is an imperative pre-requisite for those seeking sustainability. It should be ensured that nature's resources are used as effectively as possible

while taking into consideration impact on environment and society. Greater effectiveness means rational resource usage and positively affects not only economic but also social and environmental dimensions of sustainable development.

*Table 5.4*

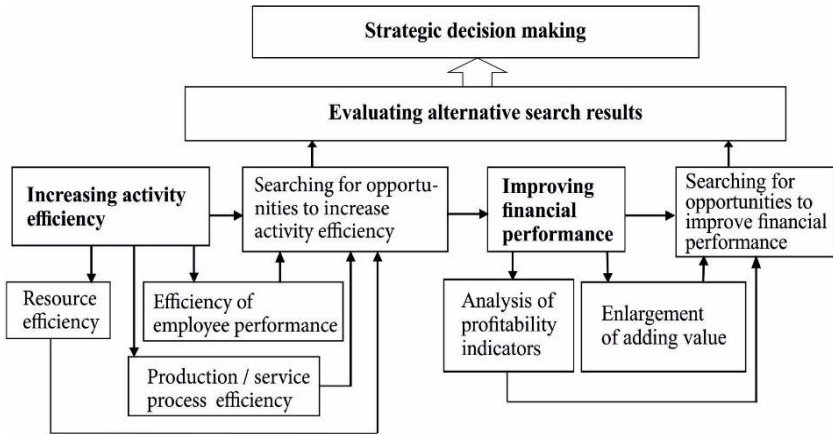
**Elements and its contents of sustainable development economical dimension**

Factors	Sub-factors	The authors
Improving financial performance	Analysis of profitability indicators Enlargement of adding value	Callado, Fensterseifer 2011; Kocmanova, Simberova 2012; Singh <i>et al.</i> 2013; Tjandra, Song 2015; Oertwing, Wintrich, Jochem 2015; ; Huanga, Badurdeena 2017; Sing 2016; Szekeley, Brocke 2017; Pavláková, Dočekalová <i>et al.</i> 2015; Slaper, Hall 2011; Hasan 2017; Husgafvel <i>et al.</i> 2017; Heitmann <i>et. al</i> 2019; Klimek, Jędrych 2021.
Increasing activity efficiency	Resource efficiency Production/service process efficiency Efficiency of employee performance	Callado, Fensterseifer 2011; Pacurami 2012; Taylor 2013; Borza 2014; Butnariua, Avasilcaia 2015; Shaaban, Scheffran 2017; Huanga, Badurdeena 2017; Heitmann <i>et. al</i> 2019; Mammela <i>et al.</i> 2019.

*Source: composed by the authors*

**5. Model of company’s sustainability**

Sustainable development is a complex concept that requires systemic approach, however it does not mean that all problematic aspects should be solved simultaneously. It only allows to see the bigger picture that one can divide into separate components, analyse them, highlight the most important ones and finally combine it into one unit (Sundstrom *et al.* 2019).



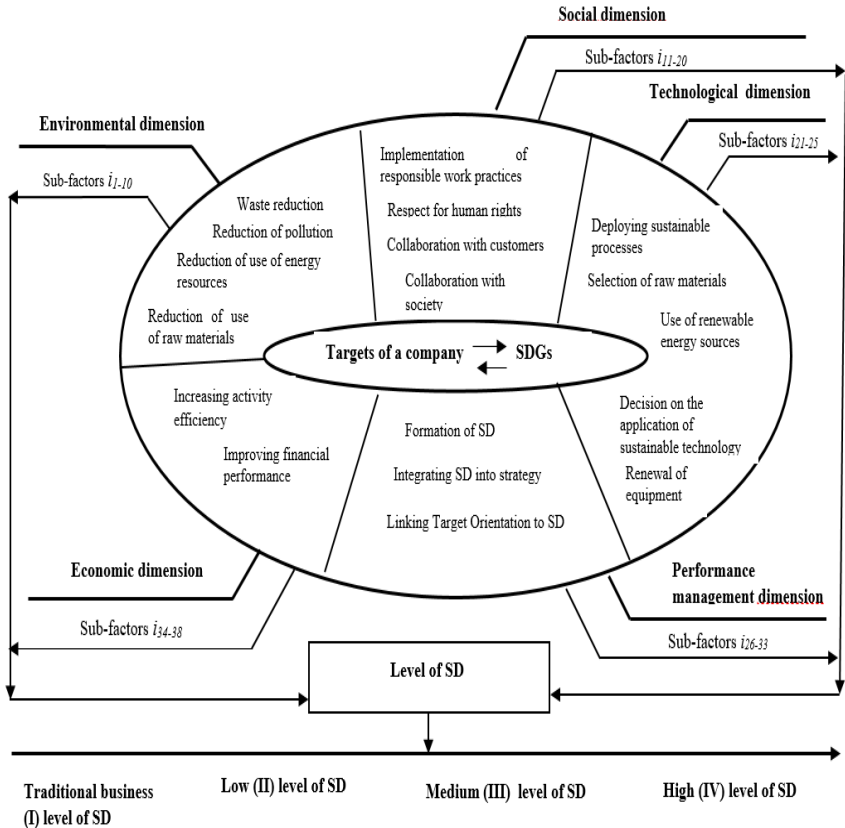
**Figure 5.5 Model of economical dimension**

*Source: composed by the authors*

During the analysis of scientific literature, it was observed that the most debatable question is how to balance different dimensions. Bossel (1999) proposes that this is nothing more than a distraction that redirects the attention from sustainable development aspects to assessment indices. Concentrating on these indices would not elucidate how or in what way one can achieve sustainability as indices convey only fragmented pieces of information. Bass, Dalal-Clayton (2002) agrees that complex assessment is crucial in order to maintain control of target implementation. The newly designed model of company's sustainable development is not oriented towards the assessment. Factors and sub-factors that reflect the content of dimensions were analyzed first during the creation of the model. The factors and sub-factors were then combined into independent models. The model of company's sustainable development consists of environmental, social, technological, performance management and economic dimensions as shown in Figure 5.6.

Created model is a five-dimensional construct combining the factors defining the content of sustainable development and sub-factors, the integration of which into the company's activities would

help companies achieve sustainable development and contribute to global sustainable development goals (SDGs).



**Figure 5.6 Model of company sustainable development**

*Note: SD – Sustainable development*

*Source: composed by the authors*

Many researchers (Dyllick, Hockerts 2002; Vom Brocke *et al.*, 2012; Garbie 2014; Dyllick, Muff 2015; Huang 2017; Liczmanska-Kopcewicz 2019 and others) claim that all dimensions of sustainable development are of equal importance and neither one requires to be

prioritized.

Model was created based on the assumption that growth of the company will be sustainable if all five dimensions will be developed equally and will be of equal importance in the activities of the company.

Indeed, switching to sustainability has to be a strategic decision (Danciu 2013; Rauter *et al.* 2015; Dang *et al.* 2019; Zheng, Kouwenberg 2019).

## **6. Application of the model of company's sustainable development**

Methodology for practical applicability of the model were prepared in three stages: preparation, conduction of research and processing of results. Detailed description of the stages is given in Table 5.5.

The following activities have been carried out during the preparation stage: 38 sub-factors were selected, criteria chosen to evaluate the sub-factors, group of 7 experts has been formed from the international setting (Germany, Ireland, Lithuania).

Ideal number for the expert evaluation method is 5 – 9 experts. If there are less than 5 experts, the research cannot be conducted since the reliability of the research is too low. Whereas if there are more than 9 experts, the expert evaluation does not have a significant change (Libby, Blashfield 1978). Criteria for selection of experts was the following: position (CEO, assistant, manager), no less than 5 years of experience in management, no less than 5 years of experience working in the business sector and previous experience of working with sustainable development projects. The experts determined significance of the four criteria (resource need, financial abilities, technical abilities and suitability based on company's profile).

The profile of chosen experts can be envisioned based on several data points: mean of the years in business sector and in the field of sustainable development – 9.3 years, experience in management – 8.7 years, positions – 5 managers, 1 CEO, 1 owner of the company. Experts were interviewed individually.

Table 5.5

**Methodology of practical application of the model**

<b>Preparation</b>	
Actions	Sequence of methodology
1	2
Compilation of a set of factors	Sub-factors are grouped by sustainable development dimensions into 5 groups.
Selection of criteria for assessment of factors	The criteria proposed for the assessment of the factors are: cost requirements, financial and technical capabilities of the company, suitability according to the type of activity.
Setting up of an expert group	Selection of experts on following selection criteria: position (company manager, deputy, department manager), at least 5 years of management experience, at least 5 years of business experience and experience working on sustainable development projects.
Preparation for expert evaluation	Selection of survey type: individual survey is offered by email Design of a research instrument Preparation of instructions for filling in questionnaires.
<b>Conducting an investigation</b>	
Determination of the criteria significance	Individual survey of experts according to prepared questionnaire.
Determination of compatibility level of expert opinion	The compatibility of expert opinions is calculated according to the Kendall (1975) formula $W = \frac{12S}{r^2m(m^2 - 1)}$ , where $W$ – coefficient of Concordance, $S$ – the sum of the ranks of each criteria, $r$ – number of experts; $m$ – number of factors.

Table 5.5 (continued)

1	2
Empirical research in the companies	Survey type selection: a structured interview with company executives is offered Design of a research instrument Preparation of extended explanation of factors Adjusting the time and place of interviews Conducting interviews using the questionnaire.
<b>Generalization of results</b>	
Results processing	Data normalization according to the formula $\%_{ij} = \frac{r_{ij}}{\sum_{i=1}^m r_{ij}},$
	Calculating sub-factor estimates, constructing a matrix of estimates, and ranking the sub-factors
	Calculation of final sub-factor estimates according to the formula $S_j = \sum_{i=1}^m \omega_i \%_{ij},$
	Determination of the sustainable development level according to the intervals of the final sub-factor estimates

Source: composed by the authors

The compatibility of expert opinions can be determined by calculating Kendall's coefficient of Concordance (Table 5.5). The calculated Concordance coefficient is equal to 0.87 ( $W = 0.87$ ) which indicates high level of compatibility between the experts' opinions. Significance of criteria was determined based on expert evaluations (resource need – 0.27; company's financial abilities – 0.39, technical abilities – 0.16, suitability based on company's profile – 0.18). Companies were selected for the empirical part of the study based on following criteria: established and operational for no less than 5 years, number of employees comply to numbers observed in small and middle sized companies, annual revenue no less than 100K Eur.

Study was conducted in 3 Lithuanian companies. In compliance with research ethic regulations the names of the tested companies will not be revealed, however another kind of informative labelling will be used instead. Hotel – restaurant (HR), Gate manufacturing company (GM), Service provider for tower constructors (TC). During the interview, the companies’ executives were asked to assess the importance of the sub-factors and assign values to them ranging from 1 (least important) to 10 (most important).

The level of sustainability was determined in all tested companies by using Multi-criteria Simple additive weighing (SAW) method that also allows to combine all factors of all dimensions into one final value. These values could fall into range of [0–1.25), [1.25–2.50), [2.50–3.75), [3.75–5.0) and mean the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> level of company’s sustainability. According to the final factor estimates and rankings in Table 5.6 the most sustainable is the firm (HR) providing hospitality services.

Table 5.6

**Final evaluations of all dimension sub-factors and their ranks**

Company	END		SD		ED		PMD		TD		Average of ranks	Final ranks
	Estimates	Ranks	Estimates	Ranks	Estimates	Ranks	Estimates	Ranks	Estimates	Ranks		
HR	0.959	3	0.969	1	0.838	1	0.823	1	0.381	1	1.4	1
GM	0.967	2	0.943	2	0.828	3	0.716	2	0.28	3	2.4	3
TC	0.970	1	0.915	3	0.829	2	0.706	3	0.326	2	2.2	2

Note: END – environmental dimension, SD – social dimension, ED – economic dimension, PMD – performance management dimension, TD – technological dimension

Source: composed by the authors

Application of Multi-criteria Simple additive weighing method (SAW) enable combining all sustainable development dimensions



into a unified evaluation.

The final estimate of the factors for each firm is calculated by summing the estimates for all dimensions (Table 5.7).

Table 5.7

**Final evaluations of all dimension sub-factors**

Company	END estimates	SD estimates	ED estimates	PMD estimates	TD estimates	Final estimate
HR	0.959	0.969	0.838	0.823	0.381	3.972
GM	0.967	0.943	0.828	0.716	0.28	3.736
TC	0.97	0.915	0.829	0.706	0.326	3.749

Note: END – environmental dimension, SD – social dimension, ED – economic dimension, PMD – performance management dimension, TD – technological dimension

Source: composed by the authors

Calculations show that the final estimates of companies are the follow: (HR) –3.972742, (GM) –3.736893, (TC) –3.749007. Determination of the level of sustainability requires the sum of evaluations of all dimensions. To determine the level, it is necessary to calculate the step interval of the estimates. Taking all sub-factors into account with maximum scores, the sum of the estimates would be 5.0. The estimate interval step is calculated by dividing the sum of the estimates by the number of intervals. Based on final evaluation results (Table 5.7) the ranges were determined [0–1.25), [1.25–2.50), [2.50–3.75), [3.75–5.0) as well as company’s level of sustainability. Companies (GM) and (TC) meet the criteria of level three as their final evaluations fall into range  $2.50 \leq 3.736893 \leq 3.75$  (GM) and  $2.50 \leq 3.749007 \leq 3.75$  (TC). The company’s (HR) final estimate satisfies the condition  $3.75 \leq 3.972742 \leq 5.0$  and falls to level four. Under current conditions the most sustainable company is (HR) that operatives in hospitality industry. Managers who are aware of the level of company’s sustainability can redirect resources to the areas that need improving thus managing the resources in a more effective way or adjusting company’s targets to achieve sustainability in the future.

Several recommendations can be provided in response to processed results of the study conducted:

Model is sufficiently universal to be applied to all business companies. Based on four suggested criteria – a need of resources, financial and technological company's capabilities as well as business suitability – the most important sustainable development sub-factors are evaluated on a 10 point basis. In response to listed criteria, companies can choose which sub-factors should be prioritized and implemented in a certain situation, which are most relevant to the company or which would require least of resources while improving company's economic results most of all. Evaluation of the sub-factors should be entrusted to higher rank managers as they are most aware of company's long term goals, while managers on a lower hierachial level could potentially be unaware of some features making the evaluation inaccurate.

To integrate all sub-factor values into a final evaluation it is recommended to use Multi-criteria Simple additive weighing method (SAW). Final evaluations of the sub-factors have to be ranked to highlight which sub-factors should be prioritized and which ones may remain less, if at all, significant to a company. Sum of evaluations from all five dimensions allows to determine the level of company's sustainability. It also elucidates which sub-factors should receive more attention and resources in order to improve sustainability. It is noteworthy that sustainable development is not a fixed target and a certain level of sustainability when achieved will not guarantee sustainability in a long perspective. Changing conditions will unavoidably alter the level of sustainability as well.

## **Conclusions**

Widely applicable model of Tripple Bottom Line by Elkington (1997) was expanded from previous three dimensions (environmental, economic, social) to five additionally incorporating technological and performance management dimensions.

The contents of company's sustainable development environmental, social, technological, performance management and economic dimensions were in-depth analyzed and structured. The

most important factors and 38 sub-factors of mentioned dimensions were highlighted; their functionality is justified in the model of company's sustainable development.

Systematic approach allows to present a sustainable company as a complex socioeconomic system. Its most important factors and sub-factors of each dimension were integrated into separate sustainable development environmental, social, technological, performance management and economic dimension model. Application of these models should aid companies in the process of managerial decision making.

Separate models created for each of the five dimensions were combined into one model of company's sustainable development in which all the dimensions are assigned equal level of significance. None of the dimensions are permitted to be prioritized over another by executing actions favouring one dimension at the direct expense of another. Upon application of the model companies would gradually integrate the principles of sustainable development into its daily operations and make a contribution to global targets of sustainable development at the same time striving for profit and meeting the expectations of stakeholders.

An empirical research was carried out in Lithuanian service and manufacturing companies using the structured interview method. All sub-factors of the model were evaluated according to the presented criteria (cost requirements, financial, technical company capabilities, business suitability), ranked according to implementation priority. Application of Multi-criteria evaluation (SAW) method allows to combine sustainable development sub-factors into one general assessment and determine the level of enterprise sustainable development.

Results of the study indicate that company's sustainable development model, as a construct of five dimensions, is applicable in business sector at a current time and technological level of a company. The highest sub-factor values specify actions that ought to be prioritised for a company that seeks sustainability. These actions should be dedicated the greatest amount of resources and care. The lowest sub-factor values pinpoint the areas requiring most

improvement, additional resources or focused managerial decisions in the context of company's sustainable development.

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**FEATURES OF  
COMPETITION IN THE  
HOSPITALITY INDUSTRY  
ON THE HOTEL  
SERVICES QUALITY**

Modern economic conditions, formed under the influence of globalization and integration processes, actualize dependence of national systems prosperity on the formation of competitive industries that play the role of multipliers of economic development in individual territories and the economy as a whole. At the same time, it became obvious that different areas of activity need their own principles of maintaining and developing competitiveness, taking into account their specific features.

Assessment of the enterprise competitiveness has always played an important role, because it can determine the current state of the enterprise, ways and directions for its improvement, based on the capabilities of the organization and market conditions in which it operates.

Issues of management and assessment of the competitiveness of enterprises were considered in the works of such leading domestic and foreign scientists as Azojev G.L. [1], Fatkhutdinov R.A. [2], Vlasova N.O. [3], Pyatnitskaya G.T., [4], Balabanova L.V. [5], Pavlova V.A. [6], Klymenko S.M. [7].

Analysis of the published works and practice of economic activity of domestic enterprises indicate the lack of the development of fundamentally important issues regarding competitiveness of the enterprises and formation of a comprehensive system for assessing competitiveness of the enterprises in the service sector.

The purpose of the research is to determine that one of the main

areas of competitive advantage in the hospitality industry is the provision of higher quality services compared to competitors. The key issue here is the provision of such hotel services that would meet and even exceed the expectations of target customers.

Quality is the most important factor in ensuring the competitiveness of every organization. Quality is the most important and crucial component of the enterprise management as a whole.

High quality of products and services is the basis of competitiveness in domestic and foreign markets, satisfaction of the diverse needs of people, ensuring a decent standard of living and a decent status of the state in the world community. This problem affects not only highly developed countries, it is also acute for the developing countries. In the past, our country did not pay much attention to quality issues, but focused on production volumes. However, in market conditions, when supply far exceeds demand, every company that sells products is forced to bid a fierce struggle for consumer attention. Therefore, one of the main directions, both in the field of production and in the field of hospitality is quality, not the production volume or provision of services. From the analysis of numerous literature sources concerning quality we can conclude that the determining condition for long-term conquest of markets is higher quality, taking into account consumer demand, which is reproduced in the amount of income [8, pp. 124-126].

The basis for the development of hotel service is to create for customers all the necessary conditions for living and recreation, ensuring high level of service. The current level of service requires the availability of additional related services from the hotel industry, the objects of which are parking lots, restaurants and shops, saunas, swimming pools, laundries, etc.

The need for integration into the world economy requires, in its turn, approximation of the quality of services in the hotel industry to international requirements. The hotel industry is the most important component of tourism, because these are the hotel companies who perform one of the main functions in the field of tourist services: provide them with modern housing and household services. Hotels in Ukraine must have modern quality systems that meet the world level,

which are a powerful means of competition.

At the international level, a number of documents have been developed that need to be implemented into national legislation.

In recent years, our country has adopted a number of laws and regulations aimed at the development of tourism, which directly influence the development and strengthening of the quality of services in the hotel industry.

Development of the hotel industry of the country is inextricably connected with the development of material and technical base, introduction of the advanced service technology, and involvement of highly qualified personnel, which forms the basis for the quality of services.

The quality problem is an important factor in increasing living standards, economic, social and environmental security. This problem affects all areas of activities without exception. Yes, high quality service is one of the main components of the competitiveness of any hotel.

When determining the quality of service, a cluster of features of the service process is specified: functional, technical, aesthetic, sanitary and hygienic, which meet the needs of a person or group of people in accordance with their purpose. In this case, the service quality is considered as a generalized concept, the components of which are the optimal composition of basic and additional services. Saving consumers' time in the process of service, product quality, operational quality of premises for consumers, technical perfection of techniques and methods of the personnel work, observance of rules concerning trade and norms of personnel behavior.

The criterion for the quality of service in hotels is its compliance with the system of requirements arising from the modern level of technology, organization of production and service, industrial relations, moral and legal norms of society, the level of architectural and artistic design, sanitary and hygienic standards, conscientious attitude to work.

Quality as a measure of value primarily reflects the degree of products or services suitability for consumption. The products' and services' ability to meet any need depends on the composition of

useful properties inherent in any product of labor, which allows to distinguish them from each other. The specific feature of the hospitality industry determines the possibility of assessing final results of work and feasibility of the costs incurred immediately after or during consumption, following the manufacture and sale of products. Objectivity in assessing the products and services quality can be achieved only if the criterion for assessing quality is the person himself with his diverse needs, individual taste, which adds some subjectivity to the results.

Conformity of quality to public requirements is fixed by special standards, technical conditions, instructions and other regulatory documents. Real capabilities of enterprises that determine the level of quality are characterized by technological, technical, organizational and economic conditions of production and service. From the point of view of consumers this is the realized quality, which is a measure of products and services conformity to their personal interests, quantitative characteristics of the level of satisfied demand [9].

Services quality in the hotel industry is a complex concept, primarily related to the consumption of two types of benefits (goods and services) and two types of relationships (tangible and intangible). Therefore, it is very important to correctly determine the criteria and indicators of service quality in the hotel business.

Thus, the indicators characterizing the quality of service in hotels can be the following:

- ensuring the fastest accommodation of guests;
- meeting the expectations of customers, meeting their needs;
- provision of the material and technical equipment in rooms that meets the requirements for the hotel of the appropriate category;
- compliance of sanitary and hygienic conditions with high contemporary requirements for a certain category of hotel and room category;
- the necessary qualification of the staff, their knowledge of foreign languages, high culture of communication with clients;
- providing a wide range of additional services;
- use of the latest technologies in customer service;

- providing conditions for recreation and entertainment, taking into account the characteristics of the guests contingent;
- high-quality information support for clients;
- constant support of a high level of service quality in the hotel [10].

The service quality in the hotel industry is a dynamic indicator that is constantly evolving and improving. Its level can differ not only in various hotels, but also in the same hotel, because the service quality is formed under the influence of many factors. Due to this, the hotel must not only strive to achieve a high level of service quality, but also maintain it at the achieved level.

To complete the picture of quality in the hotel industry, it is necessary to determine the potential quality. It has its own quantitative expression for each enterprise and is calculated based on the basis of data concerning the conditions of production and trade.

Estimates of service quality indicators allow to obtain the required volume and objective information for the management of service quality in restaurants.

Indicators of service quality are divided into individual and complex. Single is an indicator that refers to only one of the properties of the organization of the customer service process in the restaurant business [8].

It is impossible to use simple indicator to assess the quality of service, so a set of simple indicators is combined into complex indicators. A complex indicator that relates to several of its properties is called a group. Group indicators are a part of the summary indicator. This is an indicator of service quality, which refers to such a set of properties of the organization of the customer service process, which assesses its quality.

When assessing the service quality, actual quality indicators are compared with the indicators taken as the basis for this comparison. This allows you to establish the degree of perfection of the service process and its suitability to meet the needs of consumers [11].

Service quality is a set of properties arranged in the system according to its structure.

The content of the corresponding system includes comparison of

indicators of the realized and actual quality with the possibilities of the enterprises on manufacturing production and rendering services of a certain quality. If the level of quality, according to consumers, turns to be below potential, it means that the company's capabilities are not utilized full-scale. It is possible that analysis of the causes of disadvantages in the work of service personnel will help to use the reserves and improve the quality of work results.

In case of discrepancies between the assessments of actual and potential quality, the company's management must check the status of control, methods of its implementation, as well as the organization of production and maintenance processes.

The customer service system is part of a single system, which is the activity of the enterprise as a whole.

The main performance indicators of the studied enterprise were analyzed. To increase the competitiveness of the enterprise it is necessary to carry out a number of measures aimed at improving certain aspects of its activities. However, primarily, it is necessary to define purposes and tasks which the enterprise should reach at carrying these actions out (Figure 5.7). It should be taken into account that the main goal is to increase competitiveness by achieving high level of service in the hotel.

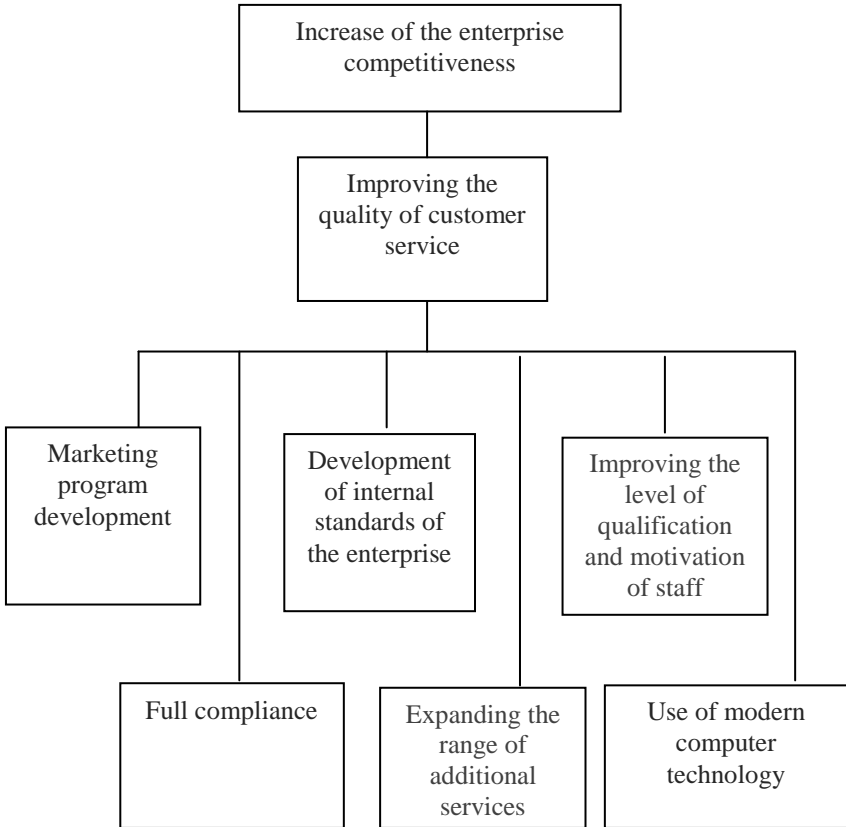
It is possible to achieve this goal by solving the following tasks:

- development and implementation of the hotel marketing program;
- achievement of full compliance with the requirements of the national standard for hotel services;
- development of internal standards of service quality in the hotel;
- expanding the range of additional services;
- increase of the level of qualification and motivation of staff;
- use of modern computer technologies in customer service.

Solution of these problems is possible only with a number of measures.

One of the most important indicators of the quality of service in the hotel is its compliance with the mandatory requirements of the standard for the hotel of the category. To bring the company in full

compliance with the category, first, it is necessary to improve the material and technical facilities of the hotel (equipment of rooms and other premises, equipment, furniture, inventory), as well as to improve the skills of staff [12].



**Figure 5.7 Tree of goals for the improvement of the quality of customer service**

However, in order to help the company take a worthy place in the market of hotel enterprises, it is necessary not only to bring the hotel in full compliance with the mandatory requirements of the national

standard of Ukraine, but also to develop its internal standard of customer service. The most important way to improve service quality is to set service standards and goals, and then train staff. The hotel must constantly raise the requirements of the internal standard of service quality and be sure to comply with them. The internal standard of the enterprise is not a mandatory standard, but the development and implementation of its requirements will allow the hotel to gain an advantage over competitors in the eyes of customers, as well as to improve its image. The internal standard contains higher requirements compared to the mandatory standard. The hotel must become an enterprise in which customers are guaranteed high quality service and these warranty obligations must be honored [9].

Internal standards may include requirements that are mandatory for higher category hotels.

One of the most important factors influencing the level of service quality in a hotel business is the provision of a wide range of additional services that can meet the basic needs of customers (both the quality of their provision and range).

The range of additional services in the studied hotel is insufficient. Therefore, it is proposed to develop new services and focus mainly on business people.

Focusing on business people, it is necessary to organize a modern conference hall, specially equipped for conferences, seminars, symposia and other business and cultural events of various organizations. Halls for conferences and other business events – a common service in many foreign hotels, though not common in our country. Conferences are sometimes held in hotels, but the demand for them is still low. One of the main reasons for this is that the hotel does not have necessary conditions for such events. Conferences are usually held in the restaurant hall. However, the restaurant is more suitable for a banquet after the conference than for the conference itself.

The other proposal is to expand the range of additional services. Particular attention should be paid to the services of the business center, which are in great demand.

These services may include the following:



- use of computer (independently or with the participation of service personnel);
- work on the Internet, sending e-mail;
- typing and printing documents on a computer;
- scanning and processing of documents;
- copying works;
- sending faxes;
- services of a secretary, stenographers;
- translator services (including dubbing);
- messenger services.

To organize a business center in the hotel will need to allocate space (you can use rooms that for various reasons have a low occupancy rate, adapt them to the business center, buy the necessary equipment: computers, laser printer, copier, fax modems (for working on the Internet and sending faxes), etc.

Mainly hotel staff will serve the business center. To work with the computer equipment, it is necessary to introduce a PC operator in the hotel staff, who will monitor the operation of computers, as well as perform scanning, send e-mails and faxes, help customers when working on the Internet. A freelance programmer will perform computer maintenance. Translators should not be introduced to the hotel staff. It is necessary to conclude cooperation agreements with several translators who are fluent in the most common foreign languages (English, German, French, Italian and other languages) and when you receive an order from the client, you call them to work. Payment for labor, as experience shows, is a certain percentage of each completed customer order. For the hotel, this form of cooperation is more profitable than retaining an entire staff of translators and paying them a fixed salary, regardless of their orders. When you receive orders for typing, your transcriber will have the same form of collaboration as with printers as with translators.

If services of the business center will be in constant growing demand, then, if necessary, in the future the hotel staff can introduce additional staff to service it.

Not only hotel guests can use the business center, but also organizations can rent rooms for offices, organizations can hold conferences and other events at the hotel, as well as persons who have nothing to do with the hotel.

At the request of the consumer, it is possible to organize delivery of fresh newspapers, magazines, etc. to a guest room.

In the enterprise under research, it is also necessary to create conditions for the organization of leisure of clients. To do this, it is proposed to open a billiard room in the hotel, to install satellite TV in the rooms with the increased comfort.

The measures proposed in this study to expand the range of additional services require financial costs that can currently be financed by the hotel.

Personnel is the most valuable resource of any enterprise. Most hotels in Ukraine lack qualified staff among the employees who directly serve customers, marketing services and other specialties. Not all employees at the hotel have an appropriate education and qualifications sufficient to provide customers with high quality services. However, to achieve a high level of service quality, it is necessary for staff to be able to provide services included in the price of the service [8].

Continuous training of staff is a condition for a high level of service. Training is done best in the form of training with consultants.

Trainings are a very popular and effective form of staff training for any company. They are conducted by the qualified specialists in the field of business and psychology directly at the enterprises. Trainings help employees to better understand their responsibilities, teach how to behave in various difficult situations, help to change their attitude to work, acquire new useful skills, solve problems and issues facing them. Targeted training programs together with an effective system of employee incentives must lead to the increased productivity, sales of services and improve the service quality provided to hotel guests [12].

To conduct training in the hotel, consultants must develop a special program, which should be agreed with the company's

management, and approved.

Employees working at the reception and service, and the other staff, including the hotel management and its structural subdivisions, should both improve their professional skills and change their attitude to work.

It would be desirable for hotel employees to conduct trainings on the problems of hotel business in a market economy, on the orientation of employees to the service quality, on the introduction of computer technology in a hotel, psychological training.

Managers of hotels and departments should regularly participate in various seminars concerning the problems of the hotel industry, in specialized exhibitions.

An effective form of staff training is conducting seminars by hotel specialists, which would consider the main problems facing the hotel and would develop proposals for their solution. Such events will show the involvement of all employees in the management of the hotel, and mourning for the results of their activities.

The hotel staff is obliged to be friendly to customers and willing to solve all their problems. To make the staff strive to perform their work well, it is necessary to stimulate it effectively. Employees who provide quality services should be rewarded for it. For example, you can enter special tangible and intangible rewards for the service quality.

The hotel cannot stand aside the project on creating a network of star hotels in Ukraine. It is necessary to create a national hotel chain, but it is a very time-consuming process associated with the organization of reservations, the introduction of quality standards, training, and working out the program of a regular guest. In addition, a centralized online supply program is being developed in order to reduce material costs.

Thus, the prospects for creating an effective quality management system will allow to provide competitive hotel services.

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**TECHNOLOGY OF  
DRIED FOOD  
PRODUCTS AND  
FOOD PRODUCTS  
USING IT:  
EVALUATION OF  
EFFICIENCY AND  
IMPLEMENTATION  
PROSPECTS**

**Introduction.** The current stage of development of the national economy indicates the growing role of scientific developments in

ensuring the effective functioning of enterprises, including food producers. The introduction of science-intensive technologies leads to the expansion of existing and creation of new markets and increase production, which ensures the competitiveness of innovative enterprises. Given the place of food industry enterprises in the technological chain, the production of science-intensive food products has a positive impact on the development of food enterprises and other economic activities, stimulating research and investment in related sectors of the economy.

Food industry enterprises belong to the group of the most innovatively active enterprises with significant production volumes. According to the State Statistics Service of Ukraine during 2015-2019 in the total number of innovatively active enterprises by type of economic activity, the share of innovatively active enterprises of the food industry was 16.8...24.6 % [1-4]. One of the promising areas of food production in Ukraine is the production of dried products. Drying is the most natural among other ways of preserving products. According to published data, the volume of the market of the dried product grows annually by 10.0...15.0 % [5], the price of dried products is almost 10 times higher than fresh or frozen [6].

Despite the positive dynamics of production and export of fruits and vegetables during 2018-2019, Ukraine is behind the world leaders in sales of dried products [7, 8].

One of the factors of low growth rates of dried products production and the lack of significant investments in the development of this segment of food production is the low functional and technological potential of existing technologies for drying food products. Based on the results of generalization of the scientific literature on technologies for obtaining dried vegetables, meat, dietary supplements antianemic direction, it is concluded that existing developments are energy-intensive and require special equipment both during drying and storage of dried products [9].

Taking this into account, the team of scientists of National University of Food Technologies (Ukraine) and Kharkiv State University of Food and Trade (Ukraine) set and solved the task of developing DFP technology using mixed heat supply drying (MHS-

drying) and substantiation of dried products production using specified technology.

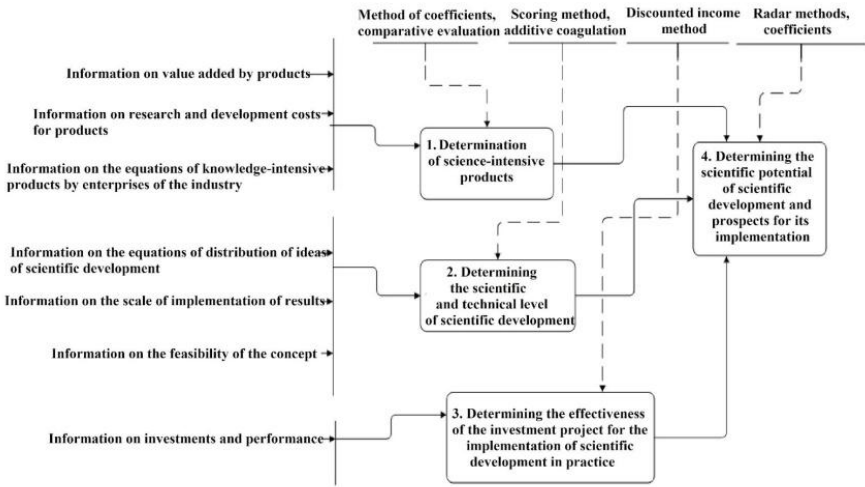
The introduction of scientific developments in the practice of activity actualizes the problem of evaluating their effectiveness in the early stages of development of the innovation process, which determines the features of technology transfer and affects the prospects for their commercialization. For technologies in the field of food production, such an assessment is carried out mainly based on qualitative methods for the price and consumer properties of new products, which ultimately makes it possible to determine its competitiveness compared to similar products.

However, the quality and price characteristics of new food products is only one aspect of the implementation of the developed food technology. Therefore, it is important to substantiate the scientific and methodological foundations of a comprehensive assessment of food technology.

The purpose and objectives of the study. The purpose of the study is to assess the effectiveness and prospects of implementation of the developed technology of dried food products using the use of drying with mixed heat in the practice of economic activity of food industry enterprises. To achieve this goal, scientific and methodological tools are substantiated and a comprehensive assessment of the technology of dried food products using drying with mixed heat supply.

**Research methods.** To evaluate the developed technology of dried products, the method of multicriteria evaluation is used, which is based on the methods of coefficients, comparative, point evaluation, additive convolution, discounted income, radar method.

The level of potential of scientific development is determined by taking into account the criteria of science-intensive products, scientific and technical efficiency, and investment attractiveness of the implementation of the developed technology in practice. Taking into account the experience in evaluating the effectiveness of scientific developments given in the publications [10-14], the potential of dried food technology when using drying with mixed heat supply (MHS-drying) was evaluated. The sequence of calculations is shown in Figure 5.8.



**Figure 5.8 The sequence of assessing the potential of the technology of dried food products using drying with mixed heat supply**

Estimation of the knowledge intensity of food products.

One of the criteria that determines the prospects of scientific development is the science-intensive products, the level and methodological principles of calculation of which depend on the stage of research (R&D).

Given the cyclical process of research, the stage of development of new technology, characterized by a high level of R&D costs, is replaced by its introduction into production, accompanied by a restructuring of the production complex with subsequent changes in cost characteristics of products.

Given this, the knowledge intensity of the product is determined by certain coefficients, which are calculated taking into account the cost of research, price, profit, value-added per 1 kg of product [13, 14]. The key characteristic during the calculations is the cost of research and development, the value of which relative to the price of the product reflects the level of its knowledge intensity.



Product intensity – a characteristic that reflects the level of research and development costs in the price of products. To determine the knowledge intensity of products, the coefficient of science intensity of products ( $K_{HI}$ ) is used, which is calculated by the formula:

$$K_{HI} = \frac{B_{\Delta P}}{U_{\Pi}} \times 100, \quad (5.1)$$

where:  $K_{HI}$  – coefficient of knowledge intensity of products;

$B_{\Delta P}$  – research and development costs, UAH / t;

$U_{\Pi}$  – product price, UAH / t.

The higher the calculated coefficient of the knowledge intensity of products compared to its average value for enterprises of a certain type of economic activity, the higher the quality of innovative development; probability of obtaining products with a high level of added value; investment attractiveness of scientific development. Exceeding the calculated coefficient of the knowledge intensity of its average value for enterprises of a certain type of economic activity indicates an average high level of the knowledge intensity of the i-th product.

Comparison of the coefficient of the knowledge intensity of the i-th product with its average value for enterprises of a certain type of economic activity allows determining the level of science intensity of products. The conclusion on the results of the ratio of these coefficients is as follows: if the coefficient of the knowledge intensity of the i-th product is greater than its average value for enterprises of a certain type of economic activity is diagnosed high, if less – low, if it corresponds to the average value – the average level of science.

Determining the scientific and technical level of scientific development. To determine the scientific and technical level of scientific development, the coefficient of scientific and technical

efficiency is used, which is calculated using the method of coefficients and scoring, taking into account the level of distribution, scale of implementation, and feasibility of the scientific concept presented in [11, 12]. Conditions for assessing the scientific and technical level of scientific development are given in Table 5.8.

Table 5.8

**Conditions for assessing the scientific and technical level of scientific development**

Indicator	Conditions for evaluation		
	1 point	2 point	3 point
The level of dissemination of ideas of scientific development	Theoretical calculations are simple, the experiment was not performed	Low complexity of calculations, verification on a small amount of experimental data	Performing complex theoretical calculations, testing on a large amount of experimental data
The scale of implementation of the results of scientific development	Certain enterprises	Industry, region	World, national economy
Feasibility concept	The concept is confirmed by expert opinions	The concept is confirmed by calculations	The concept is tested in practice

Source: compiled on the basis of [11; 12, p. 11, 13-14]

The formula for calculating the coefficient of scientific and technical efficiency is as follows:

$$K_{HTP} = \frac{\sum_{i=1}^3 B_{\phi i}}{\sum_{i=1}^3 B_{\max i}}, \tag{5.2}$$

where:  $K_{HTP}$  – indicator of scientific and technical efficiency of development, coefficient;

$B_{\phi i}$  – assessment of scientific and technical level of scientific development on the  $i$ -th indicator, actual, score;

$B_{maxi}$  – assessment of scientific and technical level of scientific development on the  $i$ -th indicator, maximum, point.

The conclusion on the results of the calculation of the coefficient is as follows: if the values of the coefficient are in the range from 0 to 0.33 diagnosed low, from 0.34 to 0.66 – medium, from 0.67 to 1.0 – high levels of scientific and technical effectiveness of scientific development.

Determining the effectiveness of the investment project for the implementation of scientific development in practice. To assess the effectiveness of the investment project to implement research into practice, the indicators of reduced income and payback period are used. Formulas (5.3) and (5.4) are used to determine the net present value:

$$NPV = \sum \frac{P_t}{(1+r)^t} - I \quad (5.3)$$

$$NPV = \sum_{t=1}^n \frac{P_t}{(1+r)^t} - \sum_{j=1}^m \frac{I}{(1+i)^j} \quad (5.4)$$

where:  $NPV$  – net present income, UAH;

$P_t$  – net cash flow by years, UAH;

$r$  – discount rate, in shares;

$t$  – duration of the settlement period;

$I$  – invested funds, UAH;

$j$  – term of investment of financial resources;

$i$  – projected average inflation.

If the investment project provides a one-time investment to determine the net present value of the formula (5.3) if the investment

project involves a consistent investment for several years – formula (5.4).

The criterion for evaluating the effectiveness of the implementation of scientific development in practice is the indicator of the payback period, the formula for determining which is:

$$PP = \frac{I}{PII}, \quad (5.5)$$

where:  $PII$  – the average annual amount of net cash flow for the period of operation project, UAH.

Based on the recommendations for assessing the potential of scientific development as an object of commercialization [11] to assess the effectiveness of the implementation of scientific development in practice, the following conditions are met: if the payback period of investment in the project, from 3 to 5 years – average, from 5 years and lower levels of efficiency of introduction of scientific development in the practice of activity.

Determining the potential of scientific development and prospects for its implementation. To determine the potential of scientific development, the radar method was used [15, pp. 184-185]. The essence of this method is to divide the circle into sectors, the number of which corresponds to the number of indicators that reflect the knowledge, scientific and technical level, and effectiveness of the implementation of scientific developments in practice (Table 5.9).

The formula for calculating the area of the figure is as follows:

$$Sp = \frac{1}{2} \sin \alpha \sum_{k=1}^n P_k \times P_{k+1}, \quad (5.6)$$

where:  $Sp$  – potential for scientific development, actual, score;

$P_k, P_{k+1}$  – vector for related indicators on science intensity, scientific and technical level and efficiency of implementation of scientific developments in practice, score;

$\alpha$  – the angle between two adjacent values of the potential vectors;

$n$  – number of evaluation indicators.

Table 5.9

**Criteria and indicators for a comprehensive assessment of the potential of scientific developments and prospects for their implementation in practice**

Criterion	Indicator
Science-intensive products	Coefficient knowledge intensity of products
Scientific and technical level of scientific development	The level of dissemination of ideas of scientific development
	The scale of implementation the results of scientific development
	Feasibility concept
The effectiveness of the investment project to implement research into practice	Payback period of investments in the project on introduction of scientific development into practice

The level of research development potential is determined by comparing the area of the radar  $S_p$  and the estimation circle:

$$K_p = S_p \div S, \quad (5.7)$$

$$S = \pi R^2, \quad (5.8)$$

$$h = \frac{K_{\max} - K_{\min}}{3}, \quad (5.9)$$

where:  $K_p$  – integrated indicator of scientific development potential, coefficient;

$K_{\max}$ ,  $K_{\min}$  – maximum and minimum value of the integrated indicator of the potential of scientific development, coefficient;

$S$  – the area of the assessment circle within which the radar is built, units;

$R$  – radius of the evaluation circle, units.

As qualitative characteristics of unit indicators were used to characterize the potential of scientific development, the following scale was used to transition from linguistic to quantitative assessment: high value of the indicator corresponds to 3, medium – 2, low – 1 units. Since the radius is taken at the level of 3 units, the area of the evaluation circle will be 28.26 square meters. units; the maximum area of the figure within the evaluation circle – 21.4 square meters. units, minimum – 2.4 square meters. units; the maximum and minimum value of the integrated indicator of the potential of scientific development – 0.76 and 0.08, respectively. In this case, the scale for identifying the potential of scientific development will be as follows (Table 5.10).

*Table 5.10*

**Scale of distribution of values of the integrated indicator to identify the level of potential of scientific development and prospects for its implementation**

The value of the integral indicator, $K_p$	Conclusion
[0,08 ; 0,30]	low level of potential of scientific development, which leads to insignificant prospects for its implementation
[0,31; 0,53]	the average level of potential of scientific development, which determines the average prospects for its implementation
[0,54; 0,76]	high level of potential of scientific development, which determines significant prospects for its implementation

**Research results.** Evaluation of dried food technology according to the criteria of food science, scientific and technical level, and efficiency of the investment project to implement scientific development in practice allowed to conclude about the high level of efficiency of the developed technology and significant prospects for its implementation in the food industry. The calculations were made using the information on the production and sale of dried products, which includes dried foods from cabbage, zucchini, Jerusalem artichokes, carrots, as well as dried meat products (DMP) and dietary supplements Redgam (DD “Redgem”).

According to calculations, the knowledge intensity of dried food products produced by the developed technologies is determined at the level of 1.11...1.18 %, which, according to Eurostat data, 1.5...2.5 times higher than similar characteristics by industry in Ukraine (0.48...0.75 %) [1-4] (Table 5.11).

*Table 5.11*

**Indicators of knowledge intensity of dried food products using the developed technologies**

Product	SRW costs, thousand UAH/t	Product price (excluding VAT), thousand UAH/t	Product consumption, %
DFP: of cabbage	0,85	74,80	1,14
of zucchini	0,85	72,65	1,17
of Jerusalem artichoke	0,85	71,90	1,18
of carrots	0,85	76,05	1,12
DMP	3,16	283,40	1,11
DS "Redham"	1,22	105,80	1,15

The high level of potential of scientific developments is also evidenced by the share of value added in the price of products, the absolute values of which are 1.1...1.7 times higher than the corresponding indicators of the processing industry in Ukraine. It is estimated that the share of value added in the volume of sales of

dried food products produced by the developed technologies is 21.0...27.8 % (Table 5.12).

*Table 5.12*

**The share of value added in the price of dried food products produced by the developed technologies**

Indicator	Sales price product (excluding VAT), thousand UAH/t	The cost of purchasing items of labor and payment for services of third parties, thousand UAH/t	Added value, thousand UAH/t	Share of value added, %
DFP: of cabbage	74,80	55,33	19,47	26,0
of zucchini	72,65	52,45	20,20	27,8
of Jerusalem artichoke	71,90	51,89	20,01	27,8
of carrots	76,05	60,05	16,0	21,0
DMP	283,40	211,44	71,96	25,4
DS "Redham"	105,80	79,77	26,03	24,6

The results of scientific work have a significant potential for use not only in the food industry, but it is also a factor of new technical and organizational solutions in the field of mechanical engineering, production of machinery and equipment for food production, packaging, transport, and warehousing logistics.

Given the increase in value-added at the stages of product creation and promotion to the consumer, the introduction of developed technologies into practice is a prerequisite for the formation of vertically integrated structures of different levels of integration. The multifaceted nature of the results of scientific development determines the objectivity of determining its scientific and technical effectiveness, which is based on assessing the prospects for use, scale, and quality of results [12].



To confirm the scientific and technical effectiveness of the developed technology, objective data on the developed technology of dried food products were used. Thus, as a result of the development of technology of dried food products, the technology of food products of a wide range was improved and adapted with its use for different conditions and capacities of enterprises, which is confirmed by 4 patents of Ukraine for inventions; 7 – on the utility model.

Regulatory documentation has been developed: TUU 15.1-01566330-229:2014 “Dried meat semi-finished product. Specifications”; TU U 15.8-01566330-279: 2012. "Dried vegetable products. Specifications"; TU U 15.1–01566330–226: 2009. "Dietary supplements from the blood of cattle and plant materials. Specifications"; technological maps for food products with DFP. The results of the work were tested, confirmed in production conditions, and implemented in 12 restaurants in Ukraine. In generalized form, the results of the evaluation of the scientific and technical level of scientific development are given in Table 5.13

*Table 5.13*

**The results of the evaluation of scientific and technical level of scientific development**

Indicator	Characteristic	Evaluation of scientific development, point	
		Maximum value	Actual value
The level of dissemination of ideas of scientific development	Performing complex theoretical calculations, testing on a large amount of experimental data	3	3
The scale of implementation of the results of scientific development	Branch	3	2
Feasibility concept	The concept is tested in practice	3	3
Total		9	6
$K_{HTP}$		0,67	

According to calculations, the overall coefficient of scientific and technical effectiveness of scientific development was 0.67 points, which confirms the high potential for further development and commercialization of developed technologies. The maximum values are marked by the characteristics of the dissemination of ideas and feasibility of the concept.

The potential of scientific development is determined in combination with the assessment of its investment attractiveness for implementation in practice. For this purpose, the payback period of the invested funds was used. The calculations were made under the condition of placing the product on the free areas of the functioning enterprise taking into account: the practice of production of dried products [16]; order portfolio; cost and selling prices for products (Table 5.14).

*Table 5.14*

**Information to determine the investment attractiveness of the introduction into production of developed technologies DFP**

Indicator	Units of measurement	Value
Price (excluding VAT)		
DFP: of cabbage	UAH / kg	74,80
of zucchini	UAH / kg	72,65
of Jerusalem artichoke	UAH / kg	71,90
of carrots	UAH / kg	76,05
DMP	UAH / kg	283,40
DS "Redham"	UAH / kg	105,80
The cost of production		
DFP: of cabbage	UAH / kg	59,80
of zucchini	UAH / kg	58,10
of Jerusalem artichoke	UAH / kg	57,55
of carrots	UAH / kg	66,10
DMP	UAH / kg	226,70
DS "Redham"	UAH / kg	84,60
Production volume	t/year	180

Additional investments in fixed assets are determined based on the specification of the required equipment and its market price; current assets – based on the standard and average daily needs for raw materials and supplies.

Economic calculations indicate the possibility of implementing a project for the production of SHP with the developed technologies and its attractiveness to the investor (Table 5.15). According to preliminary estimates, the project requires investments of about UAH 4.5 million. The payback period of the project at different levels of capacity utilization is 2.0...2.5 years, at the average load level – 2.3 years.

Thus, based on the conducted researches the high level of investment potential of the developed technologies of SHP and food products with its use or on its basis turns out that is confirmed by indicators of science intensity of production, scientific and technical efficiency, and investment attractiveness of scientific development.

*Table 5.15*

**The main indicators of the enterprise for the forecast period**

№	Indexes	Years		
		1 year	2 year	3 year
1	Investments, thousand UAH	4500,0	–	–
2	Discounted income, thousand UAH	2214	1932,1	1706,2
3	Absolute return on investment, thousand UAH	-2286,	-353,9	1352,3
4	Payback period, years	2,3		

For the generalized conclusion concerning the potential of scientific development and prospects of its introduction in practice of activity, the integrated indicator defined based on calculation of the relative area of a radar constructed within an estimation circle is calculated. The initial information and results of calculations are given in table 5.16.

Table 5.16

**Integral indicator to identify the level of potential of scientific development and prospects for its implementation**

Criterion	Indicator	Qualitative assessment	Mark
Science-intensive products	Coefficient of knowledge intensity of products	high	3
Scientific and technical level of scientific development	The level of dissemination of ideas for scientific development	high	3
	The scale of implementation the results of scientific development	average	2
	Feasibility concept	high	3
The effectiveness of the investment project to implement research into practice	Payback period of investments in the project on introduction of scientific development into practice	low	3
Evaluation circle		28,3	
Radar area		18,3	
Integral indicator		0,65	

According to calculations, this integrated indicator is 0.65 points, which according to the developed evaluation scale (Table 5.10) indicates a high level of potential of the developed technology of dried food products and significant prospects for its implementation in the practice of the food industry enterprises.

**Conclusions.** The results of the research indicate a high level of innovative potential of the developed technologies. It is established that the introduction of the developed technologies provides a high level of knowledge-intensive products. The knowledge intensity of the production of new dried food products is determined at the level of 1.11...1.18 %, which is 1.5...2.5 times higher than the corresponding indicators for other types of economic activity in Ukraine. Evaluation of scientific and technical effectiveness of the

study shows that the obtained scientific results are of high quality and can be applied in many areas, including the development of new solutions in food technology, production of machinery and equipment for food production, packaging, transport, and warehousing logistics. Based on the calculation of investment costs and their payback period, the investment attractiveness of the project for the production of dried food products using the developed technologies were assessed. The low payback period (up to 3 years) proves the feasibility of the project and its attractiveness to the investor. The high level of potential of the developed technology of dried food products and significant prospects for its implementation in the practice of food industry enterprises have been diagnosed.

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**PRODUCTION FUNCTION AS A  
TOOL OF RESEARCH ON THE  
COMPETITIVENESS OF  
INDUSTRIAL SMALL AND  
MEDIUM ENTERPRISES OF  
UKRAINE: THEORY AND  
PRACTICE**

### **Introduction**

In the conditions of economic globalization and internationalization in the activities of countries it is important to increase the competitiveness of enterprises in world markets. Both functionally and geographically has changed significantly the world market and the nature of competition in all its segments has acquired new global features.

At present, the theory and practice of enterprises management do not fully use all the possibilities of mathematical methods. Thus, at the moment the elements of mathematical modeling of economic processes and phenomena are realized mainly with the help of regression equations, which answers the question “what?” At the same time, the parameters of the equation of the production function additionally answer the questions “how much?”, “to what extent?”, “why?” This is achieved by calculating a system of indicators in which there is a certain economic meaning, which can significantly increase the analytical capabilities of the equation (model).

Problems of competition and ensuring the competitiveness of production were studied by such scientists as D. Ricardo, A. Smith, D. Abel, G. Hamel, P. Drucker, K. Andrews, R. Eschenbach, P. Zenge, F. Kotler, R. Coase, K. Christenson, M. Porter, R. Solow, J. Schumpeter, F. Hayek [1, 2].

The process of diagnosis and assessment of competitiveness of the enterprise occupies an important place in the theory of competitiveness of the enterprise, as the category “competitiveness”

is considered one of the most important objects in the management system of socio-economic entities from enterprise to national economy.

The relativity of category “competitiveness” and its dynamic nature allow us to assess the competitiveness of entity in two ways: in comparison with competitors and in relation to itself.

Most modern methods assessing of competitiveness the enterprise are based mainly on assessments of competitors [1].

At the same time, the dynamics of competitiveness the enterprise relative to itself is of greater value from the point of view of management, as it allows to assess the change of competitive potential the enterprise and the dynamics of efficiency of individual components of the internal environment about the transformation of input resources into competitive market proposals at the output.

SMEs make up the majority of enterprises worldwide and are an important factor in job creation and global economic development. They represent about 90% of enterprises and more than 50% of employees worldwide. Official SMEs contribute up to 40% of national income (GDP) to developing economies.

Peter Drucker explored that small businesses are a major catalyst for economic development. These small enterprises actively contribute to the achievement of main goals any national economy, becoming the basis of socio-economic progress [2].

The role and importance of small and medium enterprises (SMEs) in the Ukrainian economy can be described as follows:

- 1) creation of new jobs and a favorable climate for employees;
- 2) promoting innovation and flexibility;
- 3) combine of production factors that would not otherwise be used in other conditions, such as local resources or by-products of large companies.

## **Methodology**

The key tool that will be used in this study is the production function (PF) of the following modification:  $Y = f(K, L)$ .

It determines the relationship of production Y with the factors of production – capital K and labor L, where the possibility and



limitation of substitution of factors are essential.

PF of the above type is called neoclassical if it satisfies the following conditions, which can be given an economic interpretation:

1) in the absence of one of the resources production is impossible;  
2) an increase in the cost of any of the resources with a constant amount of other leads to an increase production, i.e.  $df / dK > 0$ ,  $df / dL > 0$ ;

3) with an unlimited increase in one of the resources, the production increases indefinitely, i.e.  $f(+\infty, L) = f(K, +\infty) = +\infty$  [3];

4) you can keep volume production constant, replacing some amount of one factor with the additional use of another.

Preliminary data analysis is important not only because it allows to obtain meaningful conclusions before assessing the parameters of PF, but also because it allows you to identify periods which characterized by different behavior of the original data, identify turning points (transition boundaries), i.e. identify the chronology process (which can no longer be done at the stage of parameter identification). Regardless of which economy is modeled (market developed or transitional), the specification of PF must meet some logical, economic and mathematical requirements (arising from the conditions of its construction and use):

1) all values included in the VF must be measured;  
2) product production without the costs of resources is impossible;

3) all resources included in the PF are necessary, in the absence of at least one of them the production is zero;

4) to the arguments of the PF should include all the factors significantly relevant to this production process (the condition is ambiguous);

5) resources to some extent are interchangeable (may be complementary, i.e. included in strictly defined proportions);

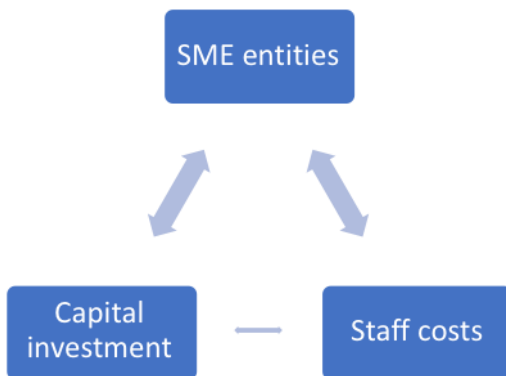
6) all values must have a clear economic meaning;

7) PF should be based on the relevant statistical base;

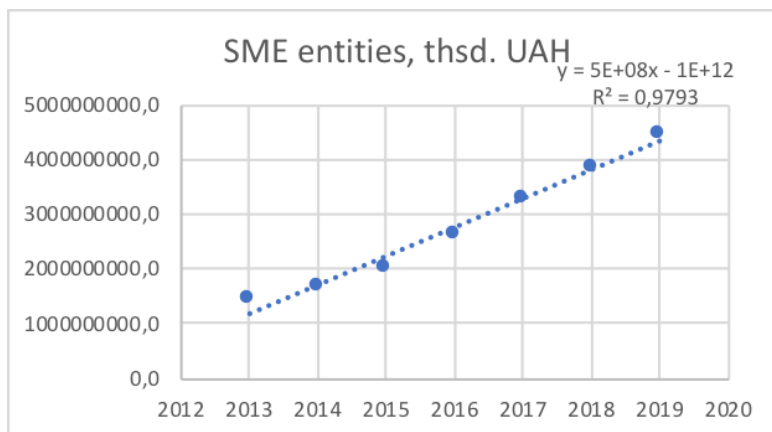
8) PF should be continuous and differentiated.

The basis for the analysis was selected Ukrainian industrial SMEs with available data for 2013-2019.

The first stage of analysis is the assessment of factors introduced into the model – “the number of industrial SMEs”, “Capital investment” and “Staff costs”, which in turn are correlated with the values of Y, K and L in the production function (Figure 5.9).



**Figure 5.9 Scheme “SMEs / Capital investment / staff costs”**

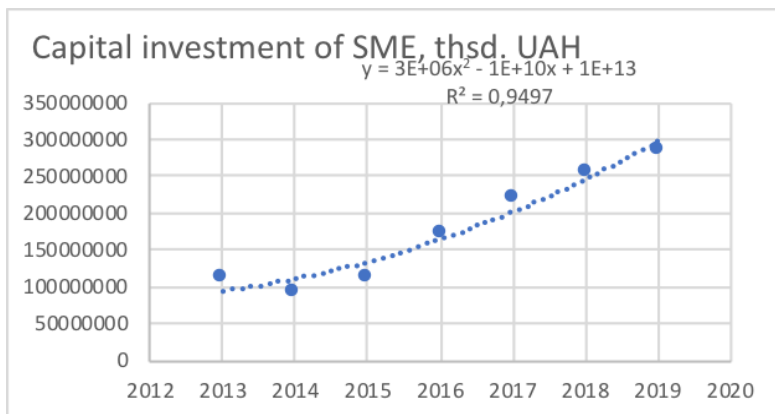


**Figure 5.10 SME entities, 2012-2020, thsd. UAH**

As can be seen from the analysis (Figure 5.10), the growth rate of the number of industrial SMEs in Ukraine has a linear function of

expression ( $y = 5E + 08x - 1E + 12$ ) and a clear upward trend over the study period.

At the same time, capital investments of industrial SMEs are as follows (Figure 5.11).



**Figure 5.11 Capital investment of SMEs, 2012-2020, thsd. UAH**

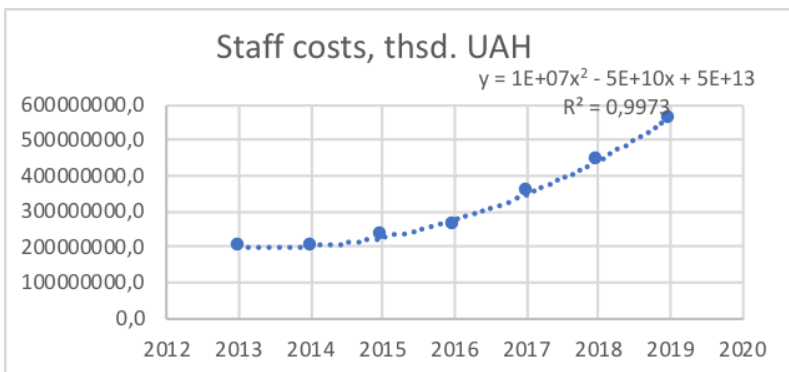
It is worth noting that in 2014 there was the lowest value of investment, which then had a downward trend, which is described by the function  $y = 3E + 06x^2 - 1E + 10x + 1E + 13$ .

The component “labor” in the production function is represented by staff costs (Figure 5.12).

This component of the production function during 2013-2014 had approximately the same values, and then had a clear upward trend, which is described by the function  $y = 1E + 07x^2 - 5E + 10x + 5E + 13$ .

The next stage of the study is to assess the impact of capital and labor on the overall economic effect of activity industrial SMEs in Ukraine, which is expressed through the indicator “Number of registered SMEs”.

For statistical analysis was chosen the period 2013-2019 according to official data of the State Statistics Service.



**Figure 5.12 Staff costs, 2012-2020, thsd. UAH**

The following results of regression analysis were obtained:

**SUMMARY OUTPUT**

<i>Regression Statistics</i>	
Multiple R	0,9909161
R Square	0,98191472
Adjusted R Square	0,97287208
Standard Error	189112150
Observations	7

**ANOVA**

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	2	7,7669E+18	3,8834E+18	108,587166	0,00032708
Residual	4	1,4305E+17	3,5763E+16		
Total	6	7,9099E+18			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>
Intercept	80845393,9	195992021	0,41249329	0,70112813	-463315694
Capital investment	9,50551085	3,81904845	2,48897362	0,06755861	-1,0978675
Staff costs	3,07513913	2,10481329	1,46100328	0,21781104	-2,7687594

Based on the results of the analysis, the following conclusions can be drawn:

1) 98% of the results are explained by factors (Capital investment and Staff costs), which are included in the model;

2) statistically significant impact on the target function (SME entities) has capital investment – with an increase of 9.5 points capital investment will increase by 1 point the value of SME entities.

## **Conclusions**

A comprehensive analysis showed that modern economic processes can be described and analyzed on the example of classical economic paradigms and functions.

The production function despite its simplicity has proven its practicality and applicability at the present stage of functioning of the economic system of Ukraine.

Thus, on the example of functioning industrial SMEs of Ukraine, was proved the relevance of the analysis with the help of production function, and the following practical conclusions were obtained:

1) Ukrainian industrial SMEs are largely dependent on capital investment – an increase in this indicator will allow to obtain higher rates of economic growth in the future;

2) the obtained target functions on key parameters can be used to improve public policy in relevant areas – in particular, support for SMEs and areas / tools for implementing these policies;

3) stimulating of activity SMEs plays an active role in creating new products / sectors and a more competitive economy of Ukraine as a whole.

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## Chapter 6

# USE OF MODERN INFORMATION TECHNOLOGIES AND DIGITALIZATION OF BUSINESS PROCESSES

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## **E-COMMERCE IN THE AGE OF DIGITAL TRANSFORMATION**

Currently, e-commerce is becoming a modern challenge to accelerate the development of the global economy. This requires the introduction of qualitatively new approaches to the strategic management of marketing activities using information technology. This is especially true in the context of the digitalization of business processes in the context of the concept of Industry 4.0.

According to expert estimates, the share of retail sales in the e-commerce market in 2021 will reach 17.5% or 4878 billion dollars. USA. According to a report by The Fashion and Apparel Industry, global revenue from e-commerce will grow in 2018-2022 by 48.2%, or from 481.2 to 712.9 billion dollars USA. The total global revenue from e-commerce in 2022 will be 6.5 trillion dollars USA.

Thus, the problems of transformation of logistics activities with the use of digital technologies [1-7] in the context of intensifying the development of the information environment remain relevant and require further research. And first of all, it concerns clarification of

the conceptual apparatus on problems of development of e-commerce.

Analysis and generalization of scientific literature show that scientists pay considerable attention to:

definition from different scientific points of view of the essence and content of the concepts "electronic business" (D. Chaffey); "e-commerce" (V. Zwass; A. Summer, Gr. Duncan; D. Kozie); "Internet trade"; "Internet commerce"; "E-retail" (M. Hargrave);

improving the customer relationship management system using information technology (G. Balabanis, K. Keller, P. Kotler, A. Payne, V. Souitaris);

practical aspects of application of digital technologies in logistics activity of enterprises and substantiation of scientific and methodical approaches to the estimation of effect from their introduction (A. Amaral, L. Barreto, H. Dzwigol, A. Kwilinski, T. Pereira).

At the same time, the versatility, multifacetedness, and debatability of certain issues on the selected topic necessitate further research. And especially the solution of this problem is actualized in modern conditions of digital transformation of business processes of the enterprises and intensive development of e-commerce owing to COVID-19.

Analysis of the specialized literature shows that there is no single scientific approach to the term "e-commerce". It is established that foreign and domestic researchers identify e-commerce with different terms: e-business, IT-commerce, e-payment service, online commerce, virtual commerce, e-trading, e-marketing, digital marketing, e-transaction, e-commerce retail trade, distance trade.

The categories "e-business" and "e-commerce" emerged in the United States in the 1980s as a result of the development of the ideas of the global information economy. As a rule, scientists and practitioners considered e-business and e-commerce to be synonymous. However, over time, researchers have begun to separate e-commerce from e-business.

According to D. Kozie [8], "... e-commerce began with the sale and transfer of funds through computer networks. But then this concept expanded significantly and included trade in fundamentally

new types of goods, such as information in electronic form. To benefit from the possibilities of e-commerce, it is necessary to understand that the view of it exclusively as business transactions through computer networks is irrevocably obsolete ... E-commerce is based on the structure of traditional commerce, and the use of e-networks gives it flexibility ...”.

As a result of the conducted theoretical analysis and own previous researches on the chosen problems [9-13] various scientific approaches to the definition of essence and maintenance of concept "electronic commerce" are generalized (Table 6.1).

Scientists and experts under this definition, as a rule, understand:

- economic activity, for the implementation of which information and communication technologies and networks are used, which allow enterprises to receive income;

- economic activity, as a result of which ICT and networks play an important role in the implementation of key processes (consumption, exchange, distribution, production);

- activities that create added value through ICT;

- the interaction of a set of economic entities in the sales process using network technologies;

- electronic interaction between business entities using Internet technologies;

- purchase and sale of goods and services via the Internet for direct profit;

- a set of operations between the company and contractors, which are carried out using information technology to optimize costs and increase the efficiency of business processes;

- commercial interaction of business entities on the purchase and sale of goods and services using information networks;

- sale or purchase of goods/services through electronic transactions made via the Internet or other computer networks;

- activities that are focused on making a profit as a result of transactions and transactions on the Internet;

- one of the modern forms of organization and implementation of economic activity, the distinctive feature of which is the use of public information systems and computer networks integrated into



the Internet;

*Table 6.1*

**Systematization of scientific approaches to formulation  
the term "e-commerce"**

Group	Components
Element of e-business	<ul style="list-style-type: none"> <li>• type of entrepreneurship;</li> <li>• a form of business process;</li> <li>• a component of e-business;</li> <li>• business activity</li> </ul>
Type of activity	<ul style="list-style-type: none"> <li>• commercial activity;</li> <li>• type of electronic commercial activity;</li> <li>• type of economic activity;</li> <li>• economic activity;</li> <li>• modern form of organization and implementation of economic activity</li> </ul>
Type of trade	<ul style="list-style-type: none"> <li>• a specific type of trade;</li> <li>• a form of trade through ICT;</li> <li>• a form of supply of products through computer networks</li> </ul>
Form of electronic relations	<ul style="list-style-type: none"> <li>• electronic interaction of economic entities;</li> <li>• a set of rules for electronic relations in the sale of goods;</li> <li>• the technology of commercial transactions;</li> <li>• type of public relations for the sale of goods;</li> <li>• commercial interaction of business entities in the process of buying and selling;</li> <li>• the relationship between economic entities</li> </ul>
Agreement	<ul style="list-style-type: none"> <li>• purchase and sale of goods via the Internet;</li> <li>• electronic commercial agreement;</li> <li>• a form of business transactions by electronic means</li> </ul>
Type of electronic transaction	<ul style="list-style-type: none"> <li>• electronic transaction in the process of selling or buying goods;</li> <li>• a system of non-cash payments</li> </ul>
Strategy	<ul style="list-style-type: none"> <li>• marketing strategy</li> </ul>

- type of economic activity, where the object of the action is trade, purchase, and sale of goods, customer service via the Internet;
- a set of rules governing the implementation of electronic relations in the execution of contracts of sale of goods;

- commercial activities related to the Internet;
- a process that is mediated through a network of interconnected computers;
- a transaction using electronic media or computer networks;
- a set of interactive methods of conducting activities to provide consumers with goods and services;
- activities covering all types of electronic transactions between enterprises and stakeholders.

On the basis of methods of groupings and classifications, the theoretical approaches to the interpretation of e-commerce which are offered by various scientific schools are conditionally systematized. As a result of generalization of existing scientific developments in the conceptual apparatus and analysis of its compliance with modern conditions of enterprises, the author's approach to the definition of the term "e-commerce" is given, which is considered as:

- component of e-business, the essence of which is to achieve partnerships in the process of buying and selling products using digital technologies and information systems;
- an effective form of organization of logistics activities of enterprises with the use of information and communication technologies and systems;
- a tool for promoting products on the market using digital technologies.

In 2019, online sales in Europe grew by 14.2% to 636 billion euros. 2020 saw an increase of 12.7% and an annual turnover of 717 billion euros. Western Europe accounts for 70% of the e-commerce market and 83% of online shoppers in the region. However, the greatest growth is observed in Eastern Europe.

E-commerce markets in Romania and Bulgaria grew by 30% last year, the highest growth rate in all of Europe. They are also the two countries with the lowest share of online shoppers – 31% and 29%, respectively.

Spain also shows good market development with 29% growth last year. The lowest growth is observed in Belgium (7%), Ireland (7%), Austria (4%), Iceland (3%). The UK has the largest share of online shoppers (94%). It is followed by Denmark (86%), Germany, the

Netherlands, and Sweden (84% each).

In the Netherlands, consumers prefer to shop on internal sites (95%). This trend is also noticeable in Poland (94%). In Malta and Cyprus, online shoppers mostly (96% and 95%) shop from overseas online stores.

Internet commerce in Bulgaria is gaining more and more market share and continues to increase its profits. The volume of online trading in Bulgaria in 2019 reached 1.750 billion leva. This is the highest result compared to previous years. In 2019, compared to 2018, the market growth is 30%. Growth in Europe in 2019, compared to 2018, in the e-commerce market is several times less and amounted to less than 14%.

According to the Bulgarian Association of Electronic Commerce, the most purchased online goods are sportswear and footwear. These are mainly household goods, toys, furniture, food, drinks, and various consumer goods.

In recent years, there has been a trend towards an increase in the growth of online sales of travel services, airline tickets, etc.

The report shows that urbanites are leading the rankings with 22% growth over the past 2 years, with villages accounting for almost 18% of sales.

The majority of consumers (88%) shop at Bulgarian online stores, 35% at online stores in the EU, and only 17.2% at non-EU stores.

One clarification is needed here – many online stores that offer products on Bulgarian websites and for Bulgarian consumers are actually based abroad – mainly in Romania and Central European countries. The Association expects continued growth in 2021. The number of e-shops will also increase.

The lockdown due to the COVID 2020 pandemic led to a boom in e-commerce, which was already growing steadily. In some areas, switching to online trading is the only way to keep a business. In others, it is an opportunity to reach an additional target audience. In 2022, online trading revenue is expected to be 6.54 trillion dollars USA (up from 3.53 trillion dollars in 2019) (Figure 6.1).

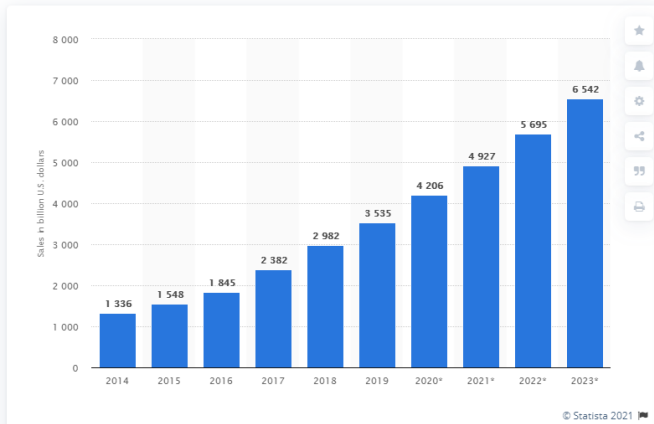
The mobile e-commerce sales niche is projected to reach 73% by the end of 2021. Of these, 30% of customers are likely to abandon

checkout if they find that the site is not optimized for mobile use (Figure 6.2).

E-Commerce > B2C E-Commerce

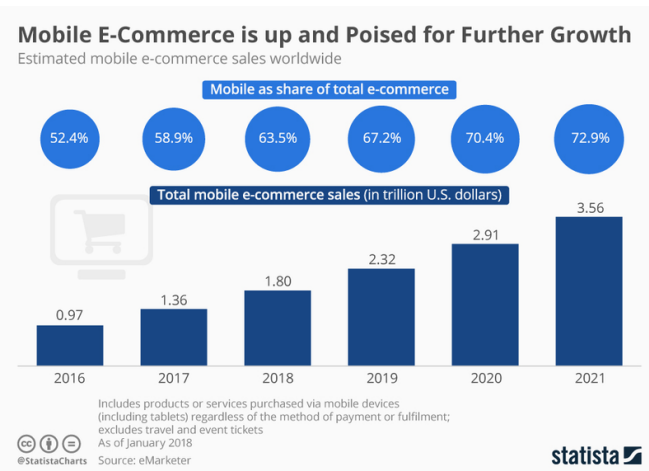
### Retail e-commerce sales worldwide from 2014 to 2023

(in billion U.S. dollars)



**Figure 6.1 Retail e-commerce sales worldwide**

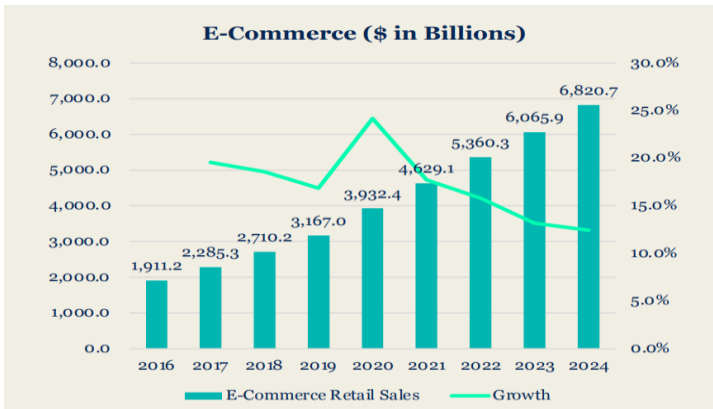
Source: Statista



**Figure 6.2 Mobile E-commerce**

Source: Statista

Group M predicts more modest results and notes that the growth rate of e-commerce (Figure 6.3).



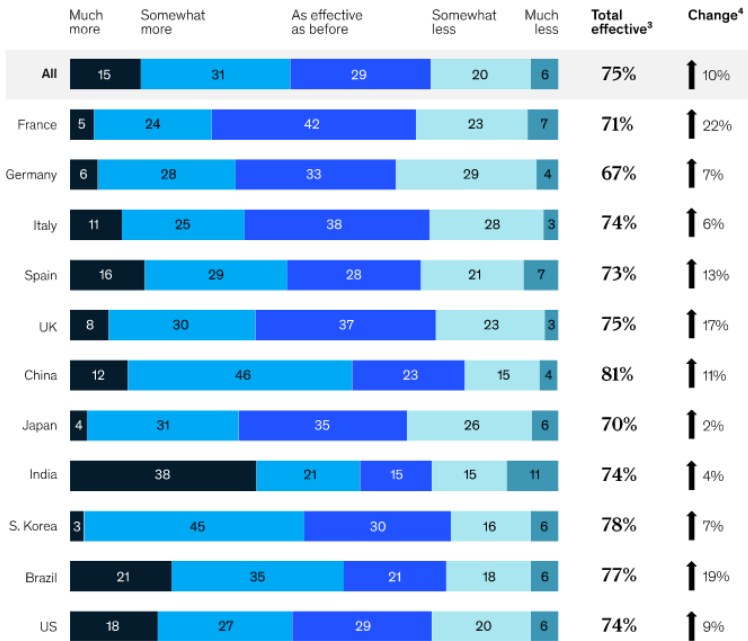
**Figure 6.3 E-commerce Retail Sales**

*Source: Group M.*

However, the report says that the share of e-commerce in the retail turnover of the entire planet will reach 25% by 2024, and by 2027 the e-commerce industry will sell goods and services worth 10 trillion dollars USA. China has already become the main beneficiary in the segment, and in 2021 the share of e-commerce in the country will reach 27.3%.

Dynamic Web predicts that there are several major trends in e-commerce. Digital transformation will continue around the world. McKinsey & Co. cites data for different countries, demonstrating the effectiveness of a new sales channel for companies (Figure 6.4).

Marketplaces will continue to gain popularity. They are easy to reach for businesses not yet familiar with digital aspects, and buyers prefer to find everything they need in one place. But not only giants will attract business – there are many undervalued sites that will receive their development in 2021. Personalization will evolve in the battle for the buyer. This approach is pushing nearly half of customers (48%) to spend more.



**Figure 6.4 Effectiveness of new sales channels around the world**  
*Source: McKinsey & Co.*

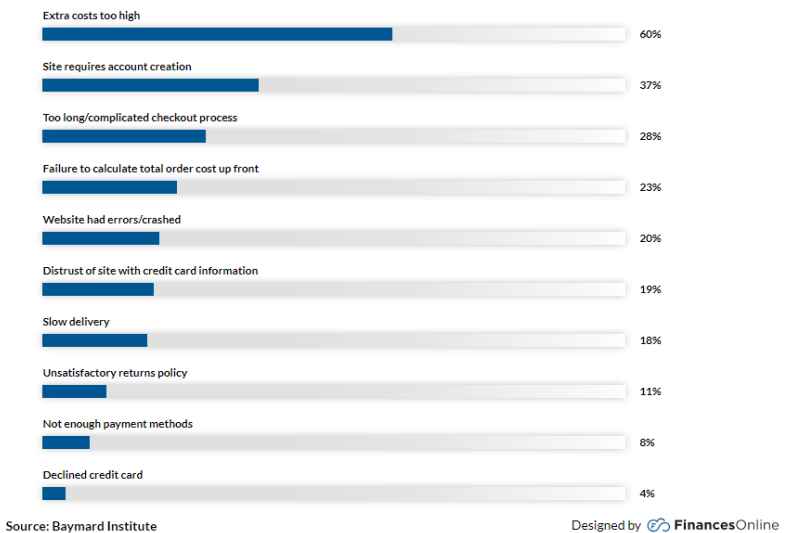
And in the digital world, it cannot exist without data collection. Direct sales to consumers, gamification, discounts in exchange for filling out a questionnaire are all ways to get exactly the information you need for a personalized experience.

Social commerce will become a serious sales channel. And this is not about the fact that the user is redirected from the social network to the shopping site, but about the fact that he makes a deal directly on the pages of Facebook, Instagram, or Pinterest. But this does not mean that you do not need to attract customers to your selling site through social networks, it should be remembered that consumers want maximum simplicity when making a transaction.

Voice commerce will allow you to get closer to the buyer. Smart gadgets are gradually entering the lives of consumers, simplifying

the buying process. Businesses have to optimize such contacts. Earlier, Gartner predicted that in 2020 50% of companies will use chatbots for voice communication with customers. In 2021, there will be even more such enterprises.

Shopify is adding a few more trends to this. Order fulfillment will become an important competitive factor. The consumer expects fast, high-quality, and inexpensive delivery. And for this, you need to optimize fulfillment as much as possible: place warehouses as close to customers as possible, offer flexible delivery and return options. FinancesOnline notes in its forecast that additional shipping costs are the most common reason for abandoning a purchase (Figure 6.5).

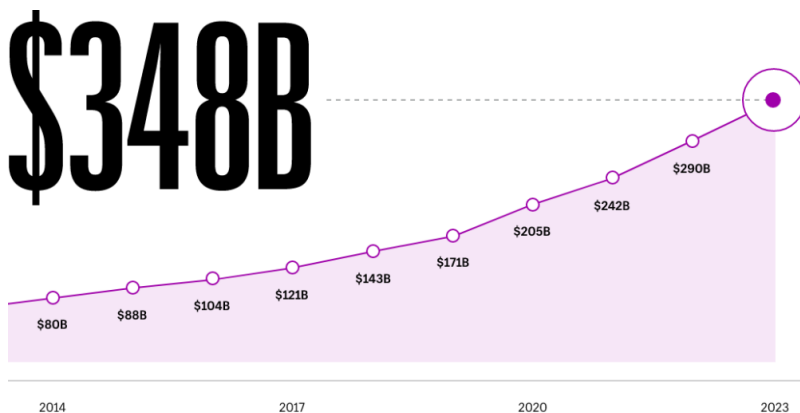


## F

### Figure 6.5 Reasons for refusing online purchases, %

*Source: Baymard Institute.*

Refunds are becoming an e-commerce scourge. In 2020, they cost entrepreneurs 205 billion dollars USA. It is assumed that by 2023 the amount of annual damage will reach 348 billion dollars USA (Figure 6.6).



**Figure 6.6 The amount of annual damage from the return of products**

*Source: FinancesOnline.*

Customer retention is becoming a priority against the background of the cost of attracting them. Loyalty programs, subscription sales models, and audience segmentation are the tricks that businesses will increasingly use to keep customers from leaving their competitors.

According to FinancesOnline, the growth rate of sales through mobile devices will decrease. The main reason here is saturation. Already, most online orders are made from smartphones.

Thus, the key trends in the development of e-commerce are:

- online trading will continue to grow steadily;
- mobile shopping will continue to gradually replace desktops;
- social networks – the new elevator for trading;
- voice commerce or “Ok Google, I want to buy ...”;
- instant delivery is not just a nice bonus, but a competitive advantage;
- multichannel sales to increase audience reach and increase conversions;
- visual Commerce – The New Minimum Plan for Online Platforms;
- AR is becoming the new e-commerce reality;
- new payment options for greater security and convenience;



– ecology and “green” consumption shape consumer preferences.

E-commerce is developing steadily and will exceed offline sales in the future. To follow the leaders, it is worth targeting mobile customers, introducing new technologies and personalizing the site for the needs of the target audience.

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**CHINA MULTIMODAL  
TRANSPORTATION STRATEGIC  
CHALLENGES OF  
INTERNATIONAL NETWORK  
DEVELOPMENT ISSUES**

## **Introduction**

With the continuous improvement on transportation infrastructure, China's transportation system has entered a new period calling for the integration and cooperation of different transport modes, in order to promote the overall efficiency of transport service, which is of positive significance to transport green and low-carbon development and improve the modern integrated transportation system [1]. It is believed that multimodal transport can provide cargo freight transport service throughout the whole process. And by seamless and integrated operation, multimodal transport contributes to reduce logistics cost and increase management efficiency. Multimodal transport not only has the great influence on logistics and transportation, but also affects the economic spatial layout, the economic operation efficiency, the business environment of trade facilitation, and the openness of a country's inland market [2]. The multimodal transport system connects the international and domestic markets, supporting the international economic and trade cooperation. Although multimodal transport started late in China compared with some developed countries, and it is still not developed enough, the Internet has brought a late-comer advantage to China's multimodal transport. The interconnection of resources of all parties is an important prerequisite for the development of multimodal transport [3]. China government has issued a number of policies to promote the information exchange between and among different modes of transport and the construction of multimodal transport information platform. In the background of the national economic development, especially the supply-side structural reform, the new and old driving energy conversion, the industrial

transformation and upgrading and the adjustment of the freight structures, the multimodal transport began to show an upward trend. Multimodal transport plays an important supporting and leading role in the change of dynamic mechanism. Particularly in the chain management and service, multimodal transport not only connects production and consumption closely, but also joins China and the world intensely, breaking the traditional pattern of piece and low-efficient connections in the past. It is effective, by reforming the multimodal transport services, to guide the demand release which has the features of the transformation of old and new functions and reflects the supply-side structural reform.

In recent years, the development of China's economy has put forward higher requirements for the transportation industry. A single mode of transportation is increasingly unable to meet customers' low-cost, high-efficiency transportation requirements. Multimodal transport is an organic combination of two or more modes of transport. It captures and integrates the advantages of various modes of transportation and is an advanced mode of transportation. With the rapid development of China's multimodal transport, there are higher requirements for logistics stations. Advanced logistics stations can not only fully utilize the multimodal transport efficiency of different modes of transportation, reduce transportation costs, but also help achieve the goal of standardized and integrated transportation of multimodal transport. Therefore, in the period of vigorous development of container multimodal transport in the country, the improvement and optimization of logistics stations are becoming more and more important [4].

### **Analysis of strategic development network solutions process of multimodal transport**

**Influence on intermodal transport** In recent years, with the rise of a new generation of information technology in which the Internet of Things, big data, cloud computing and mobile internet act as the representatives, a group of vehicle cargo matching platform enterprises have emerged [10]. These enterprises are characterized by “extensive interconnection of online information, optimal

configuration of offline resources, online and offline collaborative linkage”. The development of these enterprises remakes the organization mode of logistics, expands the service fields and advances the new pattern of profit, which has a positive significance for the development of multimodal transport in China [11]. Firstly, it helps to improve matching efficiency of different transport modes. Through optimizing the matching of vehicles and cargo, these platform enterprises intensify upstream and downstream linkage of supply chains, and reduce time lag in the process of integrated transportation. Secondly, it is beneficial to sharing information among different transport modes. Through collecting data from relevant parties, these platform enterprises get through various links for information exchange and promote the “one-bill coverage” of integrated transport. Thirdly, it provides a good chance for accumulating big data. Through collecting and accumulating data including node and route information, transport capacity and relevant governmental information, it is easier for these platform enterprises to establish the multimodal transport big data system, making the optimizing paths for multimodal transport possible. Fourthly, it promotes to cultivate market entities and nurturing multimodal transport operators. Through the matching of vehicles and cargo, information financial service and the construction of physical network, the enterprises have a solid foundation for the transformation to multimodal transport operators. Problems In recent years, China’s vehicle-cargo matching platform enterprises have experienced rapid development. At present, the top ten platform enterprises have business with more than 15 million individual drivers, serving almost half road transportation in China. However, as a whole, China’s vehicle-cargo matching platform enterprises are still at an initial stage of development and confront some bottlenecks. Firstly, it doesn’t fully adapt to some existing policies. With fast update of services provided by new format enterprises, new modes and new fields constantly come forth, where existing laws and regulations are hard to reach. Secondly, the channels for information acquisition need to be expanded. Although enterprises have accumulated a great number of operational data in the process of

operation and promotion at early stage, it is difficult to acquire relevant government data and operating data of railways, ports and airports in time. Thirdly, it is required to make innovations in government management. Since these platform enterprises carry out trans-boundary operation, it is relatively difficult to identify and classify, which raises a challenge to industry management. The state strongly encourages the development of multimodal transport. In recent years, the scale of China's transportation facilities has expanded rapidly, and the state has vigorously developed multimodal transport through various policy measures. National policies to encourage the development of multimodal transport Year Policy 2009 The State Council issued the "Regulations for the Adjustment and Revitalization of the Logistics Industry", which listed the multimodal transport and transshipment facilities as the first of the nine key projects. 2011 The Ministry of Transport and the Ministry of Railway jointly signed the "Cooperation Agreement on Joint Promotion of the Development of Railway-Water Intermodal Transport", actively promoting the construction of container demonstration corridor of railway-water intermodal transport. 2013 The Ministry of Transport has issued the Guiding Opinions on Transport Promoting the Healthy Development of Logistics Industry, which calls for the active promotion of multimodal transport development. 2014 The state council approved the medium and long term plan for logistics industry development (2014-2020), which listed the multimodal transport project as the first of 12 key projects. 2016 The ministry of transport and the national development and reform commission carried out the multimodal transport demonstration project, and the ministry of transport organized a survey of the entire industry chain of multimodal transport to draft several opinions on promoting the development of multimodal transport. Unbalanced proportion of various modes of transport in multimodal transport It was learned from the 6th China Multimodal Transport Cooperation and Development Conference that in 2017 China's multimodal transport volume was 1.368 billion tons, accounting for 2.9% of the total social freight volume. According to the plan, by 2020, China's multimodal transport volume is expected

to reach 3.02 billion tons, and the scale accounts for about 6% of the total freight volume, and the proportion is still low. There are many deep-seated problems in the development of multimodal transport in China, such as the unbalanced, incoherent and non-integrated development of various transport modes, the over-single distribution of traditional logistics channels, and the ability to support the expansion of economic space. According to the data of the past five years, among the four modes of transportation, road transport is the dominant one, and the proportion of the freight volume borne by road transport is much larger than other modes, accounting for about 70% of the total; railway transport is the main mode of multimodal transport. Accounting for about 10% of the total, far to meet expectations; other modes of transportation are obviously insufficient. Generally speaking, there is a serious imbalance in the proportion of various modes of multimodal transport in China, and it is urgent to adjust the proportion of various modes of transport. The potential demand for the multimodal transport market is huge. In recent years, multimodal transport has entered a period of accelerated development, with the issuance of numerous relevant policy documents and the rise of the national strategy for multimodal transport, which has become an important measure to promote cost-reduction and efficiency-increase in China's logistics industry and logistics supply-side Reform as a key to solve the structural contradiction in the transportation of goods in the whole society, multimodal transportation has been developing in depth continuously in our country, the operation quality has been gradually improved, and the comprehensive benefits have been preliminarily revealed, playing an active role in promoting cost reduction and efficiency increase in the logistics industry. Lay a solid foundation for building a logistics power. It is expected that by 2020, the total volume of freight will reach 3.028 billion tons. Under the strategy of "the Belt and Road", China's international cooperation projects have spread all over Asia Europe and Africa countries and regions, and actively cooperate with North American countries and regions in order to expand the market of multimodal transport and further promote the development of multimodal transport. Analysis on the development

of international multimodal transport. The role of liner companies in international multimodal transport is growing. Among all kinds of transportation modes, sea transport has the largest volume, and the vast majority of international intermodal containers have to go through the link of shipping, so many large international liner companies have been formed. In the long-term operation process, with the intensification of competition, liner companies began to expand their business to the land instead of only getting the profit of shipping. With their powerful scale and negotiation ability, giant liner companies are gradually becoming the center of international multimodal transport and playing an increasingly important role.

Integration of International Multimodal Transport and Production

With the increasing recognition of the importance of modern logistics, multimodal transport has become an important part of the enterprise strategy formulation. More and more enterprises choose to outsource the transport business, especially the international trade commodity transport business to the international multi-modal transport operator, which provides integrated services. In addition, some multimodal transport enterprises have penetrated their business into the production field, connecting the basic processes of procurement, production, sales and terminal customers more closely.

Internationalized Network as a Core Resource for International Multimodal Transport Competition

International multimodal transport provides cross-border "door-to-door" service, which requires the operator of international multimodal transport to set up branches or cooperate with foreign companies to expand the network of international multimodal transport and construct its own international network system. To set up a branch in a joint transportation node requires a strong economic strength as a support, and also consider the size and stability of the supply of goods. The cooperation with foreign companies should consider the credit risk, after a period of running-in and inspection to form a cooperative partnership of mutual trust. Either way, international multimodal transport networks, once formed, will become the core resources of enterprises, providing them with strong service capabilities and credibility guarantees to better complete multimodal transport



services. The proportion of LCL is increasing, and the LCL technology is required more and more LCL can save the space and reduce the cost to the greatest extent, but LCL technology and experience requirements are higher, LCL is the highest rate of profit in container transport. With the increasing personalization and diversification of consumer demand, the volume of goods has been greatly reduced while the variety has been greatly increased. Less than container load of goods will be increased, the fit-box goods more and more need to be packed to carry containers. Less than container load of goods will be increased, its added value will be higher and higher. Of course, a wide variety of personalized goods also put forward higher requirements for LCL technology, and how to ensure the safety, timely and accurate delivery of goods to the consignee, not only for the multi-modal transport operators put forward challenges, but also provide opportunities. Optimize existing transportation network and solve the problem of seamless connection of infrastructure. We will accelerate the construction of stations and the upgrading of facilities, upgrade the technical level of the infrastructure for multimodal transport corridors, encourage the development of specialized and general-purpose transport equipment, make full use of advanced science and technology, and use advanced machinery and equipment in the development of multimodal transport. We will adjust and optimize the layout of container handling stations and strengthen the construction of logistics centers. When planning and designing railway transport routes, the railway transport department shall consult with the port department and provide the best transport conditions. In the transformation and construction of transshipment stations, inland cities adhere to the overall planning and combined with the planning of local logistics parks, so as to build railways into the main passageway for mass cargo and long-distance transportation in and out of the parks and promote the development of regional logistics. The government has played a leading role in improving the policies and regulations on multimodal transport We should improve the laws and regulations on China's transportation and multimodal transport, regulate the operation order of the multimodal transport market,

establish sound market rules and codes of conduct, streamline the examination and approval procedures, and protect the legitimate interests of logistics enterprises. Due to the current domestic regulation of multimodal transport less relevant laws and regulations, therefore, need to speed up to establish and perfect the multimodal transport in terms of regulatory laws and regulations. By means of legislation to determine the intermodal transport related operation process and matters, to ensure that the intermodal transport has a sound system to guide China's scientific, sustainable and standardized development of intermodal transport. Reconstruct the value chain of multimodal transport cooperation and competition The multimodal transport operator is an important link in the multimodal transport value chain. It can profit by finding the imbalance of the transport market, so that the industry resources can be more effectively allocated. The multimodal transport operator can achieve the seamless connection of transport modes by changing the mode of transport organization so as to achieve the external connection between transport modes. When the multimodal transport operator accurately grasps the transport demand of the transport market, it starts from the customer demand and future opportunities, explores the mutually beneficial relationship with the multimodal transport operator, reconstructs the value chain of the multimodal transport, jointly develops new markets, and realizes the strategic goal of expanding business opportunities and common development. In the first year of 2017, 18 national departments jointly issued the "notice on further encouraging the development of multimodal transport", marking the top-level design of China's multimodal transport development. To accelerate the application of advanced information technology in multi-military transport Information technology is widely used in the field of multimodal transport is the trend of advanced information technology application can not only shorten the customs clearance time, improve the efficiency of cohesion. And it can make people get more data in road transport process and transport operations, even help enterprise supply chain make intermodal transportation mode selection, design of management decisions, provide optimal multimodal transport solutions.

Multimodal transport is recognized as the most efficient transportation service method in the world, which is conducive to improving logistics efficiency and reducing logistics costs. As a pioneer in the development of multimodal transport, Europe and the United States have accumulated very mature experience in the development of multimodal transport, but the original intention of development is similar to the current situation in China. By analyzing the experience of multimodal transport development in Europe and the United States, we can provide consideration for the development of multimodal transport in China.

World Multimodal Transport Development and Trends Multimodal transport originated around 1960. The earliest rise was the organic combination of railway transportation and road transportation, commonly known as "humpback transportation." With the rapid development of container technology, multimodal transport has gradually developed. In the 21<sup>st</sup> century, developed countries such as Europe and the United States will operate as a leading strategy for logistics and transportation. Through various policy measures, a multimodal transport service system with diverse multimodal transport, advanced facilities and equipment, and complete standard systems has been formed. The system has good prospects for development.

(1) Multimodal transport is the strategic direction of the development of the global logistics industry [5]. The experience of European and American countries shows that multimodal transport can improve transportation efficiency by about 30%, reduce cargo damage by about 10%, reduce transportation costs by about 20%, and reduce greenhouse gas emissions by about 70%. Particularly, multimodal transport based on rail and sea-rail multimodal transport is strongly supported by European and American countries because it can optimize the transport structure, solve the economic problems in integrated transportation, reduce the total cost of logistics, and develop the animal industry to green.

(2) The volume of multimodal transport has grown rapidly. In recent years, the development of multimodal transport in developed countries such as Europe and the United States has maintained a rapid growth trend. From 1997 to 2011, the volume of multimodal transport in the United States

increased from 217 million tons to 1.62 billion tons (an increase of 6.5 times), accounting for 9.2% of the total freight volume. It is estimated that by 2040, the volume of US multimodal transport will reach 3.575 billion tons, accounting for 12.5% of the total freight, the value of freight will reach 10 trillion US dollars, accounting for 25.3% of the total value of freight. (3) Road-rail transportation has become the main mode of multimodal transport. US road-rail transportation volume accounts for 53% of all multimodal transport, with a corresponding turnover of 57%. The railway company bears the leading force. More than 800 kilometers are generally undertaken by the railway. Among them, 7 I-level railway companies account for more than 33% of the total freight volume, and the largest company BNSF accounts for about 50% of the total multimodal transport volume [6].

### 2.2 Status and Problems of China's Multimodal Transport Development

China's vast territory has certain similarities with the United States. Therefore, the experience of the United States in developing multimodal transport is more useful for China. Since 2016, the Chinese government has intensively issued articles to encourage the development of multimodal transport. According to official government forecasts, in 2020, multimodal transport is expected to increase by a factor of 1.5 compared to 2015. By then, the proportion of multimodal transport will reach 7.25%, an increase of 4.35 percentage points over 2015. Based on this calculation, by 2020, the total cost of social logistics will drop by 3.9 percentage points, and the cost savings will be about 435 billion yuan. After years of construction and development, China's transportation infrastructure has been continuously improved. China has built a multi-level integrated transportation network with railways, highways, waterways, aviation and pipelines. By the end of 2017, the national expressway mileage reached 131,000 km, the railway operating mileage reached 127,000 km, the coastal port had more than 2,300 berths of 10,000-ton or above, the number of civil aviation transportation airports reached 218, and the number of various logistics stations reached 1,210. Container production and sales accounted for more than 90% of the global market share. China has basically achieved the connection of public, iron and water

container transportation, and has the basic conditions for developing multimodal transport in a deeper and wider scope. However, there are still many problems in multimodal transport, mainly including: (1) Container multimodal transport logistics station is not mature. China's current container multimodal transport is port-led, and inland stations far from the port are limited in development due to lack of policy support and government investment. The office configuration of many inland station ports is not perfect, and there is no function such as customs clearance and inspection. After the goods are transported by rail to the port, they need to be re-inspected and reported, which greatly affects the efficiency of container multimodal transport. (2) Lack of multimodal transport facilities. Multimodal transport cannot be smoothly connected. Taking the railway as an example, only 1.3% of the container throughput of China's seaports is transferred to the port by rail, 85% by road, and the remaining 14% by water [7]. In the world's largest Shanghai Port, only 0.5% of containers are transported by rail, the advantage of railway cannot be achieved. (3) Container multimodal transport cannot form large-scale transportation. China's supply of goods varies greatly, resulting in a very unbalanced supply of goods (for example, the northwest region is dominated by coal and petrochemical production, and the North China region is dominated by manufacturing output, etc.). Container multimodal transport often presents the status quo of one-way goods, and it is difficult to achieve economies of scale. In addition, the government lacks subsidies for enterprises that provide empty containers, which is not conducive to the popularization and development of container multimodal transport. (4) Container multimodal transport lacks information collection and processing. The development of container multimodal transport integration is an important measure to improve the efficiency and service quality of container multimodal transport. At present, many enterprises are committed to the construction of the railway-waterway intermodal information platform. However, the actual operation is not perfect. The various nodes in the intermodal link have their own policies and have not reached the necessary consensus on information sharing. Problems in China's Logistics

Stations The development of domestic and international multimodal transport must rely on the intelligent logistics platform of online and offline fast transactions to achieve effective linkage between “Sky Network” and “Ground Network”. As the main component of the “Ground Network”, the logistics station is the carrying entity that realizes the “Internet + Logistics”. At present, the development problems of logistics stations in China are mainly reflected in: Incomplete Infrastructure Traditional logistics stations have problems such as small container loading and unloading sites, insufficient storage capacity, and mismatching of short-distance transportation vehicles. Some of the logistics stations have backward loading and unloading equipment, and low loading and unloading efficiency, resulting in the replacement of containers for multimodal transport. The cost is too high. Single Basic Logistics Business The main business of the current logistics station is warehousing, loading and unloading, and house leasing. Packaging, distribution, distribution processing, information analysis and other high-value, high-profit service content has not become a major profit item. Most of the multimodal transport projects rely on existing offline contact methods, the radiation range is limited, and business expansion is blocked. Insufficient Integration of Logistics Station At present, the management platform and information platform of the station are still under construction. The platform customer group and coverage are relatively simple, and the functional modules are few. The integration capability of the multimodal transportation scheme is insufficient, and the customer comparison space is narrow. The integrated platform of multimodal transport also needs constant exploration and improvement. Therefore, China urgently needs to comply with existing policies to strengthen the construction of site infrastructure. According to market needs and potential customer needs, logistics companies carry out logistics service projects such as packaging, distribution and distribution processing at the station. The station and the company cooperated with each other to achieve win-win results, promote mutual development, and create a new mode of new logistics station.

## Conclusions

Now, China's multimodal transport is facing the period of strategic opportunity, with the national policy support, infrastructure improvement and market interests. Especially, the Internet provides the data driven possibility for the effective connections of related elements of multimodal transport, and the ultimate goal of multimodal transport is to realize the Internet operation and management. For this, the following four suggestions have been proposed. Promote the openness and sharing of public information resources. Basing on the national data sharing and exchange platforms, it is needed to further open government related data, to promote data integration among different platforms, and to utilize of information resources in the transport field. Besides, the platform-type enterprises are encouraged to develop transport big data analysis, to establish the information collection and sharing mechanism in which government and the society could be interactive, and government information and social information realize exchange and integration. Secondly, deepen the reform of government supervision, and adapt to the new development patterns. On one hand, the social capital is greatly encouraged to participate in the development of transport, and the government is required to ease market access. On the other hand, considering the development characteristics of platform-type enterprises, it is needed to formulate relevant laws and regulations, in order to specify rights, responsibilities and obligations of different parties. Thirdly, speed up the upgrade of intelligent level of transport infrastructure, and support platform type enterprises to expand new services. It is suggested to strengthen information collection of basic status of transport infrastructure network, vehicle operation, and transport arrangement. Besides, it needs to establish transport operation monitoring system, as a result to realize the overall coverage and extensive interconnection.

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**INFORMATION  
TECHNOLOGIES IN  
PROJECT  
FINANCING**

Fixed capital investment is an integral indicator that most fully and reliably characterizes the growth potential of the economy. Limited financial resources for the implementation of investment projects, the presence of risks lead to the search for optimal ways to ensure their financial security. One such way is project financing, which has become an important tool for economic development for most developed countries.

Experts' calculations show that if the volume of financing for investment projects using project financing mechanisms change by 1%, world GDP may increase by an average of 0.14%, taking into account the multiplier effect of investment on the economy due to changes in domestic demand (Nikonova & Smirnov, 2016).

The problem of financing large projects is especially acute for countries that are economically unstable. Reducing the risks of financing investment projects in such countries is possible with the use of project financing, as its methods and technologies developed by international practice over the past few decades allow to finance

project costs and distribute risks among different project participants, reducing the impact of uncertainty.

Project financing is a special financial technology, which is a way to implement projects subject to the creation of a special new company (SPV) in order to separate the project from the main activities of its initiators. The SPV company mainly attracts debt funds for the project, pays debts and dividends from the operating cash flow after the completion of the project in operation.

Project funding has other characteristics that distinguish this way of financing projects from others (Blank *et al.*, 2015). Among the main differences of project financing from other methods of financial support of projects are the following:

1. Exclusion of recourse claims against the borrower company;
2. Involvement of a wide range of project participants: the customer, investors, banks, investment institutions, consultants (financial, legal, environmental), underwriters, licensee's, insurers, etc. In large projects, the main participant in project financing is a strategic investor who invests in projects of sectoral or regional orientation with the possibility of further absorption;
3. Financial designing of the project involves the formation of the optimal structure of funding sources (bank loans, shares, equity, corporate loans, bonds, financial leasing, etc.), while debt is usually more than 75% of the capital structure of the newly created company;
4. The main guarantees of return for investors and creditors are contracts, licenses, and patents issued to the project company.

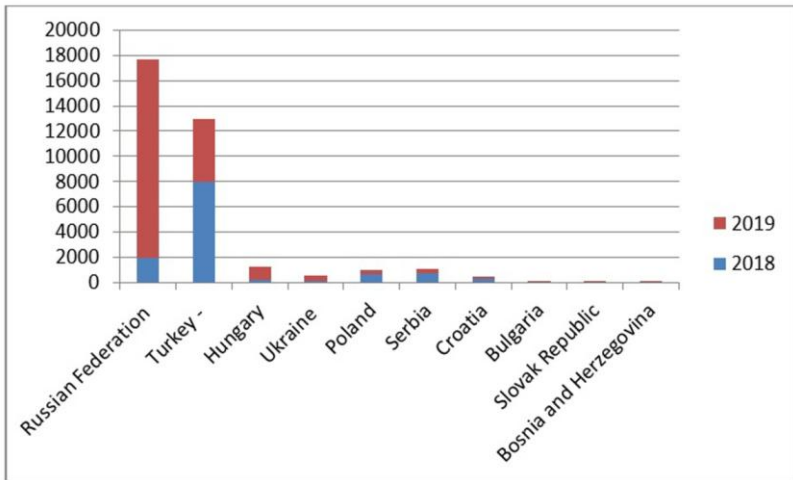
Thus, project financing has its own specifics, its effectiveness depends on many factors. With the presence of increased risks, long project implementation time, the complex structure of financial instruments, many participants require the use of technologies, programs, and tools that would simplify the business processes of the project, making them faster and more transparent for participants.

### **Current trends in project financing**

The processes of globalization have contributed to the development of project financing in recent years. According to the

annual data of the Global Project Finance Review, the total amount of loans aimed at project financing in 2019 amounted to \$296.6 billion, which is 3% more than in 2018, a total of 816 agreements were concluded (Refinitiv, 2019a, 2020a). Lending to projects using project financing schemes in the US region in 2019 decreased overall by 6%, mainly due to reductions in the Caribbean region (-91%).

Loans to finance EMEA projects (Europe, Middle East, and Africa) in 2019 amounted to \$121.6 billion, which is 9.0% more than in the previous year. It is important to note the development of project financing in Eastern Europe, the volume of credit agreements amounted to \$23422.8 billion (+ 89%), while in Western Europe there was a decline in lending (-6%). In Figure 6.7 shows the Global Project Finance Loans in the countries of Eastern Europe in 2018-2019. Among the countries of Eastern Europe, the largest volumes of transactions took place in the Russian Federation: \$15752.8 billion (+ 717%); Turkey: \$4918.3 billion (-39%); Hungary: \$989.9 billion (+ 302%); Ukraine: \$507.3 billion (+ 413%).



**Figure 6.7 Global Project Finance Loans (Refinitiv, 2019a, 2020a)**

The analysis of regional project financing markets showed that

EMEA remained the most active region in the market. Despite the restrictions imposed in 2020, revenues from project financing agreements in Europe, Middle East, and Africa during the 2<sup>nd</sup> quarter of 2020, compared to the same period in 2019 as a whole increased by 5%; in Western Europe they decreased by 4.3%.

*Table 6.2*  
**Global Project Finance Loans (Refinitiv, 2019b, 2020b)**  
*(US\$ millions)*

<b>Region</b>	<b>First half 2019</b>	<b>First half 2020</b>	<b>Chg (+/-), %</b>
	proceeds of a loan		
<b>Global</b>	119543,6	123635,3	3,4
<i>Americas</i>	40 550,70	42181,4	4,0
Central America	3358,8	1746,6	-48,0
South America	16752,7	3924,5	-76,6
North America	20335,2	36495,4	79,5
Caribbean	104	15	-85,6
<i>EMEA</i>	43983,1	46231,9	5,1
Africa/Middle East/Central Asia	13165,5	15785,4	19,9
Africa	-	4039,4	-
Sub-Saharan Africa	1127	4039,4	258,4
<i>Europe</i>	30806,2	30446,5	-1,2
Eastern Europe	1561	2447,8	56,8
Poland	1577,2	207,7	659,4
Turkey	465,2	57,7	706,2
Romania	216,6	-	-
Serbia	126,6	-	-
Czech Republic	62,2	-	-
Western Europe	29245,3	27998,7	-4,3
<i>Asia Pacific &amp; Japan</i>	35009,8	35222	0,6
Australasia	12616,6	15392,9	22,0
Southeast Asia	6457,7	1857,2	-71,2
North Asia	1432,9	4685,9	227,0
South Asia	9831,3	7596,1	-22,7
Japan	4671,4	5689,9	21,8

Loans to finance EMEA projects in the first half of 2020 amounted to \$46.2 billion, 108 operations were implemented. The EMEA market was dominated by agreements in the energy sector (\$23.6 billion), an increase of 70% compared to the first half of 2019.

Eastern Europe made a significant breakthrough, where the growth of revenues from project financing agreements with loans amounted to 56.8%. The largest projects in Eastern Europe are implemented in countries such as Poland (+ 659%), Turkey (+ 706%). In Romania, Serbia, Czech Republic in the first half of 2019 there were no projects that would be implemented using project funding.

In the first half of 2020, the oil and gas sector grew by 13% compared to the same period last year to \$36.6 billion, mainly due to six mega-deals, which were closed in the second quarter. The total volume of the second quarter increased by 40% compared to the first quarter, 52 agreements worth \$24.6 billion were concluded. The Asia-Pacific region and Japan financed a project totaling \$35.2 billion out of 90 agreements in the first half of 2020, which is a 1% increase over the same period last year. In the Africa/Middle East/Central Asia region, growth was almost 20%.

Thus, the development of global project financing in 2020, despite the crisis, continued. However, very few large projects are implemented in Ukraine using project financing due to political and legal risks for investors and creditors, as well as due to the lack of experience in implementing such agreements.

The negative factor is that in 2020 the inflow of foreign direct investment to Ukraine stopped. Thus, for 11 months of 2020, the outflow of foreign direct investment from Ukraine amounted to \$200 million (Danylyshyn, 2021). The main reasons are the lack of rapid progress in the implementation of structural reforms, uncertainty with further prospects for overcoming the COVID-19 epidemic.

Ukrainian banks view project financing of large transactions as a high-risk operation. Crisis phenomena in the economy of Ukraine, changes in the financial regulatory framework (Basel III standards) have limited the availability of credit. Ukrainian banks are more

willing to provide loans for the expansion and modernization of existing facilities on the terms of project financing. Their participation in technologically complex new projects of basic branches of economy is insignificant. In some cases, such as coal projects, they are financed by international financial organizations such as the European Bank for Reconstruction and Development.

### **Use of software in project financing projects**

Information in the modern world is one of the most important resources, and information systems have become a necessary tool in various fields, including investment.

Investment projects that are implemented under project financing schemes, in contrast to innovative projects, must be effective. In this case, the option of unprofitable should not be considered because the uncertainty is not as high as in the field of innovation. A large number of representatives of the private and public sectors of the economy are involved in the implementation of large-scale projects, all of which expect to receive a certain commercial or social effect. Modern information technologies can contribute to the effective use of various project financing tools, objective analysis of projects, the formation of a security package for participants. Their application is especially relevant in the conditions of use of increasingly complex financial instruments, the complication of legal, ecological, and other tasks facing the customer (owner) of the future project.

IT helps to simplify the procedures of cooperation between state institutions and private sector companies, monitor the implementation of the PPP (public-private partnership) project, ensure reliability and security for all participants, transparency, and access to the necessary information.

The software used in the implementation of large-scale projects allows the management team to effectively manage their time and successfully implement the planned phases of the project.

Automation of project management processes allows faster and more efficient management. The functional structure of project management is quite complex and may include: Project Integration Management; Project Scope Management; Project Time

Management; Project Cost Management; Project Quality Management; Project Human Resource Management; Project Communication Management; Project Risk Management; Project Procurement Management.

The key advantages of project management software products in the field of project financing are:

1. *Estimation of cost parameters of the project, convenient and effective budget management.* It should be noted that there is a relationship between business evaluation and cost analysis of projects at different stages of their life cycle. The main cost parameters of the project are the cost of the project, project budget, the cost of the project company, the cost of collateral or other forms of loan repayment, the value of shares of the project company, project bonds. Estimation of cost parameters is an important component of project analysis and uses a cost estimation methodology (international and national valuation standards). To assess the cost parameters of the project in international practice, information technologies are actively used, including Big data technologies for the analysis of large amounts of data from numerous different sources of information. Task management tools within the software product allow you to control the project budget without the need to manually record costs in spreadsheets (for example, in Microsoft Excel spreadsheets).

2. *Calculation of forecast indicators of project efficiency.* It is traditionally believed that project evaluation is carried out in the first, pre-investment phase, but different project parameters may change over time due to the influence of various external and internal factors. Project analysis should be a continuous function, it should be carried out at all stages of the project life cycle in order to ensure sound decisions about the project, respond to changes and achieve the planned results.

The built-in functionality of project cash flow forecasting and other forms of financial reporting (balance sheet, statement of financial performance) allows you to calculate the main indicators of project efficiency: NPV (net present value), IRR (internal rate of return of the project), and PB (simple payback period).

3. *Optimization of project costs.* Project evaluation is only one of the tasks of project management. Implementation efficiency requires systematic approaches to the optimization of funding sources in order to form a financial structure that would meet the needs of the project customer in terms of funding, the timing of funds, the cost of funding sources.

Throughout the project life cycle, the issue of cost optimization based on the principles of cost engineering and automated management support systems is urgent.

4. *Project risk analysis.* Project funding involves complex projects that involve a wide range of participants. Project participants are potentially risk bearers. In addition, the duration of implementation affects the uncertainty of possible results. The need to identify, analyze and develop measures that would reduce the risks of project financing is obvious. Various methods are used to risk analysis, the most common project's sensitivity analysis, scenario analysis, break-even assessment. The scenario approach and the sensitivity analysis of the project reflect the level of possible risks and the ranges in which the above indicators change.

5. *Provision of project monitoring and control systems.* In modern conditions, the requirements for tools for monitoring and auditing projects, the use of IT-technologies and software products for sound management decisions at all stages of the project life cycle (methodology of Project management) are increasing.

Project monitoring is important at the project implementation stage and operation stages. The main objectives of control at these stages are to ensure timely financing of the project, identification of problems, risks, and development of measures to reduce negative impact; ensuring timely repayment of loans in accordance with the terms of agreements with creditors; assessment of opportunities to achieve the planned results. The project monitoring process is carried out by the project customer, creditor banks, and government agencies (in case of state participation). IT technologies in the monitoring and management processes should be based on materials that regulate this process in project participants and allow the formation of reporting documentation on the results.



Information technologies play a special role in the implementation of international and concession projects with the participation of the state (SBI, BOT, BOOT, etc.), as the requirements for their effectiveness increase.

6. *Availability of centralized access to documents.* Effective organization of cooperation and communication between project participants is impossible without sharing files and documents. If the software product has the function of centralizing the sharing of the project database, it simplifies the work of finding files or documents while performing a specific task within the project.

7. *Convenient time control.* In order to monitor performance, the time required for project teams to perform certain tasks is often monitored. Therefore, built-in time control is an important essential feature of software for project finance.

### **Analysis of software products**

Consider software products that are used to evaluate projects in the field of project financing, as well as to monitor their implementation.

#### **Project Finance Software Atena**

Software Atena (ATENA, 2016) has developed an innovative methodology for analyzing the return on equity investments or PPP solutions based on a new software technology called Project Finance Atena and is revolutionizing the modern approach based on spreadsheets and the use of external services of consulting companies.

The main advantages of implementing this new methodology in the software product are:

- Planning and control of public works and services.
- Sharp reduction of internal costs for the implementation of public works and business plans by limiting the cost of compiling, assessing, and analyzing sensitivity.
- A sharp reduction in the cost of consultations according to the list of costs.
- Autonomy in project management of new/existing public works, not relying only on third parties.
- Security, reliability, transparency of projects implemented

through the program Project Finance Atena.

- Certified algorithms with an indication of relevant sources.

### **Software Promoter**

Because projects involve a large number of stakeholders with different requirements and interests, modeling in a Microsoft Excel spreadsheet environment has some limitations in use.

Software for project financing (PROMOTER, 2021) is the main technology that uses a number of software tools for project financing to evaluate projects in oil, gas, petrochemical, energy, pulp and paper, transport, infrastructure, and related industries. This model of project financing can be used both in traditional cases of project financing and in concession infrastructure projects implemented on the basis of PPP.

The software product allows you to forecast cash flows, including the use of equity and loans during the construction phase; and income, operating expenses, loan payments, tax payments, and dividend flows during the operating phase. It is used to assess the viability of such projects by calculating the internal rate of return (IRR), net present value NPV), payback, loan coverage ratios, and other key project criteria. The Enterprise version of the Promoter product includes database support and the ability to customize and analyze project portfolios. The promoter is supplied by Project Planning and Management Ltd. as part of its consulting services.

### **Alt-Invest Software**

Alt-Invest software is a model that runs in Microsoft Excel. With the help of Alt-Invest software you can carry out all the necessary stages of financial planning of projects: describe the macroeconomic environment, generate input data for forecasting sales of products or services, also calculate project performance indicators. Alt-Invest software supports the following environment: Windows XP/7/8 operating system and later versions; Microsoft Excel 2007/2010/2013 and later.

### **Project Expert Software**

Project Expert software is an automated system for planning and analyzing the effectiveness of investment projects based on the cash flow model. The software product runs on different versions of

operating systems (Windows XP/ 7/8, etc.). The key features of this software product include:

- Support for many project calculation currencies, which is important when using multi-currency financing in international projects.
- There are several approaches to calculating the discount rate.
- Programmed tools for formula formation of forecast items: income, expenses, and taxes.
- Ability to generate financial statements with different forecasting periods.
- Available tools for automated scheduling of key project financial indicators and performance indicators.

Scenario construction, sensitivity analysis, and project update tools (which are convenient during project monitoring) greatly simplify the work of managers in the field of project financing.

#### **Omnitracker Software**

Omnitracker can be used for professional implementation of all stages of the project within the company, regardless of the complexity of its structure. It helps to optimize work regardless of the complexity and size of the project, automates business processes, allows faster processing of sub-stages, reduces the likelihood of errors, and if necessary allows you to change the timing of project phases while maintaining all necessary dependencies between stages. The advantages of the product are the ability to monitor the project, the transparency of all actions, as the monitoring panel, KPIs, and progress indicators display current data on the project in real-time. In addition, access is mobile, with the help of the web gateway 2.0 it is possible to use this project management software at any time and in any place (OMNITRACKER, 2020).

#### **COMFAR Software**

COMFAR offers support for the feasibility study of large infrastructure projects or public-private partnership (PPP) projects through a blended funding mechanism. COMFAR provides an opportunity for short-term and long-term analysis of financial and economic consequences for industrial and non-industrial projects. COMFAR (UNIDO, 2021) is accompanied by manuals, training

materials, and interconnected project preparation software.

### **Primavera Project Planner Software**

Primavera Project Planner software (ORACLE, 2021) is designed to manage large and complex projects, especially in mechanical engineering and construction. Primavera provides its users with the following features: choosing the right combination of strategic projects; ensuring corporate project management; improving processes and methods; improving project collaboration; measuring progress towards goals; relationship of projects with strategy.

Thus, the market offers a wide range of software products that can be adapted to the needs of project financing, their use can reduce the risk of projects by forecasting development, performance analysis, ongoing monitoring of investment activities, and rapid response to change. Comparative characteristics of the software used in project financing are shown in Table 6.3.

The results of the comparative analysis of different types of software, which are shown in the table, show that the software products Project Finance Atena, Promoter, Alt-Invest, Project Expert and Comfar effectively solve the problem of forecasting the financial part of projects and risk analysis. However, they do not have the powerful tools for project task management and resource allocation that are well programmed in Omnitacker and Primavera Project Planner project management products. At the same time, none of the presented software products solves the problem of minimizing the time for preparation of legal documents in the process of structuring agreements, which is especially important for project financing. Due to the complexity of structuring agreements between project participants in the field of project financing, one of the effective approaches to minimize time and other costs may be to use the achievements of companies in the field of Legal Tech and combine (integrate) working Legal Tech software products with existing software solutions of project management and financial planning.

The conceptual scheme of the project of a new software product, which could include the key characteristics of software solutions for both project management and finance, and in the legal field, is shown in Figure 6.8.

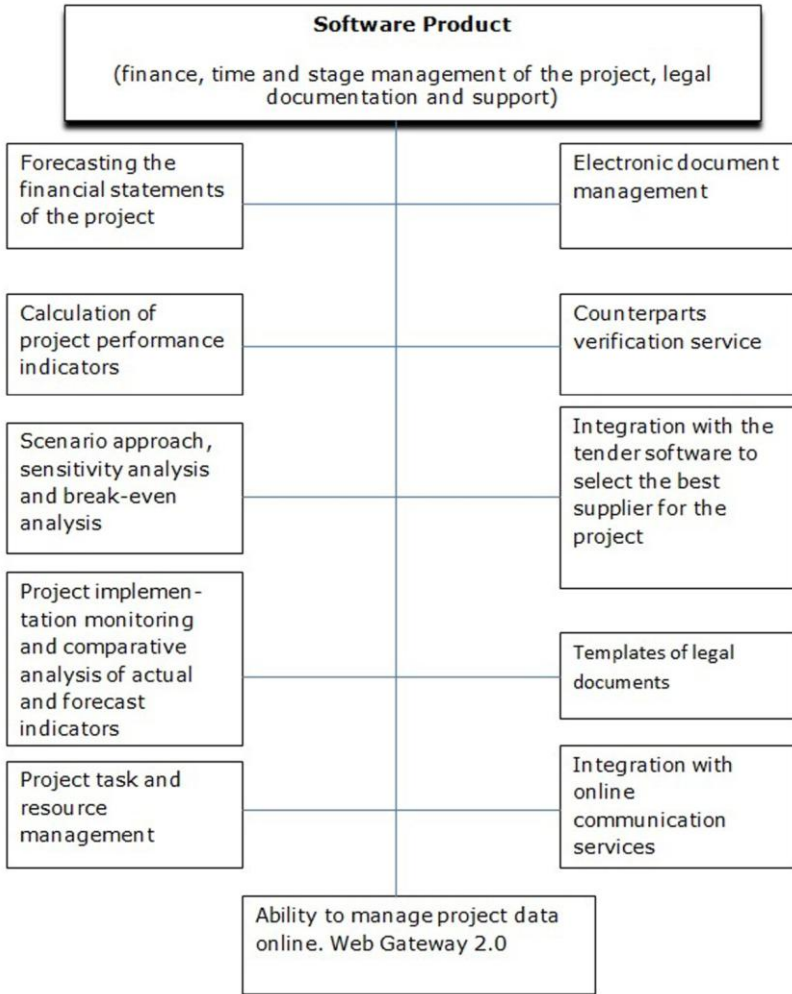
Table 6.3

### Comparative characteristics of software

Software characteristics	Software						
	Project Finance Atena	Promoter	Alt-Invest	Project Expert	OmniTracker	Prinavera Project Planner	Comfar
Project cash flow planning and forecasting tools	+	+	+	+	-	-	+
Estimation of cost parameters of the project	+	+	+	+	-	-	+
Calculation of forecast indicators of project efficiency	+	+	+	+	-	-	+
Project cost optimization	+	+	-	-	+	+	+
Project risk analysis	+	+	+	+	-	-	+
Project monitoring and control system	+	+	-	+	+	+	+
Centralized access to documents	-	-	-	-	+	-	-
Convenient time control	-	-	-	-	+	+	-
Templates of legal documents	-	-	-	-	-	-	-

The use of information technology is especially relevant for projects involving foreign investment, as well as for projects implemented with the participation of the state. The initial requirements and investment criteria for such projects are very strict. This necessitates the use of a wide range of methods and tools for their analysis, descriptive modeling based on the definition of functional dependencies between individual elements.

The choice of the optimal scheme and tools of project financing, methods of forecasting cost indicators, monitoring, and control of tasks at each stage of the life cycle is not possible without the appropriate software package. In the context of globalization, project financing is developing, business processes are becoming more complicated, and customers, investors, creditors, and other



**Figure 6.8 Conceptual scheme of the project of a new software product**

participants face new problems and challenges. All this requires new modern software products to optimize performance.

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**INFORMATION SUPPORT  
OF CONTROLLING IN  
MANAGEMENT OF TRADE  
NETWORKS**

The effectiveness of the implementation of controlling functions in the management of retail chains depends on the quality of information support, as well as on how operational and reliable will be the information received by the controlling service. In addition, knowledge of the basics of information support will allow to form the optimal scheme of information flows of controlling in the information system of the business entity. The task of creating and functioning of the information support system of controlling is to prevent the receipt of redundant information, large volumes of which make it impossible to process it qualitatively and create problems for the effective functioning of controlling. The information needs of the controllers of the network trade entity should be clearly considered.

Today, information is an important resource, which is a set of messages that reflect the specific state of the object or phenomenon, event or economic activity. Some researchers believe that information in a market economy is one of the main products [4; 13]. The team of authors led by A. N. Azrillian [1] notes that information has a certain value, which includes the time spent by managers and subordinates on its collection and processing, as well as the costs associated with market analysis, payment for computers, the use of external consultants and more. Thus, information is an important resource that has a certain value and is consumed in the implementation of any activity, including in the field of controlling.



Information in controlling retail chains (as an important resource) has certain features, the main of which are the following:

- the circulation of controlling information in trade chains is carried out through secure channels with the help of special means of its dissemination and storage;

- in the process of using controlling information does not lose its usefulness at once, but gradually transfers its value to the result of the functioning of controlling and management activities;

- controlling information helps to increase the participation of all staff and managers of the network trade business entity in management;

- controlling information is full of subjective moments (assessments, opinions, generalizations, experience of controllers, etc.);

- part of the information of the controlling service is a priori, i.e. contains preliminary data used by management for decision-making;

- information may contain biased data about the actual state of the controlling object, caused by rumors, stereotypes, superstitions and others;

- different types of information of the controlling service must have certain access modes depending on the levels of management in order to prevent the violation of trade secrets of the trading network.

Summarizing modern scientific views on the essence of information, we can formulate the following definition: "information in the controlling of retail chains" is a set of information about the state of controlling objects in the network, as well as the results of controlling activities.

Based on the analysis of management practice, we can identify a number of key requirements for information necessary for effective controlling in retail chains:

- timeliness – the information received by the controlling service must be prompt, objective and reflect the state of the controlling object at a certain point in time, which ensures the objectivity and efficiency of controlling activities;

- reliability – the information must with a given level of accuracy

reflect the parameters of the operation of a particular object;

- sufficiency – the amount of data should be sufficient for the controlling service to make effective decisions and make objective analytical conclusions;

- relevance – the information received by the controlling service must be essential for solving a specific task;

- periodicity – information must be received by the controlling service with a given frequency;

- accessibility – ease of obtaining information, its processing and understanding;

- unambiguity – the information should come to the controllers in such a way as to prevent its different understanding and interpretation;

- usefulness – the use of certain information by controllers should help increase the efficiency of their activities;

- relevance – compliance of information with the requirements of specific controllers;

- targeting – the rational distribution of information to users in order to effectively and efficiently use it;

- digitization – the ability to ensure the circulation of information data in the system of information and telecommunications infrastructure;

- encryption – for the convenience of working with information, it is advisable to encode it, which will protect it from unauthorized use and simplify the passage in the system of information flows of the retail network.

The importance of creating a system of information support A. M. Karminsky, S. H. Falko, A. A. Zhevaha, N. Yu. Ivanova [9] see in the need for operational support of the management system and controlling services of enterprises, because in a period of rapid changes in the market, a shorter cycle of turnover of products and services, changes in consumer demand, the completeness and relevance of the information base becomes crucial.

The main problems of information support of business entities management, and hence controlling, are as follows: information

arrives with a significant delay; the information contains a lot of unnecessary data and is too detailed; most of the information characterizes past events; the information contains mainly digital data; information coming from different sources is often contradictory; information comes to users irregularly; lack of information concerning the definition of future goals and strategic planning, etc. An effective system of information support of controlling in the management of trade networks will help to overcome these problems. It will create additional benefits for the functioning of this management technology: increase the level of adaptation of the controlling service to the needs of the management of the network trade business entity in the rapidly changing conditions of external and internal environment; increase the level of efficiency and validity of the main functions of controlling in the management of retail networks; prompt evaluation of results in current economic activity of the trade network in terms of their compliance with the established goals; rapid search for reserves to improve the main types of economic activity and their operational application; development of trade network management through the rapid dissemination of effective management of certain aspects and activities, and use of modern management methods and tools.

Information support of controlling in management should be considered both as a system and as a process. The main characteristics of the system of information support of controlling in the management of trade networks are:

- is a functional complex that provides organic interaction of technical means, methods and technologies of working with information;
- provides the ability to collect, search, group, analyze, store and disseminate information among managers and controllers;
- takes into account the information needs of users – controllers and managers;
- provides information receipts on the status and parameters of the operation of controlling objects at certain intervals or in accordance with its needs.

Given the peculiarities of controlling in the management of retail

chains, we can define the term "information support system of controlling in the management of retail chains" – a functional set of tools, methods and technologies that provides search, collection, grouping, analytical processing, storage and dissemination of information about status and parameters functioning of controlling objects on the main indicators of activity of the subject of network trade business with the certain periodicity and according to information needs of controllers.

The main elements of the information support system of controlling in the management of retail chains are: the subsystem for collecting information about the state of the external environment (information about the state of the external environment by monitoring its main factors); the subsystem for collecting information about the state of the internal environment (array of data from internal sources – management accounting, information of units, etc.); the subsystem of information flows (provides optimal circulation and physical movement of information messages); information technology (provides the interaction of a set of tools and methods of collection, accumulation, movement, processing of information, etc.). A feature of functioning of the controlling information support system is its focus not only on reporting on performed business operations of the network, but also on documents declaring future business operations (supply contracts, pre-orders, etc.), as well as forecasts of external and internal environment, which will have a significant impact on business results.

Some researchers [10] suggest to consider information support as a process consisting of a series of successive stages. Given the peculiarities of controlling in the management of retail chains, we can identify the following stages of the information support process:

- establishing the information needs of controllers (specifying the recipient of information data, determining the content of the necessary information, the formation of basic requirements for certain information, etc.);
- collecting or obtaining the necessary information from other departments, its processing (obtaining data from external and internal sources, determining the timing of collection and processing of

information, estimating the cost of collecting information and its effect, determining the performers to collect information and the degree of detail, structuring information, aggregation of data and their grouping by key performance indicators of the trade network, etc.);

- transfer of information and its interpretation (establishment of the form of information presentation and direct provision of information data to their consumers, exclusion of possible duplication of information flows in the trade network, verification of received information, development and adjustment of management reporting forms of controlling services, bringing information data to a standardized presentation format and other);

- storage of information (subject orientation of data, ensuring the invariability of deposited information, ensuring the chronology of information storage and its integration, determination and compliance with the terms of information storage, etc.);

- analysis of information (formulation of analytical conclusions on certain aspects of controlling activities, development of future behavior scenarios of the economic system of the trade network, formation of various conclusions and proposals to ensure the movement of the trade network in a certain target area direction, as well as to improve management, etc.).

Thus, the first and most important stage of the process of information support of controlling in the management of retail chains is to establish the information needs of controllers. Controlling information, and hence the functioning of the system of information support of controlling, according to N. P. Shulga [15], must meet the information needs of its consumers – owners and managers. Accordingly, the information received by the controlling service of the trade network must meet its information needs. A. I. Orlov [12] defines the information needs as a conscious understanding of the difference between individual knowledge about the subject and knowledge accumulated by society. Taking into account the peculiarities of controlling in retail chains, as well as its goals and objectives, we can determine that "information needs of controlling in the management of retail chains" – conscious understanding of the

difference between their knowledge of the state and parameters of certain controlling objects, as well as the difference between the existing professional knowledge of controllers and the accumulated knowledge and experience of society, science, competitors, contractors and certain managers and employees of the subject of network trade business.

I. Ye. Davydovych [3] proposes to differentiate the information needs of employees of the controlling service depending on the individual stages of planning and control. The information needs of controlling differ depending on its subsystems. Thus, strategic controlling requires primarily data on the state of the external environment of direct and indirect influence, tactical controlling focuses mainly on external data and information on the state of the internal environment, operational controlling requires primarily operational information on the internal environment of the trade network. The information needs of controlling also depend on the specific stage of implementation of its mechanism. For example, at the stage of analysis of the impact of environmental factors on the economic activity of the trade network, the controlling service needs information about the current state and dynamics for previous periods of key indicators in external environment, based on which appropriate analytical conclusions are developed.

L. I. Kravchenko [11] proposes to differentiate the information support of the analysis depending on a certain functional unit of management (for example, analysis of retail trade, analysis of wholesale trade, analysis of turnover costs, etc.). Thus, the information needs of controlling in the management of retail chains are also determined by such factors as: functional management unit, the main aspect of management, management function, and an element of organizational and financial structure of the network, which at some point is the subject of attention for specialists of the controlling service.

Taking into account the peculiarities of controlling in the network trading business, the following factors that influence the formation of information needs of trade network controllers can be identified: the importance of a certain type of controlling activity; the number of

key performance indicators of the retail network, for which a certain controller is responsible; the number of options for future behavior of a particular controlling object; structure of the controlling service and others.

Summarizing the above, we can conclude that information is an important resource that ensures the effective functioning of controlling in the management of retail chains.

Information in the controlling of trade networks (as an important resource) has the following features: does not lose its usefulness at once, but is gradually transferred to the results of the functioning of controlling and management activities; its circulation is carried out through protected channels by means of special means of distribution and preservation; it is full of subjective moments (assessments, opinions, generalizations, experience of controllers, etc.); contain biased data about the actual state of the object of controlling (rumors, stereotypes, superstitions, etc.); promotes increase participation of all staff and managers in management; for the most part it is a priori, i.e. it contains preliminary data used by management for decision-making; its various types must have certain access regimes depending on the levels of management to prevent the violation of trade secrets of the trade network.

In order to meet the information needs of trade network controllers, it is necessary to create the necessary information support, which can be considered both as a system and as a process. As a system, information support consists of the following elements: the subsystem for collecting information about the state of the external environment, subsystem for collecting information about the state of the internal environment, subsystem of information flows and information technology. As a process, information support involves the implementation of the following stages: establishing the information needs of controllers; collecting or obtaining the necessary information from other departments; its processing, transmission and interpretation; storage and analysis.

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**INNOVATIONS AND  
MODERN  
TECHNOLOGIES:  
WEB-BASED IDEA  
MANAGEMENT  
SYSTEMS AND  
ALTERNATIVES**

## **Introduction**

Successful companies are beginning to recognise that their growth and success are based on the acquisition, creation and usage of knowledge, which is in line with the nature of the information society, which focuses on obtaining more information, namely knowledge and the use of information technologies. One such IT innovation that helps to acquire, create and apply knowledge, thereby promoting mass creativity and innovation, enabling society to be involved in addressing various important issues, promoting open innovation, etc., is web-based idea management systems (IMS), which include a systematic process of generating, evaluating and developing ideas that help to implement the best ones, thus becoming an ongoing innovation in the new era. Therefore, this paper aims to highlight the web-based IMS as modern technologies for innovations and compare them with alternatives.

## **Methodology**

Literature review was applied as the general data gathering method. The data were later analysed using content analysis.

Authors have summarized the main objectives for literature review from the researches (Boote & Beile, 2005; Bolderston, 2008; Boell & Cecez-Kecmanovic, 2010):

- 1) delimiting the research problem;
- 2) seeking new lines of inquiry;
- 3) avoiding fruitless approaches;
- 4) identifying recommendations for further research (exploring research gaps);
- 5) exploring important variables relevant to the topic;
- 6) identifying the main methods, literature, theories that have been used;
- 7) giving an overview about the research field, main developments in the area.

All the resources were examined by a content analysis. The content analysis was conducted in 3 steps: (1) preparation – gathering literature source analysis protocols; (2) organization – initial coding was conducted: there were predefined and data driven; (3) report development – described categories. A category network is shown in the Figure 6.9.

Innovations, idea management system, crowdsourcing	Topicality of Idea management systems
	Basics of web - based Idea Management Systems
	Alternative

**Figure 6.9 Category Network**

*Source: created by the authors*

## 1. Topicality of Idea Management Systems

Innovation has always existed as a driving force for development, but its concept is relatively new and understanding is diverse and has been explained by many economists, politicians, etc. For example, the paper prepared by the Latvian Ministry of Economy defines innovation as a process in which new scientific, technical, social, cultural or other ideas, developments and technologies are implemented in a product or service required and competitive on the market, and various explanations highlight exactly the novelty of

ideas, processes, methods, tools, etc./introduction (Oxford Dictionary of English, 2006). The Latvian Technological Centre notes that the result of innovation is innovation, improvements in the quality and efficiency of products and processes, as well as innovation in the work organisation, and in the development of new supplier and consumer relations. Similarly, it has been defined by the OECD indicating that innovation is a new or significantly improved product (goods or services), a process, the introduction of a new marketing or organisation method in business practice, a workplace organisation or external relations (OECD, 2005). Each of these explanations expresses important aspects of innovation. The authors conclude that the term innovation needs to be understood not as learning new knowledge or generating ideas, but as a process of implementing new ideas that ultimately benefits the parties involved. It can therefore be concluded that ideas and ideas management are one of the pillars of innovation management.

The assessment of a number of considerations and aspects, including taking into account the objective of work, for reasons of clarity and precision, in view of the increased international visibility and relevance of the management of ideas in recent years, concluded that it is appropriate to provide management of ideas from the innovation process. The idea management framework is explained by A.T.Kearney and Gartner's explanation that management of ideas is a structured process involving the generation, evaluation and development of ideas (Rozwell, 2012). By combining these explanations, a definition was created: management of ideas is a systematic process involving generating, evaluating, developing ideas and helping to translate the best ideas into real innovations. The study will use this definition as a basis for explaining not only the management of ideas but also the IMS. The study has adopted, as a definition of IMS, a definition developed by the authors that IMS is an instrument for the development of innovative solutions that provides a systematic process in the virtual environment that includes generating, evaluating, developing ideas and helping to translate the best ideas into real innovations.

Before a more detailed look at IMS, the authors had looked at the development tools for innovative solutions to give a clear insight into the management of ideas. They help organisations to develop competences, technologies, ideas and concepts by turning them into innovation (Mikel, 2012). The authors concluded that most of these instruments have been developed over the last decade (Phaal *et al.*, 2006). The instruments for the development of innovative solutions are numerous and varied, covering a variety of aspects, such as some of them promoting creativity (Kristensen, 2004), knowledge management (Nevo *et al.*, 2007), intellectual capital management (Rivette *et al.*, 2000), open innovation (Chesbrough, 2003), (Dahlaher *et al.*, 2010), etc., but over the last ten years, new solutions have been created, such as IMS.

The world is changing because the new era of knowledge/access/digital brings a wide range of global, regional, national and industrial changes (Johnson, 2001), (Ramo, 2009), so not only the concept of innovation and instruments for the development of innovative solutions should be considered, but in addition to developments affecting the development of IMS, such as the role of innovation. growth in the access/knowledge era, development of open and co-innovation, and crowdsourcing.

The increased role of innovation in the era of the knowledge-based economy should be noted. Innovation is considered to be one of the central elements of a knowledge-based economy, so representatives from different sectors are looking for new ways to make the innovation process more efficient than it used to be. In today's digital economy, rapid access to knowledge is a key success factor for business competitiveness (Tiago *et al.*, 2007), thus the acquisition, creation and use of knowledge, plays an important role in this era, as well as the evaluation of information and ideas (Battistella *et al.*, 2012), (Drucker, 2002), (Pine, 1999). Knowledge is considered to be a different skill of the future (Prahalad, 1998). In a knowledge-based economy, a new trend is emerging: the company controls knowledge, systematically, continuously generates and uses it in development (Shukla, 1997), thereby increasing the need for intellectual resources and their use, motivational tools (Oster, 1999),

and one of these innovation resources is the company's employees and stakeholders. Acquiring ideas and knowledge, evaluating and developing ideas requires special methods for companies to manage them effectively (Bothos et al. 2012), various tools are emerging to provide it, thus creating and studying a variety of tools and techniques worldwide (Escher, 2005), (Gassmann, 2004), (Lichtenthaler, 2007).

Information and communication technologies play a major role in the new era as innovation is linked to the development of information and communication technologies and the Internet, which in turn has an impact on company structure and decision-making process, and the use of different types of networking and virtual environment capabilities is becoming an important element in competitiveness (Garrigos, 2012). Different virtual teams are becoming common, with people from a wide geographical field (Hertel *et al.*, 2005). It is virtual teams that are one of the opportunities for today's organisations that have to be able to operate in global competition, in different markets and under the influence of fast-changing technologies (Gressgard, 2011). As the use of virtual teams increases, the innovation process is also changing in organisations and individual creativity is becoming important (Anderson *et al.*, 2004). As a result, more and more organisations are starting to use a variety of e-environment-based tools. One of the following methods is the use of IMS, applied globally by many large companies such as Adidas, Henkel, IBM, Bombardier, Cisco, Dell, Spar, Detecon, Google, Lego, Toyota, BMW, Melitta, Microsoft, Starbucks, Ideo, Samsung, Rocher, Tchibo, involving their customers and employees in the innovation processes (Roebuck, 2011). It can be concluded that, in an era of new economy/access, where everyone has access to the same literature, technique, methods, measures, etc., the use OF IMS may become a uniqueness aspect for each organisation (Karanjekar, 2007) who want to manage ideas successfully, in line with the latest trends.

## **1.2. Basics of Web-based Idea Management Systems**

An overview of the development, trends' usage and factors

affecting the development of innovative solutions show that changes are taking place around the world, which also lead to the creation of new instruments for the development of innovative solutions, and one of the following instruments, as demonstrated by an overview of section 1.2. and 1.3., is IMS, so that a more detailed look at this instrument is essential. The author will launch an overview of the IMS section 1.2 with a more detailed description of the IMS and their development.

Today's organisations operate in a very complex and fast-changing global environment (Friedman, 2011), which calls for new innovation models and tools (Lee *et al.*, 2012). One such newly created instrument is IMS. One of the world's leading innovation experts, Dr. R.G. Cooper, says that generating ideas is all the work but no responsibility (Cooper, 2001) if the company doesn't have a systematic approach to managing ideas. As a result, the ideas created in a company are not identified, maintained and developed that can be done in an innovation-friendly environments, but these ideas can be addressed through a variety of IMS, enabling a systematic process in the virtual environment that includes generation, evaluation, development and transformation of the best ideas into real innovations.

IMS began to develop in the early 90 s. The first developed IMS can be called “passive” “IMS, but the first 'active' IMS appeared around 2005. One of the first “active” IMS was created by *Bayer MaterialScience* (product – “Idea Works”) (Gamblin *et al.*, 2007). This model motivated employees to be creative and to generate ideas for specific business needs through an Internet-based ideas management system. There are currently more than 70 IMS established worldwide, mostly “active” “IMS” are used and distributed. The authors note that such a situation has emerged on the basis of the substantial difference in the performance and effectiveness between “passive” and “active” IMS. The world is witnessing an increasing number of “active” IMS, but IN “passive” IMS, many companies are distributing parallel to “active” IMS or have ceased their distribution (see Table 6.4 for comparison).

Table 6.4

### Comparison of 'Active' and 'Passive' IMS

	'Active' IMS	'Passive' IMS
<b>Description</b>	The company defines the issues and challenges for which ideas are created and developed. They are published on the Internet platform or are installed on mobile devices where a specific or undefined audience can enter, rate, and develop ideas created. There are opportunities to assess the activities of the creators of ideas by commenting on or voting on the best ideas, thereby creating ideas ratings (Gamblin et al. 2007). Research has shown that the most effective way of managing ideas is the use of various “active” IMS, such as a study conducted by the Swiss Distance University of Applied Sciences shows the effectiveness of IMS (Bothos et al. 2009).	An e-mail system specially designed to perform more functions than a regular recommendation post (Robinson, 1997). It allows ideas from different topics and issues to be submitted, but it tends to slow down the number of ideas submitted after its implementation phase, and to reduce the quality and relevance of the ideas submitted, thereby rendering the process ineffective (Gamblin et al., 2007). The ideas created by this IMS are not focused and there are problems in finding applications and places in the company. Consequently, the distribution of “passive” IMS was almost terminated by the appearance of “active” IMS (Mikelsone, 2013).
<b>Price</b>	\$14,95 - \$250 a month	4 - \$49.50 per month
<b>Users</b>	Different types of organisation in different sectors	

*Source: based on Mikelsone (2013)*

*Bayer Material Science* has identified as the main benefits OF IMS the possibilities of working among unrelated parties, involving staff from all levels and structures, attracting experts commenting on or developing ideas to cooperate with people living in different time zones, continents, to keep all ideas on the platform until they are used (Gamblin *et al.*, 2007).



It is essential for companies/organisations that both internal and external resources can be used to develop innovative solutions, since many innovative ideas can come from people associated with, or from an organisation/enterprise end product/service, etc. These ideas may not be disclosed unless companies/organisations create tools that allow them to reach the innovation marketplace (Hippel, 2005; Mikelsone *et al.*, 2019).

Chesbrough noted that there is too little use of external resources in innovation processes, thereby leading to an inappropriate duplications of innovative activity, emphasising the importance of working with smart people both inside and outside the company; using both internal and external resources in R&D and, if the company finds the best use of internal and external ideas, it will win (Chesbrough, 2003). Moreover, studies have shown that business/organisation customers are no longer satisfied with passivity and want to be involved in the development of innovative solutions for companies/organisations whose final products they use (Showers, 2010). The possibilities and development of instruments to involve clients in the various *co-creation* measures are being stepped up, but instruments are relatively little studied and developed and other stakeholders (Hatch *et al.*, 2010) are also involved. The authors would like to note that, with IMS, it is possible to involve all stakeholders, not only employees, managers and consultants, but also partners, clients, the general public, any audience who can provide valuable ideas to an organisation.

The growth of IMS is currently seen, but the future is expected to increase the role of IMS, not only in a private sector but also in many other sectors. In the future, the authors believe that IMS will become part of a corporate culture, since today the world's leading companies, *Nokia*, *Samsung*, *Siemens*, etc., are unthinkable without the use of IMS (Mikelsone, 2020). Watching the trends of IMS in the world it can be stated the use of IMS in the academic and public sectors have increased gradually.

### **1.3. Alternative**

Looking at IMS, consider their alternatives significantly, thereby gaining insight into the benefits and disadvantages of IMS compared to other development products for innovative solutions. As an instrument for the development of innovative solutions, there are many alternatives, such as “passive” IMS, joint sessions, a variety of consultations that can be obtained and developed.

The authors concludes that “active” the main benefits of IMS are the possibility of creating an efficient network of ideas involving different partners. It is essential that the use of these products and the process of creating ideas is not limited by time and geographical boundaries, since the place of sale and use is the Internet, but by the lack of a relatively new supply that has not been met and understood by potential users. It should be noted that the use of one product does not exclude multiple uses at the same time. Studies have shown, for example, that the use of “active” IMS can effectively be combined with the classic brainstorm (Bothos, 2009). The authors believe that “active” “IMS can be used during a joint session, while “active” or “passive” IMS solutions can be developed through consultations or joint sessions.

For an overall comparison see Table 6.5.

### **Summary**

IMS is an instrument for the development of innovative solutions that provides a systematic process in a virtual environment that includes generating, evaluating, developing ideas and helping to translate the best ones into real innovations.

IMS is in line with world trends. Firstly, in an era of an accessible and knowledge-based economy, the tools that are able to ensure that ideas and knowledge are acquired, evaluated and developed are becoming relevant. Secondly, the role of ICT is increasing, with various Internet tools becoming more important in innovation processes. Thirdly, IMS is becoming an opportunity in the context of open innovation and co-innovation, enabling both internal and external sources of knowledge to be used in the development of innovative solutions, creating a co-ordinated process.

Table 6.5

**Comparison of IMS and 3 Main Alternatives**

	'Active' IMS	"Passiv " IMS	Real Environment IMS sessions	Advice/expert advice
Products	Virtual ideas, evaluation and development systems in a virtual environment.	An e-mail system has been created that performs slightly more functions than a regular suggesting box.	<b>Events where stakeholders share ideas together. The sessions are based on the co-creation methodology.</b>	Different solutions can be obtained and developed during consultations with different specialists.
Advantages	Creating an efficient network of ideas involving different partners (clients, etc.) Time or geographical limits shall not be limited.	An easy way to get ideas.	<b>A fascinating way of acquiring ideas, an opportunity to involve different people.</b>	Obtaining expert opinions and ideas, dealing with specific issues through specialists have become available.
Shortcomings	A relatively new offer that has not been met and understood by potential users.	The ideas created in this idea management product are not focused and there are problems in finding applications and places in the company.	<b>At a specified location and time, so all interested parties may be present.</b>	A relatively lower number of possible solutions.
Place	Distributed over the Internet. Used in the Internet environment.	Distributed over the Internet. Used in the Internet environment.	Distributed over the Internet and in the real environment. Marketed in real environments.	Distributed and marketed in both the Internet and real environments.
Products, examples	Academy of Ideas, SocMap, WebStorm, AKIVA.	Suggestion Box.	Talking ideas.	NOTE, Business Consulting Ltd.

IMS began to develop in the early 90 s. They are distributed worldwide and in the future is expected to increase their role, not only in private but also in other sectors.

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## Chapter 7

# TRANSFORMATION OF EDUCATION SYSTEM MANAGEMENT IN THE CONDITIONS OF MODERN WORLD CHALLENGES

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### **THE ROLE OF ICT IN THE EDUCATION SYSTEM OF CENTRAL EUROPE**

## **1. Introduction**

The emergence of information and communication technologies (ICT) at a rapid pace is the root cause of the marked economic and social changes perceived with the advent of the 21<sup>st</sup> century (Transforming Education, 2011). The most striking consequence of recent decades has been the revitalization of the holistic use of ICT (Saidi & Mongi, 2018). Due to the increased interest in technical science, a significant part of the education system has evolved into an advanced educational organization (Patel & Patel, 2017). Gathering knowledge and information is no longer a problem today, and their preservation is ensured (Braun *et al.*, 2020). Innovative solutions in educational institutions and the use of ICT provide an enhanced basis for knowledge management that serves individual needs (Fazekas *et al.*, 2020). The emergence of ICT has brought about great change in society in several ways. Interest in embedding information and communication technologies in education has grown and has significantly reshaped the nature of the education system (Srivastava, 2016). In fact, ICT is a mixture of computing tools and



multimedia resources that ensure the creation, transfer, and use of knowledge (Alkamel & Chouthaiwale, 2018). The integration of computer devices into educational practices will reform the learning environment and the function of learning aptitudes used so far in different disciplines (Zokirovna, 2020).

The use of electronic technologies in European education is evidenced by a number of studies. In Europe, the educational application of electronic technologies helps to expand students' knowledge and helps them to stand their ground in competition in the knowledge-based economy (Conrads *et al.*, 2017). The aim of this study is to examine the prevalence of ICT technologies in five Central European countries. The reason for choosing the topic is to be found in the impact of the emergence of new technologies on the education system. The study, based on secondary research, examines the use of the Internet by individuals, the Internet access possibilities of households and uses comparative analysis to explore the digital competences of youth and the more experienced generation.

## **2. Literature review**

Over the last century, products developed by intelligent technology have made people's lives easier. In the period of technology, the emergence of ICT has resulted in much higher quality and access to more information (Trehan & Trehan, 2017). According to public policy makers and professionals, it is a well-known reality that in practice, ICT simultaneously enhances educational, economic and social efficiency. In more and more cases, educators try to incorporate digital tools into the curriculum, regularly use electronic tools as well as programs for teaching, and in many cases organize lessons in this way (Brolpito, 2018).

The opportunities offered by ICT promote innovative teaching methods and facilitate the acquisition of information. Nowadays, it participates in the education system as a complementary element (Das, 2019). It enables students to have more effective learning practices, while it also makes it easier for teachers to perform administrative tasks, and provides faster and deeper acquisition of knowledge during education (Dhital, 2018).

The application of ICT was mainly manifested in distance learning. Instead of physical education, students learn in a home environment using a variety of technical tools. ICT has provided spatial and temporal flexibility for students, as it also makes education accessible to students who are geographically separated or have some form of physical disability (Kämäräinen *et al.*, 2002). Education within traditional classrooms is also increasingly benefiting from the integration of electronically accessible content and techniques into the curriculum (Bansal, 2016).

The introduction of the possibilities offered by the technical sciences has an impact on the organization of education in several respects. The change will have an impact on the curriculum, which on the one hand can be accessed electronically by students, giving them immediate feedback on their performance. The reformed scoring system and curriculum provide an opportunity to move towards project-based education (Nádori & Prievara, 2018). Quality education and a modern information network have a significant impact on knowledge building and development. Digital culture encompasses the process of acquiring knowledge correctly, building relationships with others, and correcting difficulties that arise (Eger *et al.*, 2018). ICT investments raise significant questions for decision-makers, including how many tools will be needed, how to distribute them, what additional training would be needed for user teachers, how to integrate these skills into education, and how to apply them effectively in education (Transforming Education, 2011).

Digital education offers many opportunities, but these can only be exploited if the appropriate computer tools are available to both teachers and students and institutions need to have a wide-ranging internet connection. (ICT in Education, 2019). Connecting to the Internet is essential for the operation of most ICT tools, which is an elementary factor in creating an effective learning environment (Uvarov, 2019). In addition, teachers need to be trained and encouraged to use emerging solutions, but it is important to understand that this can never be a completed learning process for them as ICT changes at a lightning fast pace (Kubiatko, 2017).

There are many benefits of incorporating ICT into education. On

the one hand, it influences students' learning skills and, on the other hand, it ensures the professional development of educators (Joshi, 2017). Incorporating innovative solutions into traditional methods helps learners to acquire and store the knowledge they have acquired, provides different learning opportunities according to individual needs, and has a motivating effect on building relationships with others (Chowdhury *et al.*, 2018). Modern information and communication technologies provide both teachers and students with a relatively large amount of knowledge to be acquired in a short period of time, however, ICT also presents many challenges in education (Roliak, 2019). The primary sources of problems may be the lack of technological training on the part of the educator, the lack of effective computer applications, the outdated capacity and lack of experience, and insufficient organizational skills (Henderson, 2020). ICT is changing the way education is used and knowledge is transferred. You can even force the instructor to participate in multiple roles, mediate, or take on the role of student (Baltodano, 2015). Despite the fact that young people use electronic devices on a daily basis, they still face a number of difficulties. For an efficient life path, there is an increased emphasis on the proper application of new technical advances (Braun *et al.*, 2020).

The European Community recognizes the importance of ICT as a strong element in lifelong learning. The goal of this approach is for teachers to be digitally trained and to pass on their knowledge to their students as well (Guarini, 2021).

In the world of electronic operations, knowledge-based and technical innovations are changing very rapidly, which means that huge developments can be expected in the future (Kaware & Sain, 2015). In the field of artificial intelligence, even more marked changes are expected by 2030, which will affect education and learning, the relationship between teacher and students (Szűts, 2020).

The 3<sup>rd</sup> European Education Summit (2020) report states that green and digital education is socially and individually important. However, there is a need for a deeper integration of electronic technology built into the education system, and for a wider provision of Internet connection opportunities. The 2021-2027 Action Plan

aims to develop digital education and improve the digital competences of teachers and students.

### 3. Research methodology

The research is secondary research that builds on the databases of the OECD, The World Bank and Eurostat. We are looking at the period 2015-2019, as the most recent data are from this period. In the context of the comparative analysis, the data serve as a summary, providing insight into the Internet access and use opportunities of the population of the five Central European countries, as well as the digital skills of young people (16-24 age group) and older generations (25-64 age group). The data were aggregated using the Microsoft Excel spreadsheet program.

### 4. Result of research

The most important results of the secondary research are presented below. According to Transforming Education (2011), information and communication technologies can only facilitate the acquisition and use of information if they have access to it. Although gradual progress can be seen, not all countries have a similar rate.

Table 7.1 shows the development of the indicator measuring the Internet use of individuals in five Central European countries in the period between 2015 and 2019. During the examined years, the indicator measuring individual Internet use changed the most in Hungary, rising from 72.8% to 80.4. Slovakia (82.9%) and the Czech Republic (80.9%) improved by about 5%, while Poland (84.5%) improved by 6.5%. The value of the indicator was the highest in Austria (87.8%) over the whole period.

*Table 7.1*

<b>Individuals using the Internet (%)</b>					
	2015	2016	2017	2018	2019
Austria	83.9	84.3	87.9	87.5	87.8
Czech Republic	75.7	76.5	78.7	80.7	80.9
Hungary	72.8	79.3	76.8	76.1	80.4
Poland	68.0	73.3	76.0	77.5	84.5
Slovak Republic	77.6	80.5	81.6	80.4	82.9

*Source: The World Bank Database*

Table 7. 2 illustrates the development of the indicator measuring the Internet access possibilities of households in the period between 2015 and 2019. In connection with the period under review, a significant increase was observed in Hungary (86.20%) and Poland (86.75%), an increase of more than 11%, and an increase of approximately 8% in the Czech Republic (87%). Regarding the indicator measuring the Internet access of households, Austria is the leader over the years, the value of the indicator has increased from 82.42% to 89.91%. Slovakia (82.19%) produced the smallest improvement, showing an improvement of around 2.5%.

*Table 7.2*

**Internet access of all households (%)**

	2015	2016	2017	2018	2019
Austria	82.42	85.09	88.79	88.78	89.91
Czech Republic	78.98	81.65	83.24	86.36	87.00
Hungary	75.64	79.18	82.35	83.31	86.20
Poland	75.78	80.45	81.88	84.19	86.75
Slovak Republic	79.48	80.52	81.33	80.84	82.19

*Source: OECD database*

Braun *et al.* (2020) believe that bearing in mind that the young generation is growing up in an electronic world and using technological devices on a daily basis, their digital skills still need to be developed.

Table 7.3 shows the changes in the indicator measuring the basic and above-average digital competences of young people (age groups 16-24), regardless of gender, according to which the indicator increased from 57% to 62% in the Czech Republic and from 40% to 44% in Poland. Slovakia (54%) has the largest fluctuation in the value of the indicator.

Table 7.4 examines the development of an indicator measuring the basic and above-average digital competencies of the more experienced generation (25-64 years old), regardless of gender. The value of the indicator, similarly to young people, shows an increase in the Czech Republic, from 60% to 67%. Austria, Hungary, Slovakia and Poland show a fluctuating trend, of which Poland (44%) is the lowest. In Slovakia, however, a 6% decrease was observed in 2019 compared to 2017.

Table 7.3

**Individual's level of digital skills (16 to 24 years)**

	2015	2016	2017	2019
Czech Republic	57%	54%	60%	62%
Hungary	50%	51%	50%	49%
Austria	64%	65%	67%	66%
Poland	40%	44%	46%	44%
Slovak Republic	53%	55%	59%	54%

*Source: Eurostat database*

Table 7.4

**Individual's level of digital skills (25 to 64 years)**

	2015	2016	2017	2019
Czech Republic	60%	57%	64%	67%
Hungary	52%	54%	53%	53%
Austria	66%	67%	70%	68%
Poland	40%	44%	46%	44%
Slovak Republic	53%	56%	62%	56%

*Source: Eurostat database*

## 5. Conclusions

In our own study, we studied the possibilities of household Internet access and changes in indicators measuring individual Internet use in five Central European countries between 2015 and 2019. In addition, we used comparative analysis to examine changes in indicators measuring the basic digital skills of the young and older generations.

In connection with the indicators measuring individual Internet use, there is an increasing trend among the examined countries, however, the value of the indicator by 2019 is the highest in the case of Austria (87.8%). Although by 2019 the indicator also shows a value above 80% in the V4 countries, in their case the value of the indicator was much lower than 80% in the initial period of the study (2015), only in the case of Austria (83.9%).

The value of the indicator measuring household Internet access shows an improvement between countries during the period under review. In line with the indicator examined above, Austria is the

leader, accounting for almost 90% of the value of the indicator.

There is still room for improvement in young people's digital competences, which need to be developed in the future. The 2019 outbreak of the coronavirus also hit the education system significantly as educational institutions were forced to switch to online education instead of attendance education, which allows education through a variety of computer devices. In order for teachers to be able to deliver the curriculum smoothly and for students to accept the curriculum, it is important that they have the appropriate technological tools and be able to handle them appropriately.

The results show that of the four Visegrad countries, the Czech Republic has the highest rate, measuring the digital skills of young people, at 62%. In Poland, development is extremely important, as the value of the indicator is less than 50%, ie 44%. In Austria, the indicator shows a progressive development of 66%.

The indicator measuring the digital skills of people aged 25-64 is also the highest in Austria at 68%. In Poland, like young people, the figure is 44%.

Overall, Austria has a progressive trend among the Central European countries studied. Among the Visegrad countries, the Czech Republic plays this role, and Hungary and Slovakia show a similar direction, with more or less different differences. In terms of digital competencies, Poland is at a disadvantage in terms of results.

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## Chapter 8

# IMPLEMENTATION NORMS OF INTERNATIONAL LAW AND EUROPEAN UNION LAW IN THE PROCESS OF ENSURING EFFECTIVE THE ECONOMIC SYSTEMS MANAGEMENT

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**HIGH-RISK THIRD  
COUNTRIES IN RELATION  
TO EU LEGISLATION AND  
FINANCIAL ACTION TASK  
FORCE  
RECOMMENDATIONS**

## INTRODUCTION

Third countries are identified as high-risk by the European Union (the 'EU') and the Financial Action Task Force<sup>17</sup> (the 'FATF') through the EU methodology and FATF Recommendations. The underlying legal regulation of listing a third country on the EU List is the 4th AML Directive.<sup>18</sup> With FATF, this is governed by FATF Recommendations and related methodologies.

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<sup>17</sup> *The Financial Action Task Force is an intergovernmental organization set up in 1989 at the initiative of the G7 to develop anti-money laundering and anti-terrorist financing policies.*

<sup>18</sup> *Directive (EU) 2015/849 of the European Parliament and of the Council of 20 May 2015 on the prevention of the use of the financial system for the purpose of money laundering or terrorist financing, amending Regulation (EU) No 1095/2010 of the European Parliament and of the Council 648/2021 and repealing Directive 2005/60/EC of the European Parliament and of the Council and Commission Directive 2006/07/EC (as amended by the 5th AML Directive).*

Third countries are identified on two levels. On the EU level regarding the existence of a potential threat to the EU internal market, and on the FATF level as posing a possible international threat.

The identification of third countries on the EU level happens through an autonomous evaluation of third countries flagged for identification. In particular, strategic shortcomings in the anti-money laundering and anti-terrorist financing system (the 'AML/CFT System') are analyzed assessing the technical compliance and effectiveness of the AML/CFT System. The evaluation process is divided into several stages, whereby the EU requires the third country to provide a high-level written commitment. The final stage is to produce a Delegated Regulation by the EU Commission with the list of high-risk countries.

The FATF identification is similar to that of the EU, except that it is a more 'formal' process of visiting and cooperating with a third country. The final stage is to adopt a Mutual Evaluation Report.

## **EU HIGH-RISK THIRD COUNTRIES IDENTIFICATION METHODOLOGY & FATF RECOMMENDATIONS APPLICATION**

### **EU HIGH-RISK THIRD COUNTRIES IDENTIFICATION METHODOLOGY**

Based on the power to adopt **Delegated Acts**, the EU Commission proposed to add further countries<sup>19</sup> to the List of High-Risk Third Countries (the 'EU List') at the beginning of 2019, which

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<sup>19</sup> For more details, see: Directive (EU) 2015/849 of the European Parliament and of the Council of 20 May 2015 on the prevention of the use of the financial system for the purpose of money laundering or terrorist financing, amending Regulation (EU) No 1095/2010 of the European Parliament and of the Council 648/2021 and repealing Directive 2005/60/EC of the European Parliament and of the Council and Commission Directive 2006/07/EC (as amended by the 5th AML Directive). Interinstitutional Agreement between the European Parliament, the Council of the European Union and the European Commission on Better Law-Making

– despite calls and requests – failed to address the shortcoming identified in combating money laundering and terrorist financing (the 'AML/CFT System').

Pursuant to Article 64 of Section 5 of the 4AMLD, the entry into force of the Delegated Act is linked to the absence of objections by the European Parliament and the Council of the EU within one month of notification. With this regard, the European Parliament and the Council of the EU – by exercising their right and subsequently rising objections – made it impossible to add other high-risk countries (eg Panama, Saudi Arabia, etc) to the EU list. This was mainly the result of procedural shortcomings due to the lack of a transparent process aimed at motivating the countries concerned to take decisive action in addressing the strategic shortcomings, while respecting the rights of third countries, including the right to comment on shortcomings identified therein.

In this context, the European Parliament called on the EU Commission in its resolution to set up a transparent process involving the introduction of specific benchmarks for countries to avoid being included in the EU List.<sup>20</sup> The initial methodology for identifying high-risk third countries was largely originating from the FATF methodology similarly aimed at identifying high-risk third countries.<sup>21</sup>

It follows from the above, a **revised methodology for identifying high-risk third countries (the 'EU Methodology')** was published.<sup>22</sup>

The new EU Methodology applies to all third-country jurisdictions. Referring to the Treaty on the Functioning of the EU, it also applies to the overseas countries and territories, which have their own legal system different to that in force in the EU Member

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<sup>20</sup> *European Parliament resolution of 19 September 2019 on the state of implementation of the Union's anti-money laundering legislation (2019/2820(RSP)).*

<sup>21</sup> *FATF, Methodology for assessing technical compliance with the FATF Recommendations and the effectiveness of AML/CFT systems, 2013.*

<sup>22</sup> *Commission staff working document. Methodology for identifying high-risk third countries under Directive (EU) 2015/849.*

States.<sup>23</sup> The EU Methodology also applies to all associated non-European countries and territories that have special relations with Denmark, France, the Netherlands, and the United Kingdom.<sup>24</sup> In particular, it includes third countries that have made a monetary agreement with the EU.<sup>25</sup>

As the EU Methodology focuses exclusively on third countries, EU Member States and countries acceding to the European Economic Area Agreement are therefore excluded from the EU List.<sup>26</sup>

**The main elements of the methodology** focus on two aspects:

- *interaction between the EU and the Financial Action Task Force.* 4AMLD directly regulates the obligation to include the instruments of other international bodies active in AML/CFT Systems, in particular the FATF Recommendations.<sup>27</sup> In this regard, it is a correlation between two high-risk country lists (FATF & EU) As a general rule, third countries on the FATF High-Risk Country List (the 'FATF List') should also be included in the EU List. If there is a discrepancy, and a certain country is not listed in the EU List, the EU Commission has the power to assess the sufficiency and complexity of the FATF procedures of adding that particular country to the FATF List. In particular, the existence of additional specific criteria set by the EU (such as the degree of threat posed by a third country) is examined. In addition, the EU Commission has the power to add a third country to the EU List that is not included in the FATF List.

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<sup>23</sup> Commission staff working document. *Methodology for identifying high-risk third countries under Directive (EU) 2015/849*, p. 9.

<sup>24</sup> Article 198 and Annex II. of the Treaty on the Functioning of the EU.

<sup>25</sup> It concerns: San Marino, Monaco, Andorra, and Vatican.

<sup>26</sup> It includes: Norway, Istanbul, and Liechtenstein.

<sup>27</sup> The 4th Recital of Directive (EU) 2015/849 of the European Parliament and of the Council of 20 May 2015 on the prevention of the use of the financial system for the purpose of money laundering or terrorist financing, amending Regulation (EU) No 1095/2010 of the European Parliament and of the Council 648/2011 and repealing Directive 2005/60/EC of the European Parliament and of the Council and Commission Directive 2006/07/EC (as amended by the 5th AML Directive).

- *autonomy of EU third country evaluation.* Pursuant to 4AMLD, the basis for classifying third countries as high-risk is the existence of **strategic shortcomings** in national mechanisms of AML/CFT Systems and the existence of a significant threat to the Union's financial system.

The EU Methodology regulates **two ways of identifying third countries** as high-risk, i.e. third countries assessed by the FATF and autonomous assessment of EU third countries.

In general, the principle is those third countries on the FATF List are also included in the EU List. The reason to include high-risk third countries in the FATF List is the existence of a real threat to the international financial system, and for this reason, these countries are also considered a threat to the EU financial system.<sup>28</sup>

It is important to note in this regard that the EU Commission, together with some Member States, is a member of the FATF, and the remaining Member States are also represented by the FACT through MONEYVAL.

**The aim of adding** a country to the EU List is to provide for the protection of the EU's financial system and the proper functioning of the EU's internal market.<sup>29</sup>

The identification of high-risk third countries takes into account **strategic shortcomings** in the following areas: the existence and effectiveness of the functioning of the legal and institutional framework in AML/CFT Systems in third countries; the effectiveness of the risk management methodology of AML/CFT Systems in third countries; and the powers and procedures of the

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<sup>28</sup> For more details, see: Commission staff working document. *Methodology for identifying high-risk third countries under Directive (EU) 2015/849*, p. 12.

<sup>29</sup> Article 9 of Section 1 of Directive (EU) 2015/849 of the European Parliament and of the Council of 20 May 2015 on the prevention of the use of the financial system for the purpose of money laundering or terrorist financing, amending Regulation (EU) No 1095/2010 of the European Parliament and of the Council 648/2011 and repealing Directive 2005/60/EC of the European Parliament and of the Council and Commission Directive 2006/07/EC (as amended by the 5th AML Directive).

oversight authorities, including the level of cooperation with the competent authorities of the Member States.<sup>30</sup>

Identifying strategic shortcomings in third countries is part of a comprehensive process aimed at including a third party in the EU List.

In this context, the revised EU Methodology – in the assessment of AML/CFT regime of this country – assesses the following aspects: the criminalization of money laundering and terrorist financing; due diligence requirements vis-a-vis customers; keeping of records and reports of suspicious financial and non-financial transactions; the powers and procedures of the oversight authorities; the existence of dissuasive, reasonable, and effective sanctions; experiences of international cooperation; the availability and sharing of information on beneficial owners of individuals and legal arrangements; implementation of targeted financial sanctions.<sup>31</sup>

## **FINANCIAL ACTION GROUP THIRD COUNTRY IDENTIFICATION RECOMMENDATIONS**

**The FATF identification and evaluation processes** are implemented through FATF Recommendations, technical compliance assessment methodology with FATF Recommendations, and the effectiveness of AML/CFT Systems (the 'FATF Methodology').

The FATF Recommendations does not define high-risk third countries as such. In this regard, the FATF emphasizes that it is not

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<sup>30</sup> For more details, see Article 9 of Section 2 of Directive (EU) 2015/849 of the European Parliament and of the Council of 20 May 2015 on the prevention of the use of the financial system for the purpose of money laundering or terrorist financing, amending Regulation (EU) No 1095/2010 of the European Parliament and of the Council 648/2021 and repealing Directive 2005/60/EC of the European Parliament and of the Council and Commission Directive 2006/07/EC (as amended by the 5th AML Directive).

<sup>31</sup> Commission staff working document. Methodology for identifying high-risk third countries under Directive (EU) 2015/849, p. 6.

easy to define them, as several third countries with different types of risk associated with different types of crime exist.<sup>32</sup>

**FATF Recommendations** require increased care concerning third countries that the FATF considers to be high-risk. At the same time, it calls for the adoption of appropriate and effective countermeasures that are adequate to the risks associated with being included in the FATF List.<sup>33</sup>

**FATF Methodology** focuses on the following areas: international cooperation and coordination, money laundering in terms of criminal liability, implementation of targeted financial sanctions in the area of terrorist financing, implementation of targeted financial sanctions related to the proliferation of weapons of mass destruction, international cooperation, supervision and oversight, financial intelligence unit, and sanctions.

**FATF Methodology** draws attention to two related components in the context of third-country assessments:

- *technical compliance*. Technical compliance assesses the effectiveness of related legislation and the establishment of an appropriate institutional framework of AML/CFT Systems. In particular, it is related to the assessment of the degree of third country legislation compliance with FATF Recommendations.<sup>34</sup>
- The main part of the technical compliance assessment comprises of the risk assessment and the risk approach application. Third countries should apply a Risk-Based Approach (the 'RBA')<sup>35</sup> to prevent or mitigate the risk of money laundering and terrorist financing. In this context, the FATF allows some of its

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<sup>32</sup> Annex 2, Commission staff working document. *Methodology for identifying high-risk third countries under Directive (EU) 2015/849*, p. 55

<sup>33</sup> *The FATF Recommendations*, p. 19.

<sup>34</sup> For more details, see: FATF, *Methodology for assessing technical compliance with the FATF recommendations and the effectiveness of AML/CFT systems*, 2013, p. 15-17.

<sup>35</sup> For more details, see: *Report from the Commission to the European parliament and the council on the assessment of the risk of money laundering and terrorist financing affecting the internal market and relating to cross-border activities. Wolfsberg Statement Guidance on a Risk Based Approach for Managing Money Laundering Risks*.



recommendations not to be applied, but the third country concerned will be required to show records of the existence of low risk in relation to a particular financial institution and its activities or operations performed by individuals and/or companies (evidence of temporary operation).<sup>36</sup>

- *the effectiveness of AML/CFT Systems* is examined in terms of the effectiveness of the systems established and of the results achieved.<sup>37</sup> Efficiency refers to the degree to which financial systems mitigate the risks and threats of money laundering and terrorist financing activities. The intention is to determine the extent to which national systems achieve compliance with and objectives stipulated by the FATF standards. In addition, all system failures are identified based on the performance analysis. The evaluation of the effectiveness of the systems takes into account existing national legislation, the powers of the oversight authorities, and the overall set of measures aimed at combating AML/CFT. It follows from the above, the FATF Methodology directly governs the individual issues that have considered by the evaluators when evaluating the compliance with the AML/CFT criteria. Based on the answers to the issues above, the actual state of AML/CFT Systems is determined.<sup>38</sup>

## **EU LIST & FATF LISTING PROCEDURE**

### **EU HIGH-RISK THIRD COUNTRIES LISTING AUTONOMOUS PROCESS**

Currently, the autonomous process of listing a third country on the EU List **consists of the following stages**: applicability, the

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<sup>36</sup> For more details, see: *FATF, Methodology for assessing technical compliance with the FATF recommendations and the effectiveness of AML/CFT systems, 2013, p. 26.*

<sup>37</sup> For more details, see: *FATF, Procedures for the FATF Fourth Round of AML/CFT Mutual Evaluations, p. 5.*

<sup>38</sup> For more details, see: *FATF, Methodology for assessing technical compliance with the FATF recommendations and the effectiveness of AML/CFT systems, 2013, p. 18 and 20-21 and 99 – 130.*

definition of priorities, evaluation, cooperation with third countries, and conclusion and delegated act implementation.

The **applicability** focuses on the overall assessment and identification of high-risk third countries. Countries are considered as being high-risk if they meet any of the following criteria:

- designation by the European External Action Service or Europol as a third country that has a systemic impact on the integrity of the EU financial system due to the degree of threat. The information assessed includes inter alia an analysis based on the data collected on serious and organized crime.<sup>39</sup>
- international foreign financial centers. These are third countries, the list of which is used by the OECD.<sup>40</sup>
- countries with strong economic ties to the EU. Statistical indicators made based on the list of non-cooperating third countries are used.<sup>41</sup>

It follows from the above that high-risk third countries pose a threat to both the international system and the EU internal market. As a result, the FATF List is not included in the priority setting stage. Third countries on the FATF List are not subject to evaluation and are automatically considered high risk.

**Defining Priorities** Based on the applicability definition above, third countries are divided into individual groups. At present, third countries are divided into two groups. The first group contains a list of third countries with the highest priority, while the second group will be evaluated gradually until 2025.<sup>42</sup>

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<sup>39</sup> For more details, see: Council Document 12159/12, *Serious and Organised Crime Threat Assessment (SOCTA) – Methodology*.

<sup>40</sup> For more details, see: *OECD Taxation Working Papers No. 46*, p. 21.

<sup>41</sup> For more details, see: *Council conclusions on the revised EU list of non-cooperative jurisdictions for tax purposes (2021/C 66/10)*.

<sup>42</sup> *EU policy on high-risk third countries* [https://ec.europa.eu/info/business-economy-euro/banking-and-finance/financial-supervision-and-risk-management/anti-money-laundering-and-counter-terrorist-financing/eu-policy-high-risk-third-countries\\_en](https://ec.europa.eu/info/business-economy-euro/banking-and-finance/financial-supervision-and-risk-management/anti-money-laundering-and-counter-terrorist-financing/eu-policy-high-risk-third-countries_en) [26-04-2021]

The first group includes third countries, modified in the list of non-cooperating jurisdictions for tax purposes, and countries that have already been assessed according to FATF Recommendations.

**Evaluation** The Commission is preparing a comprehensive document analyzing the following areas: risk profile and level of threat by the third country, AML/CFT system vulnerability based on the shortcomings identified, evaluation conclusion.<sup>43</sup>

**Cooperation W/ Third Countries** The aim is to motivate third countries to address pre-identified issues to avoid being included in the EU List. Once the consultation process is complete, the EU Commission may still have serious concerns about mitigating the risks the country is facing. In this context, the EU Commission will prepare a series of mitigation measures that the country is obliged to take to address the concerns raised. Based on the comments received, the EU Commission will require a written high-level political commitment to be made by the third country. In addition, the EU Commission sets an observation period, which is usually 12 months.

**Delegated Regulation & Conclusion** If a third country fails to make a high-level political commitment, the Commission may conclude that strategic shortcomings persist. It follows that the EU Commission will have the power to adopt a delegated act, whereby rendering the country as a high-risk third country.

Compared to the FATF List, the EU List requires stricter controls on transactions between the EU and third countries. This may ultimately affect “poor” third countries, where the majority of the population suffers from financial exclusion.<sup>44</sup>

## **FATF HIGH-RISK THIRD COUNTRIES LISTING PROCEDURE**

**Third Country Visit Preparation** At least six months before the scheduled visit to the third country, the FATF Secretary shall notify

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<sup>43</sup> For more details, see: Commission staff working document. *Methodology for identifying high-risk third countries under Directive (EU) 2015/849*, p. 27- 34.

<sup>44</sup> For more details, see: FATF, *Guidance Anti-Money Laundering and Terrorist Financing Measures and Financial Inclusion*.

the country concerned of the schedule and the entire on-site evaluation process. This country must provide up-to-date information on the technical compliance and effectiveness of AML/CFT Systems. Likewise, the FATF assessment team will examine the level of technical compliance and risk factors of AML/CFT Systems. The on-site visit provides the best opportunity to clarify issues related to the functioning of AML/CFT Systems. The total length of the visit is ten days.<sup>45</sup>

**Conclusions & Mutual Evaluation Report** At the end of the on-site visit, the FATF evaluation team will set a deadline for preparing the conclusions and (if applicable) for discussing the content of the Mutual Evaluation Report (the 'MER'). As part of the evaluation process, the third country may comment on the proposals of the FATF evaluation team. The role of the FATF evaluation team is to present the key issues of the third country as well as other findings during the discussion. Subsequently, the FATF Plenary discusses the shortcomings identified.

**Mutual Evaluation Report** The FATF Plenary will consider the views of the evaluation team and the objections of the third country in the process of adopting the MER. At the end of the discussion, a final version of the MER will be adopted. If the FATF Plenary does not jointly agree on the MER text, the FATF Secretary will produce amendments and supplements. Proposals may be related to the need for further information or amendments. As part of the subsequent decision-making process, the FATF Plenary may postpone the adoption for the MER to finalize pending further discussions of the proposed changes or (if minor changes are concerned) approve the MER subject to later amendments.<sup>46</sup>

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<sup>45</sup> *FATF, Procedures for the FATF Fourth Round of AML/CFT Mutual Evaluations*, p. 13.

<sup>46</sup> *For more details, see: FATF, Procedures for the FATF Fourth Round of AML/CFT Mutual Evaluations*, p. 17.

## CONCLUSION

The biggest issue with the existence of two independent lists (EU and FATF) is their discrepancy. For instance, countries such as Iceland and Albania are not listed on the EU List. The reason for omitting the states is the applicability governed by the EU Methodology. The EU Methodology does not apply to the EU Member States. With regard to Albania, it is an acceding EU country.

Another issue is the need for two independent lists. The EU Commission and the EU Member States are members of the FATF and are the largest group.

The EU has taken over the recommendations of the FATF and incorporated them into the 4AMLD. 4AMLD directly governs the duty to include the instruments of other international bodies active in combating CML/CTF, with the priority given to the FATF Recommendations.<sup>47</sup>

In the context of these findings, we question the need for the simultaneous application of two independent third country evaluation processes as well as the existence of two separate lists. It would probably be more appropriate to review the current situation and incorporate the FATF List into the EU List.

### References:

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3. *Council Document 12159/12, Serious and Organised Crime Threat Assessment (SOCTA) – Methodology.*
4. *European Parliament resolution of 19 September 2019 on the state of implementation of the Union's anti-money laundering legislation*

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<sup>47</sup> *The 4th Recital of Directive (EU) 2015/849 of the European Parliament and of the Council of 20 May 2015 on the prevention of the use of the financial system for the purpose of money laundering or terrorist financing, amending Regulation (EU) No 1095/2010 of the European Parliament and of the Council 648/2011 and repealing Directive 2005/60/EC of the European Parliament and of the Council and Commission Directive 2006/07/EC (as amended by the 5th AML Directive).*

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  9. *Report from the Commission to the European parliament and the council on the assessment of the risk of money laundering and terrorist financing affecting the internal market and relating to cross-border activities. Wolfsberg Statement Guidance on a Risk Based Approach for Managing Money Laundering Risks.*
  10. *Directive (EU) 2015/849 of the European parliament and of the Council of 20 May 2015 on the prevention of the use of the financial system for the purposes of money laundering or terrorist financing, amending Regulation (EU) No 648/2012 of the European Parliament and of the Council, and repealing Directive 2005/60/EC of the European Parliament and of the Council and Commission Directive 2006/70/EC.*
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[https://ec.europa.eu/info/business-economy-euro/banking-and-finance/financial-supervision-and-risk-management/anti-money-laundering-and-counter-terrorist-financing/eu-policy-high-risk-third-countries\\_en](https://ec.europa.eu/info/business-economy-euro/banking-and-finance/financial-supervision-and-risk-management/anti-money-laundering-and-counter-terrorist-financing/eu-policy-high-risk-third-countries_en)

## CONCLUSION

In the context of modern world challenges facing society caused by the COVID-19 pandemic, the most important factor in ensuring the sustainable functioning and further development of economic entities is the formation and implementation of new concepts, strategies and mechanisms for managing economic systems. Modern world challenges necessitate the transformation of economic systems and the formation of new approaches to their management. This is manifested through a decrease in the competitiveness of economic entities, ineffective use of resource potential, an increase in operating costs, and a low level of innovation. In connection with the impact of the COVID-19 pandemic on socio-economic processes, it becomes necessary to revise, improve and supplement the existing methods of managing economic systems. The solution to this issue is partially possible through the introduction of modern information technologies in the subject area of economic systems management, innovative restructuring of economic entities, improvement of business processes, digital transformation, effective information support of business processes. Digitalization has become an effective tool for optimizing economic activity, an element of a growth strategy in the market and a model for expanding the volume of activities, which has formed a new concept for managing economic systems.

The results of the authors' research in a scientific monograph are devoted to solving the problems of forming and improving new concepts and strategies for managing economic systems, and mechanisms for their implementation in the context of modern world challenges to society on the basis of models of managing economic entities.

An important component of the scientific monograph is the formation of modern strategies for increasing the competitiveness of economic systems, improving corporate structures, innovative restructuring of enterprises, ensuring environmental safety, approaches to implementing a supply chain logistics management system, making effective decisions in the forecasting system,

developing e-commerce, implementation of information technologies in project financing, controlling, education system, etc.

The research results presented in the scientific monograph reflect the theoretical and practical aspects of the implementation of organizational-economic mechanisms for managing economic systems in the context of modern world challenges, conditions of constantly changing market conditions and instability of markets for goods and services, preservation and optimization of the resource potential of economic entities, the introduction of modern innovative technologies and digitalization of economic activities.

It has been established that the effective use of conceptual approaches to the management of economic systems is an important element of innovative support for the activities of economic entities, which makes it possible to improve operational processes at enterprises and carry out restructuring. Such systems are aimed at increasing production efficiency, optimizing operating costs, improving corporate structures, and introducing logistics.

Overcoming the crisis of socio-economic processes in the context of modern world challenges provoked by the COVID-19 pandemic, and creating conditions for the sustainable further functioning of economic entities are aimed at structural changes in promising sectors of the economy. At the same time, economic diagnostics of the existing potential of economic systems, rational use of available resources and information environment, which demonstrates the real state of problems and allows to develop mechanisms for market self-regulation and management of economic systems, to develop possible scenarios for overcoming the pandemic crisis based on a conceptual approach, is of great importance.

The scientific monograph uses modern methods and technologies for assessing crisis phenomena and threats, as well as modeling crises, and developed scenario forecasts for effective management of economic systems in the post-pandemic period. Optimization models using data mining, fuzzy logic in decision support systems for evaluating investment projects, modeling the



sustainability of companies, using the production function to study the competitiveness of small and medium-sized industrial enterprises, information technologies of project financing, web-based idea management systems, information computer technologies in educational systems have found their application.

Practical recommendations have been developed and proposed to overcome the negative consequences of the pandemic and the further effective functioning of economic systems, in particular, mechanisms to ensure liquidity and solvency, innovative restructuring, strategic management of intermodal logistics, models of increasing competitiveness.

Promising directions for overcoming the pandemic economic crisis in the future, arising from research in a scientific monograph, are the implementation of environmental safety strategies, blockchain as a driver of digitalization, the formation of international logistics networks, optimization of business processes, etc.

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