MONOGRAPH

DEVELOPMENT OF SMALL AND MEDIUM ENTERPRISES: THE EU AND EAST-PARTNERSHIP COUNTRIES EXPERIENCE

Edited by professors Igor Britchenko and Yevheniia Polishchuk

Tarnobrzeg 2018

STATE HIGHER VOCATIONAL SCHOOL MEMORIAL
OF PROF. STANISLAW TARNOWSKI IN TARNOBRZEG
and
KYIV NATIONAL ECONOMIC UNIVERSITY
NAMED AFTER VADYM HETMAN
and
HIGHER SCHOOL OF SOCIAL AND ECONOMIC IN PRZEWORSK

MONOGRAPH

DEVELOPMENT OF SMALL AND MEDIUM ENTERPRISES: THE EU AND EAST-PARTNERSHIP COUNTRIES EXPERIENCE

Edited by professors Igor Britchenko
and Yevheniia Polishchuk

Tarnobrzeg 2018

УДК 334.78:336.1

The monograph is approved for publication at the meeting of Council
of the State Higher Vocational School Memorial of Prof. Stanisław Tarnowski
(from 20.03.2018)

Development of small and medium enterprises: the EU and East-partnership countries experience: monograph / [Britchenko I., Polishchuk Ye. and all] / Edited by Igor Britchenko and Yevheniia Polishchuk : Wydawnictwo Państwowej Wyższej Szkoły Zawodowej im. prof. Stanisława Tarnowskiego w Tarnobrzegu, 2018. — P. 378.

The monograph reveals challenging issues of small and medium enterprises development in the European Union and East-Partnership countries. Special attention is paid to a new paradigm of financing investments and fostering innovations at all levels of legal entities including SMEs, enhancing innovative entrepreneurship in conditions of global social and technological challenges as well as determining priority sectors for small and medium enterprises as drivers of economic growth.

The authors of the monograph emphasize on such European approaches to financing SMEs as crowd-funding and SME-bonds, analyze experience of applying fiscal instruments to support investment and innovations. The researchers underline the role of social investment as an innovative strategy for European SMEs that could be applied in Ukraine and East-partnership countries, suggest new conceptual approach to the evaluation of innovative business development. They also analyse trends of Ukrainian IT enterprises development in the context of modern information services in a global market.

Additional attention is paid to the analysis of SMEs' entrepreneurial potential in conditions of global social and technological changes, estimation effects of applying electronic governance technologies to provide administrative services by public authorities of various levels of governance. Finally, the researchers disclose economic mentality of legal entities as an informal side of financial assets and substantiate the necessity of creation entrepreneurial universities as drivers of innovative development of economy.

The materials of the monograph will be useful to scholars, financial managers of companies, financial analysts, representatives of state bodies who implement the state policy in the field of SMEs development in the East-partnership countries, as well as students of economic universities.

CONTENT

INTRODUCTION

Last twenty years small and medium enterprises (here and after — SME) play crucial role and make a great impact on the growth economy. Latest research shows their incresing part in GDP in the most highly developed countries. High developed SME sector became a feature of wealthy economy and prosperous country.

In the Investopedia the definition of SME looks like small and midsize enterprises are businesses that maintain revenues, assets or a number of employees below a certain threshold. Every country and economic organization has its own definition of what is considered a small and medium-sized enterprise. In the United States, there is no distinct way to identify SMEs, but in the European Union, a small-sized enterprise is a company with fewer than 50 employees, while a medium-sized enterprise is one with fewer than 250 employees.

As statistics shows, more than 15,2 thousand of medium and 328 thousand of small business representatives function in Ukraine. On these enterprises more than 6.1 million employees are involved. This is not very high indicators for such a big country as Ukraine. There is a range of obstacles which exist and do not allow SME to develop. Most of them were described in huge number of scientific and popular literature. Among them there are:

– Poor entrepreneurial culture in the countries. People do not know how to start and then how to run their businesses; risk of capital loosing is also make potential entrepreneurs to refuse from further actions,

– The pressure of authorities on SMEs decrease the incentives of development. The cost of running business is much higher because of the corruption;

– The strategy of SME development, does not fit general government policy of economic growth;

– Poor literacy of knowledge about different finding sources leave SMEs on the sidelines of financial flows;

– The focus on only trading activity does not accept SMEs to create innovations. This means that their competitiveness is lower than other innovative enterprises. That is why for most SMEs the grant funding, which supports innovations, is closed;

– Ukrainian banks nowadays are more strictly than before in risk assessments of business. The banks suffer from the lack of clients in SME sector, but in the same time they must follow the requirements of Central Banks.

Situations can be changed with the adoption of a number of measures in such directions: to develop modern and traditional instruments of SMEs projects financing; to work out the tax incentives and instruments of development innovations and investments in SME; to develop entrepreneurial culture as a background for the SMEs growth; to transform the ways of governmental support of SMEs development in the context of global challenges; to measure of the effectiveness of international support programs for the SMEs development; to propose new forms of business associations and their role in the SMEs development; to identify the priority sectors of small and medium enterprises as drivers of economic growth; to develop social investments as a contribution to SMEs development.

Due to this, the goal of the study is to find out the main changes in different directions of SME development in EU and Eastern-European countries and to give recommendations for Ukrainian situation.

Ukrainian situation.

Mentioned issues were studied be such authors as: Ye. Polishchuk, M. Dyba, I. Britchenko, T.Mayorova, I.Petrenko, P. Rubanov, O. Subochev, O. Yurkevych, O. Tymchenko, Yu. Sybirianska, Yu.Vasylyshen, Z.Varnalii, M. Romanyuk, D. Nikytenko, Z. Matsuk, V.Gura, I.Mazur, P. Jarosh, Iu. Gernego, O. Dyba, V. Dyba , I. Kubareva, P. Machashtchik, V. Lavrenenko , N. Harashchenko , V. Vostriakova, I. Riepina, K. Riepin, L. Petrenko, A. Pavlenko, I.Pavlenko , Ch.Chyzhov, G. Shvydanenko, O. Borodkov , O. Pereverzieva, A.Ivashchenko, O. Chukurna, Yu. Danshina, O. Zubko, K. Kravets, T. Cherniavska, B. Cherniavskyi, Iu. Ignatova, N. Rudyk, M. Borowska.

The materials of the monograph will be useful to researchers, managers of SMEs, representatives of government agencies implementing the state policy in the field of SMEs, as well as students studying finance and investment.

CHAPTER 1.

MODERN AND TRADITIONAL INSTRUMENTS OF SMES PROJECTS FINANCING

SME BONDS IN EUROPEAN COUNTRIES AS A NEW APPROACH TO FINANCING

Ye.Polishchuk,
Doctor of Science in Economics, professor,
Kyiv national Economic University named after Vadym Hetman
M. Dyba,
Doctor of Science in Economics, professor,
Kyiv national Economic University named after Vadym Hetman
I. Britchenko,
Doctor Habil., Professor of State Higher Vocational School
Memorial of Prof. Stanislaw Tarnowski
O. Svyrydenko,
PhD Student of StateState Research Institute
of Informatization and Economic Modeling

Nowadays a lot of new financial instruments for SMEs innovation projects are getting more popular in the business environment. A great number of them are traditional like credit loans at the same time we can observe the appearance of innovative ones. Variable set of financial instruments generalized on fig.1. This classification is giving by Organiztion of Economic Cooperation and Development (OECD). As we can see from the fig.1 the classification is based on risk approach.

For further research it is needed to clarify these definitions. Firstly, *asset based finance* is the method of assigning structured turnaround capital and term loans, disbursement of debit portfolio, stocks, machines, funds, and / or real estate. This type of finding is suitable for SMEs beginners, refinancing existing loans, growth financing, mergers and acquisitions.

Secondly, alternatives debt is a form of debt relief and are currently referred to as debt restructuring or tolerance. Debt restructuring allows SME

to reconcile the terms of payment, terms and payment schedules to allow the recipient to get a better chance of returning the primitive principal. By weakening the part of the pressure of accrued interest, as well as reducing the amount paid for each lot, the creditor protects himself from the debtor who is at risk of his payments, and thus increases the probability of satisfaction of the primary debt. Alternative debt can also be used for lower interest rates. Accepting an existing debt and / or reviewing its condition, or paying a principal amount at the expense of funds received from new sources of financing, the developer corporation may reduce its costs of financing below the amount incurred as a result of the original contract. The corporation may issue callable bonds for s restructuring in the future. The debt from these bonds can be called up as necessary, and then replaced by a new, lower interest rate [2].
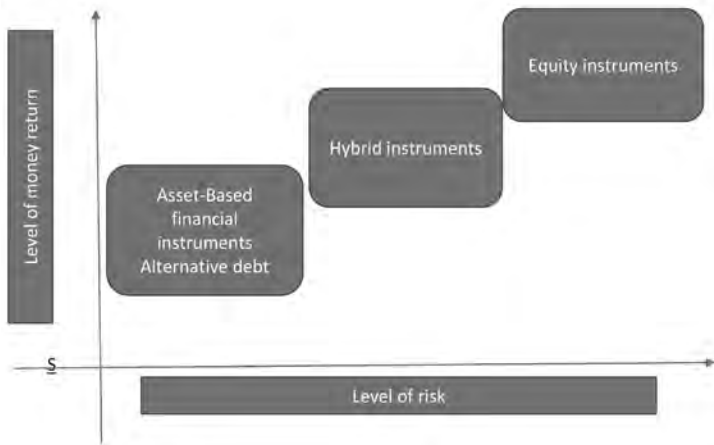
Fig. 1. Groups of financial instruments for SME innovation project*
Source: Based on [1]

Thirdly, "hybrid instruments are the key tools in shaping a holding firm's tax policy appears to be merited" [3].

Fourthly, equity investments provide a critical capital base for a company or project to grow its operations, access other sources of finance, and reduce investment risks faced by other project/company investors, especially debt investors who are repaid before equity investors [4].

From within each group there are other specific instruments. In the table 1 below the types of financial instruments are described within each group.

Table 1

Types of alternative SME financing*

ASSET-BASED FINANCING	
Asset-based lending	A business loan secured by collateral (assets). The asset-based loan, or line of credit, is secured by inventory, accounts receivable, equipment, and/or other balance-sheet assets.
Factoring	A financial transaction and a type of debtor finance in which a business sells its accounts receivable (i.e., invoices) to a third party (called a factor) at a discount
Purchase order financing	A funding option for businesses that need cash to fill single or multiple customer orders.
Warehouse Receipt	A receipt used in futures markets to guarantee the quantity and quality of a particular commodity being stored within an approved facility
Leasing	A contract outlining the terms under which one party agrees to rent property owned by another party.
ALTERNATIVE DEBT	
Corporative bonds	A corporate bond is a <u>debt security</u> issued by a corporation and sold to investors
Securitized debt instruments	the products of securitization, which in turn is the process of passing debts onto entities that in turn break them into bonds and sell them.
Covered bonds	are debt securities issued by a bank or mortgage institution and collateralised against a pool of assets that, in case of failure of the issuer, can cover claims at any point of time. They are subject to specific legislation to protect bond holders.
Private placement is	a capital raising event that involves the sale of securities to a relatively small number of select investors. Investors involved in private placements can include large banks, mutual funds, insurance companies and pension funds.
Crowdfunding (debt)	Debt based crowdfunding encompasses several different types of crowd based lending. These include mini-bonds, peer-to-peer lending (sometimes known as 'peer-2-peer'

	or 'P2P' lending) and invoice financing. Essentially, a large amount of retail investors (the crowd) lend money through a platform to a business or individual. In removing many of the middlemen that would be involved if the transaction happened through a bank, debt based crowdfunding can keep the costs down for borrowers while giving the lenders improved rates of return.
"HYBRID INSTRUMENTS"	
Subordinated loans/ bonds	A loan or security that ranks below other loans and securities with regard to claims on a company's assets or earnings.
Silent Participations	financing method an investor (so called silent partner) participates in the commercial business of another person by providing a capital deposit and in return receiving a participation in the profits of the company
Participating loans	a special form of a loan. The lender receives a participation in the profits or turnover of the company in return for the provision of capital. This participation can be confined to the purpose for which the loan was provided or pertain to the whole business of the company. Additionally, fixed interest payments can be included in the contract. The participating loan differs from a silent participation particularly by the fact that the lender does not hold a stake or share in the company. He cannot influence the company's business and does not participate in the company's losses.
Profit participation rights	are purely contractual participations in a company with which the investor participates as well in profits as in losses of the company. The owner of the profit participation right is not a shareholder of the company and he is usually not entitled to membership rights. This means that he has no voting right in the company's shareholders' meeting and no right to attend these meetings.
Convertible bonds	a type of debt security that can be converted into a predetermined amount of the underlying company's equity at certain times during the bond's life, usually at the discretion of the bondholder.
Bonds with Warrants	a bond with an attached warrant, the warrant gives you the right to buy a certain number of fixed-price shares of the stock of the company that issues the bond. You are not

	obligated to purchase the stock, and the price specified on the warrant may be different from the price at which the stock is trading on the day you buy your bonds.
Mezzanine finance	A hybrid of debt and equity financing that is typically used to finance the expansion of existing companies. Mezzanine financing is basically debt capital that gives the lender the rights to convert to an ownership or equity interest in the company if the loan is not paid back in time and in full.
EQUITY INSTRUMENTS	
Private equity	capital that is not noted on a public exchange. Private equity is composed of funds and investors that directly invest in private companies, or that engage in buyouts of public companies, resulting in the delisting of public equity. Institutional and retail investors provide the capital for private equity, and the capital can be utilized to fund new technology, make acquisitions, expand working capital, and to bolster and solidify a balance sheet.
Venture capital	inancing that investors provide to startup companies and small businesses that are believed to have long-term growth potential. Venture capital generally comes from well-off investors, investment banksand any other financial institutions. However, it does not always take just a monetary form; it can be provided in the form of technical or managerial expertise.
Business angels	An angel investor is an affluent individual who provides capital for a business start-up, usually in exchange for convertible debt or ownership equity.
Specialized platform for public listing of sme	SME-focused equity platforms have been established across the globe, offering an alternative to main listing boards on national stock exchanges.
Crowdfunding (equity)	is the process whereby people (i.e. the 'crowd') invest in an early-stage unlisted company (a company that is not listed on a stock market) in exchange for shares in that company. A shareholder has partial ownership of a company and stands to profit should the company do well. The opposite is also true, so if the company fails investors can lose some, or all, of their investment.

Sources: [5], [6], [7], [8], [9], [10], [11]

As we can see, there is a large set of alternative instruments of SMEs. Lately such financial instruments as bonds play a crucial role for SME development all over the world.

The SME bond is an agreement between the company and the investor that the investor will provide to the company with the amount of money that the company will return to the investor at the end of the agreed maturity. The «face value» of the SME bonds is the principal that the company has committed to pay to the investor and serves as a basis for calculating the interest payable on the bonds. The price of the question is the same; generally coincides with face value (unless otherwise indicated).

While the SME is borrowing money of investor, the company will pay interest to investors during the life of the bond. The amount of interest payable on each SME Bond is equal to the value multiplied by the interest rate agreed and paid monthly or quarterly.

SME bonds can be considered part of a diversified investment plan. In a balanced portfolio, bonds for SMEs can offer a higher fixed rate than equities and savings accounts that fluctuate with market conditions and interest rates [12].

There are different bonds. The main of them could be devided into SME Bonds for Growth and SME Bonds for acquisition (see table 2).

Table 2

Deference between into SME Bonds for Growth and SME Bonds for acquisition*

SME Bonds for Growth	SME Bonds for acquisition
A new source of financing on the debt capital SME side. The Basel III regulatory banking measures have placed a squeeze on lending, and already impacting on SME's seeking finance globally.	Seller could offer SME Bonds as Vendor finance for franchises, management buyouts or acquisition. Suit most industries like logistics, energy, automotive and consumer sectors.
As a result growing companies continue to source alternative capital sources and a SME Bond is private finance that fills the gap.	SME Bonds are ideal as funding alternatives for companies too small to tap into the Corporate Bond market and want to invest in a self-sustaining cash-generating asset.

SME Bonds for Growth	SME Bonds for acquisition
SME Bonds funding for acquisition finance or refinancing of expiring debt. Well known brand name have the advantage when placing bonds backed by a balanced financing structure.	The SME Bond rate is negotiated around the terms of the acquisition or buy-out and converted to equity or refinanced. Can use company assets as security.

Source: [12]

The main reason is that SMEs have witnessed traditional sources of funding dry up since the 2007 — 2013 financial crisis and are seeking financing through alternative methods such as peer-to-peer loans, securities based crowdfunding, Enterprise Investment Schemes and mini-bonds. Roughly 7% of SMEs seek financing from private equity and the remaining 1% from other parts of the markets. As the market matures new instruments such as SME Bonds have the potential to reshape the financial landscape; offering growth opportunities with less risk to investors. The frameworks being established are creating retail enabled investments as low as £1000, giving average income worker the opportunity to take a stake in companies that are enhancing the future. The market is ripe for market makers, issuers and investors seeking to create long — term market value and jobs. With banks coming under increasing pressure to comply with Basel III, lending has become restricted to a select few. The capital market needs initiatives such as SME Bonds to provide leverage to the stifled economy [13]

Other advantage is that for SME there is no need to be afraid of bank's rejection in getting loan. Other reason is that very often SME doesn't have enough money to purchase an established business. Next one is that SME wishes legal structure with legal documents. Then, it is possible to use SME Bonds for negotiations flexible terms with the seller. After, SME can also use such instrument for trading history for lending approval. In practice SME bonds are used for a combination of growth financing and refinancing.

All these incentives belong to internal ones. We can also reveal external inducements, among them are:

– private investors always search attractive investment projects. Very often SMEs play role of providers of innovations. It is cheaper for both investors and SMEs to get their goals without any intermediary (bank, invest-

ment funds). That is why equity capital is still high demanded in comparison with other sources of finance.

– SME bonds are transparent financial instrument for investor who is ready to invest in SME projects. This can be achieved by creating special purpose vehicle (SPV) that will issue the bonds,

– Banking lending has shorter periods then financing with bonds,

– Banking lendig is related to the rules of Basel III, rather other investors (private and institution) do not.

There are different platforms — private placement — for listing SMEs' bonds. The most popular is euronext.com — the Pan-European marketplace. This platform allows to SMEs from Netherlands, Portugal, France, Belgium to be listed on. The aim of this platform is to serve the real economy by bringing together buyers and sellers in venues that are transparent, efficient and reliable. On this platform companies from different sectors (Investment Services, Specialty Chemicals, Biotechnology, Electronic Equipment, Business Training&Employment Agencies, Personal Products, Industrial Machinery, Medical Equipment, Furnishings, Software, Renewable Energy Equipment, Exploration&Production etc) of economics successfully have already listed. And as we can see most of them represent innovation SMEs. It means that high-tech companies also can use not only tradition financial instruments. By listing on Euronext SMEs make their bonds tradable and accessible for wide circle of different investors. This creates a myriad of benefits for them: increased brand awareness, easier access to investors in subsequent issues or a stock exchange listing, and the possibility of an exit for the director-majority shareholder [14]. In the table 3 we can see selected examples of SME bond issues:

Table 3

Some bonds issues for SMEs at Euronext exchange*

Name of SMEs	Place of issue	Date of issue	Amount, €	Rate of bond, %	Maturnity, years	Listed or non-listed
Brisa Concessao	LISBON, Portugal Euronext	June 2016	120 milions	EUR+0.024%	6	Non-listed issuer

Name of SMEs	Place of issue	Date of issue	Amount, €	Rate of bond, %	Maturnity, years	Listed or non-listed
The Navigator Cmpany	LISBON, Portugal Euronext	March 2016	200 milions	EUR+0.019%	7 years	Listed issuer
Lusiaves Group	LISBON, Portugal Euronext	February 2016	25 milions	EUR+1.06%	10 years	Non-listed issuer
My stic Invest, SGPS, S.A.	LISBON, Portugal Euronext	February 2016	20 milions	EUR+3.7%	7 years	Non-listed issuer
Belfius	BRUSSELS, Belgium Euronext	January 2016	25 milions	1.5%	23 years	Listed issuer
OrPEA	BRUSSELS, Belgium Euronext	December 2015	50 milions	2.51%	7 years	Non-listed issuer
Vrije Universiteit Brusseles	BRUSSELS, Belgium Euronext	October 2015	21 milions	1.65%	20 years	Non-listed issuer
Econocom	BRUSSELS, Belgium Euronext	June 2015	€46m	2.4%	6 years	Listed issuer

Formed by author, using sources: [15]

Obviously, that SME bonds are cheaper than banking lending. Interest rate of EUR according to Global rates service [16] for 2017 is -0,18%, while ECB interest rate is 0%. It easy to assume that this typeof financing getting more and more popular next years.

Nevertheless, not for all SMEs bonds can be suitable for future placement on specialized platforms. As Dutch consultants state, SME bonds are appropriate for companies with: a grounded financing need of a minimum of 2.5 million euros; nteresting and sufficient current assets as collateral for the bond issue; proven business model and track record with sufficient cash to pay the bond coupon.

Notwithstanding the low-level price of coupons, it is need to say that issue of SME bonds is not very easy process. There are several phases in it (see Fig. 2):

Analysis and structure
- Examination of readiness for the issue and capital market capability
- Definition of bond and issue structure (e.g. volume, interest, period)
- Definition of project team (internal/external) and project management
- Preparation of information memorandum (including "Bond story"

Execution
- Support for rating process
- Integration of banks
- Preparation of bond brochure
- Investor discussions
- Definition of stock exchange

Placement
- Submission/approval/ publication of prospectus
- Marketing and communication
- Subscription and allocation of the bonds
- Listing and trade

Follow-up work
- Compliance with information obligations /preparation of documents
- Monitoring of possible covenants
- Processing of redemption / follow-on financing

Fig. 2. The phases of SME bonds issue*
Designed by author using surces[17]

Very often SME address to consulting firms which have the experience in issuing SME bonds and know it procedure. From one hand, it economie the tome, from other it adds the value to the cost of financing. Due to this, mid companies are the target auditory of issuing bonds.

SME bonds market in some European countries has been developing since 2010. For instance, in Germany SMEs can use bond for financing of their activity (see fig. 3)

There were issued SME bonds on 194 milions Euro. Total defaults are 30. Average coupon rate is 7.25%.

German SME bond market has both positive and negative experience. Outstanding refinancing risks point to a serio us likelihood of further corporate defaults in the market. While all market participants are working on reestablishing the credibility of the German SME bonds market, it is important to incorporate the lessons learned from the past. Scope Ratings ("Scope") has analysed the reason for the high number of defaults and points out measures aimed at reducing them in future. The lessons learned can serve as guidance to other European markets, helping them to establish transparent and credible bonds markets in their respective country.
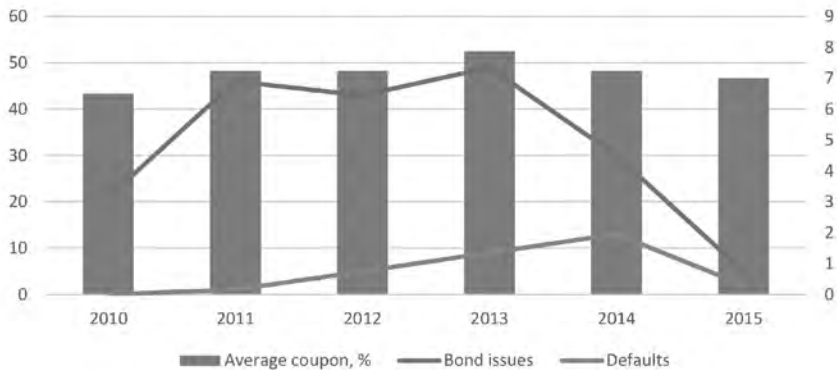
Fig. 3. German SME bond market in Fig.s*
Calculated using sources [18]

Eclectic reasons for high default rate Scope [18] sees diverse reasons for the high default rate in the German SME bond market, namely: structural problems in a particular industry with strong debt issuance activity, such as the renewable energy market; fraud allegations; • financing of unduly risky investments with proceeds of bonds issuance; lack of strict financial covenants limiting the ability of creditor-friendly debt protection measures. Often the SME bond market was seen as the last resort of financing for weaker debt issuers. This trend was further accelerated by the expansive monetary policy of the European Central Bank, catalysing the provision of capital through private placements or the traditional banking system. The average credit ratings assigned at issuance indicated a low investment-grade or high non-investment grade credit quality of the

segment, while the actual default rate suggests an average credit quality of mid sub-investment-grade in this market. Lessons learned Some market participants have drawn their conclusions and have adjusted to these circumstances. For instance: debt advisors are examining new issuances with more scrutiny, which has led to several cancellations of new bond issues, issuers are offering improved creditors protection by means of provision of tangible collateral or stricter covenants; bond exchanges have heightened transparency requirements for a listing; rating agencies have adapted rating methodologies with a more focussed approach on future cash flow generation and liquidity; investors are conducting more thorough reviews on their investments, recognising the need for in-depth credit analysis of an international standard; issuers are pursuing other financing options with alternative financial instruments such as private debt placements or the issuance of hybrid bonds.

Considering crucial role of SME at Europian countries and accounting for problems wich face investors and SMEs, there were developed additions to MIFID II provides for a new category of market to facilitate: access to capital for SMEs; and the further development of specialist markets that aim to cater for the needs of smaller and medium-sized issuers. Currently, SME growth markets, growth markets or junior markets are usually operated under MiFID as multilateral trading facilities (MTFs). For example, in the UK, AIM is an MTF and not a regulated market under MiFID. MiFID II envisages that the creation within the MTF category of a new sub-category of SME growth market and the registration of those markets should: raise their visibility and profile; and aid the development of common regulatory standards in the EU for those markets. MiFID II recites that attention should be focused on how future regulation should further foster and promote the use of that market so as to make it attractive for investors, and provide a lessening of administrative burdens and further incentives for SMEs to access capital markets through SME growth markets [19].

As we can see, the approaches to SME financing are getting changes. Some traditional resourses of finance have been losing their popularity sharply. Instead of them, modern types of financingis getting very popular nowadays. Among them are SME bonds. SME bonds are used mostly in Great Britain, France, Germany, Portugal, Nitherlands, Belgium. SME bonds are realized with assistans of SPV and can be traded on special place

market. From recent times MIFID II has included rules for SME bonds on growth markets. For sure, these measures will have favouriable impact on SME development. It is worth to notice, that this will contribute for the development of export and innovation potential of SMEs. In general, it can facilitate the enters on new markets, spreading purchasing power, increasing working places etc.

REFERENCES:

1. Financing SMEs and Entrepreneurs 2017. An OECD. Scoreboard. Retrieved from: http://www.keepeek.com/Digital-Asset-Management/oecd/industry-and-services/financing-smes-and-entrepreneurs-2017_fin_sme_ent-2017-en#page75
2. What is a Debt Alternative? Retrieved from: https://www.structuringfinance.com/types-of-capital/what-is-a-debt-alternative
3. Dominik Gajewski. The Role of Hybrid Instruments in the Implementation of Business Tax Policy. Vol. 6 Issue2. 2012. Pp. 84-90
4. S. Venugopal and A. Srivastava (2012). Glossary of Financing Instruments Retrieved from: https://www.wri.org/sites/default/files/pdf/glossary_of_financing_instruments.pdf
5. https://www.investopedia.com/
6. Purchase order financing. Retrieved from: https://www.paragonfinancial.net
7. S.Grover. Securitized Debt Instruments. Retrieved from: https://pocketsense.com/securitized-debt-instruments-6739322.html
8. Basel Committee on Banking Supervision, Supervisory framework for measuring and controlling large exposures, page 12
9. What is debt based crowdfunding? Retrieved from: https://www.syndicateroom.com/crowd-investing/debt-crowdfunding
10. Silent Participations. Retrieved from: http://www.mzs-law.com/financial-professionals/financing-of-companies/silent-participations.html
11. What Are Bonds With Warrants? Retrieved from: https://finance.zacks.com/bonds-warrants-7452.html
12. SME Bonds debt capital for established Australian companies seeking alternative finance. Retrieved from: https://www.accrutus.com.au
13. SME Bonds Launched by Founding Director & Chairman of ASSOB. Retrieved from: https://www.crowdfundinsider.com/2015/07/70981-sme-bonds-launched-by-founder-of-assob/
14. SME bond. Retrieved from: https://www.keijsercapital.nl/en/sme-bond/
15. Discover a selection of bond issues made by SMEs. Retrieved from: https://www.euronext.com/en/listings/bond-financing/sme
16. Euribor interest rates. Retrieved from: http://www.global-rates.com/interest-rates/euribor/euribor.aspx
17. Competence centre for SME bond issues. Retrieved from: http://www.roedl.de:10006/en-gb/de/services/management-it-consulting/Corporate-Finance/Pages/sme-bond-consulting.aspx

18. Lessons Learned in the German SME Bond Market Special comment (2015). Retrieved from: https://www.scoperatings.com/ScopeRatingsApi/api/downloadstudy?id=996c9a6d-259f-41d7-81ee-0c58935cc479

19. MIFID II and SME growth markets: A new category of markets to facilitate access to capital for SMEs. Retrieved from: https://www.eversheds sutherland.com/global/en/what/articles/index.page?ArticleID=en/Financial_institutions/MIFID_II_and_SME_growth_markets_-_a_new_category_of_markets

20. Брітченко І. Г., Момот О. М., Саєнко В. Г. Економічні проблеми розвитку підприємницької функції в секторах економіки національного господарства / під наук ред. проф. Брітченко І. Г. — Донецьк-Полтава: ООО «Техсервіс», 2012. — 640 с.

CROWDFUNDING AS AN INNOVATIVE PLATFORM FOR SMES DEVELOPMENT

T. Mayorova
Doctor of Economic Sciences,
Professor, Head of Investment Activity Department,
I. Petrenko
Phd in Economics,
Associate Professor of Investment Activity Department,
SHEI "Kyiv National Economic University
named after Vadym Hetman"

Small and medium-sized businesses or *small and medium-sized enterprises (hereinafter — SMEs)* are an integral part of each national economy. This is the most flexible and open to innovation element in a market economy. The main features of this type of business are market-oriented agility and mobility, relative independence, ability of staff capacity using in accordance with a flexible schedule. This business plays an important role for social reproduction in each country, because it is an integral part of any socio-economic system development, ensuring market relations stability, attracting the main part of individuals to open their own business and to ensure high productivity on the basis of specialization and cooperation in production. This has a beneficial effect on the national economy growth.

At the same time, one of the greatest challenges that prevent SMEs from realizing their whole economic potential is limited access to financing to support their economic activities. The own funds are mostly insufficient for business activities. Budget financing remains negligible and selective. Bank lending is often invalid to such enterprises because of high requirements for borrowers and high interest rates. In this context, SMEs are forced to look for alternative means to attract a sufficient cash flow that is necessary for their further development. In particular, crowdfunding represents such a mean.

Due to the fact that crowdfunding remains a new economic issue, it is not now well established from a variety of studies. The main part of researches devoted to crowdfunding began to appear only during the last five years. Furthermore, many foreign authors mainly investigated crowdfund-

ing origin, its ability to attract funds for projects, as well as practical recommendations to those who decide to use crowdfunding platforms to raise their funds through the Internet. In particular, S. Dresner [1], M. Thompson, S. Khambaita [2], I. Micic [3], T. Elliott Young [4], A. P. Borner [5], R. T. Harrison [6] and others researches and experts offer their findings about crowdfunding

Meanwhile, there are some still episodic studies that provide information on crowdfunding in Ukraine. In particular, such questions are examined in a still limited number of scientific articles by Ukrainian authors, namely: I. Vasylchuk [7], O. Dyba, Iu. Gernego [8, 9], N. Shapran [10], O. Vasiliev, S. Matyushchenko [11], N. Medzhybovska [12], A. Ivashchenko, Ye. Polishchuk [13], K. Kovtunenko, O. Nesterenko [14]. The analysis of previous mentioned studies has made it possible to demonstrate that crowdfunding is considered both as an object of financial investment and as a mean for start-up projects financing and intellectual investment in Ukraine, as well as a way of financial support for small and medium-sized enterprises development.

The fact that the phenomenon of crowdfunding has appeared relatively recently in Ukraine and is still under investigation, while this mean is already rather developed in the world, in particular, becoming a powerful platform for SMEs development and socio-cultural projects implementation, enable us to talk about the current issues relevance.

The purpose of this research is to develop crowdfunding theoretical framework as an innovative financial mean for investment resources formation and to review in detail the available information on some practical aspects concerning crowdfunding use for SMEs development.

In order to achieve this purpose, the following tasks are to be considered:

– to develop an understanding of crowdfunding as a modern financial market mean;

– to generalize and specify crowdfunding classification taking into account its current implementation trends;

– to analyze the current state of crowdfunding market in Ukraine and crowdfunding platforms worldwide;

– to explore the crowdfunding potential in SMEs development projects financing and to develop recommendations for its intensification.

Firstly, this research gives a brief overview of the recent history of crowdfunding. Despite the generally accepted fact that the term was first used in 2006, there are different research opinions, namely: on the one hand, the majority agrees that the authorship of the term belongs to Jeff Howe [15], [16, p. 58], but, on the other hand, there is point of view that the author is Michael Sullivan [17]). However, the phenomenon of crowdfunding has much longer history. For instance, there are a number of architectural monuments, which were built by donations, in particular, the Cathedral of Christ the Savior in Moscow, the construction of the Statue of Liberty in New York, Sagrada Familia in Barcelona and etc. However, crowdfunding mass-adoption has grown simultaneously with advent and development of the Internet. The first example of internet crowdfunding is funds collection to organize a tour of rock band Marillion. In 1997, without any involvement of the band itself, fans of the band organized and conducted an online fundraising campaign to finance the band's US musical tour. They joined forces to raise more than 60 000 USD. Since then, the band used this method to tour and records several more times [18, p. 302].

In 1999, the freelance association from the United Kingdom (The Professional Contractors Group), which was established online, collected 100 000 pounds for 5 days to carry out its professional activities as a public organization.

The US ArtistShare Company (2000/2001) was featured as the first music crowdfunding site. Then the website for the film industry was appeared, namely the website FilmVenture.com was founded in 2002.

As the result of crowdfunding successful application in the area of non-commercial cultural and social projects, crowdfunding becomes widespread in the area of financing start-ups and the local businesses.

In April 2012, the then US president, Barack Obama signed a new law, namely JOBS Act (Jumpstart Our Business Startups Act), which legalized such crowdfunding type and allowed startup companies to raise up to one million USD with it without any paper and registration for the sale of shares that they needed before [18, p. 302].

Further crowdfunding development was facilitated by social networks and particular websites. However, the general reason for the crowdfunding foundation and widespread is connected with the following prerequisites:

– reluctance to deal with traditional financial intermediaries due to services high cost, funding limitation and significant transaction costs;

– development of information technologies and communication facilities;

– the emergence of stakeholders, which are interested in new ideas search for further investing, as well as those who needed to finance projects that could not be interesting for traditional investors.

Thus, generally, crowdfunding (the combination of two words — crowd and funding) can be explained as «public funding» or «funding by a group of stakeholders». There are wide ranges of crowdfunding concept definitions, highlighted by scientists and experts.

In particular, N. Omelchuk provides crowdfunding definition as a mechanism to raise funds in order to implement a product, conduct an event, help those who is in need, support business, etc. [19]. At the same time, the author does not provide information on such mean peculiarities.

J. Howe defines crowdfunding as a type of people (donors) collaboration who voluntarily combine their money or other resources, mainly using Internet, to support the other people or organizations (recipients) efforts [20, p. 12]. Despite the fact that this definition is wider than the previous one and represents a general idea of crowdfunding, the nature of the «efforts», to achieve which the funds are collected, remains still unclear.

In Merriam-Webster online vocabulary crowdfunding is defined as the practice of obtaining needed funding (as for a new business) by soliciting contributions from a large number of people especially from the online community [21]. In this case, crowdfunding is also considered as a kind of activity. However, the principles of its implementation are not clarified.

P. Belleflamme, T. Lambert and A. Schwienbacher describe crowdfunding as an open mainly online competition to provide financial resources either in the form of donations or in exchange for a future product or in other form of compensation to support initiatives for achieving specific goals [22, p. 8].

J. Hemer proposes the similar definition with addition that financial resources provision takes place either in the form of donations (without requirements) or in exchange of a certain compensation form or voting rights to support initiatives for achieving specific goals [23, p. 8].

A. Lay and S. Weaven examine crowdfunding as the possibility of venture projects financing and defining it as an increasing on-line trend, repre-

senting a new potential capital pool as a resource for startup projects share capital formation [24, p. 86]. In accordance with such approach, crowdfunding is exclusively defined in relation with venture projects. However, the real area of crowdfunding use is much wider.

This research is aimed to investigate whether crowdfunding is able to be considered as an innovative financial mean. Meanwhile, crowdfunding has to be understood as financial assets variety in the market circumstance that are legal requirements of these assets owners for obtaining certain future income (as a rule, in cash) and through which operations are carried out in the financial market.

The answer to this question is affirmative because:

– using crowdfunding attracts cash flows, which move financial resources from one economic entity to another; thus, the crowdfunding is involved within the national income reallocation;

– in situation, when crowdfunding is not carried out on a free basis, but involves a certain form of income for the project donor, we are able to talk about the emergence of the financial obligations to the project initiator and financial asset for the person who has allocated funds for project implementation.

Taking into account the above mentioned researches and also understanding the main **crowdfunding** features, we propose to consider it as follows: *this is an innovative financial mean that allows to attract funds from a group of individuals and / or legal entities (donors) using IT instruments on a voluntary, time limit and possible payment basis to finance a specific business, political, social, creative or environmental project initiated by other economic subjects (project initiators).* In contrast with already existing approaches to understanding crowdfunding, this definition identifies it as a financial mean, which allows us to define the requirements to crowdfunding and identify its role in financial resources attracting that are necessary for SMEs development.

The rapid development of crowdfunding causes the emergence of its numerous types, which composition needs to be ordered due to differences in scientific classifications.

Most authors distinguish crowdfunding types based only on one classification, namely depending on the reward for the participants ([15], [16, p. 59], [25, pp. 174-176]. However, under the current conditions, this fi-

nancial instrument becomes much more complicated that causes the emergence of other classification features.

In accordance with our point of view I. Vasylchuk offers the most complete classification, but she uses the term «forms» instead of «types» that is not reliable. After supplementing and clarifying the above mentioned classification we obtained the following structure of crowdfunding types (table. 1):

Table 1

Classification of crowdfunding*

Crowdfunding features	Types

Depending on the reward form for the donors**	1. Donation-based (sponsorship), in which people do not receive any reward
	2. Investment-based, in which people receive reward:
	   2.1. non-financial, where donors receive goods or services in exchange for their contributions;
	   2.2. financial in form of:
	      2.2.1. share of income from the financed project
	      2.2.2. capital share ownership
	      2.2.3. income as the percentage for credit, granted for the project

Depending on motivation of project initiators	1. Non-profit projects 2. Profitable projects 3. Intermediate projects
Depending on the way of donors' participation in the project	1. Donations 2. Active investment 3. Passive investment
Depending on the initiative nature and the level of projects implementation	1. Projects of operating companies 2. Startup projects 3. Independent, individual projects
Depending on the project purpose	1. Business project 2. Social project 3. Political project 4. Ecological project 5. Creative project 6. Other projects

Crowdfunding features	Types
Depending on the legal status of the project initiators	1. Financing of individuals 2. Legal entities financing
Depending on the term of project realization**	1. Short-term (less than one year) 2. Long-term (more than one year)
Depending on the order to receive funds for project financing**	1. Funds are attracted by pre-sale of the goods 2. "All or nothing" — funds are provided only in case when the whole claimed amount is collected 3. Funds are provided in the amount that was collected 4. Funds are provided in the amount declared to be the minimum required for the project (unless the whole claimed amount has not been collected)
Depending on the nature of reward for crowdfunding platform**	1. Project applications are free of charge 2. There is a commission fee for crowdfunding platform

* Source: compared by authors based on [7, p. 63]
** Supplementing and clarifying by authors

The above mentioned types of crowdfunding, depending on the reward form for the donors, need further clarification.

Donation-based crowdfunding or sponsorship is voluntary; it is carried out on the principles of altruism and without any obligations for the recipient. This type is mainly applied to social, political and medical projects (funds collection for assistance in disease treatment or for the charitable organization activities). This kind of crowdfunding was prevailed for some time.

Investment-based crowdfunding is different from the previous one and provides a certain donor reward — *financial or non-financial.*

The second one is the most common crowdfunding type because of an appropriate crowdfunding platform number. This is an effective raising funds mean for each project from creative to those of complex technological products. The main feature is that donors receive non-financial reward in response to their support. This may be the first copy of a book or music album, an invitation to a concert, a mention in the titles of the film, the first

sample of the product, an autograph, etc. Furthermore, there is no additional form of economic benefit.

A special case of the non-financial reward scheme is the pre-order model. The possible reward within this concept may be a self-financed product. For example, it is a book, a movie, a music album, software or a new gadget. The authors of such projects promise to deliver the product immediately after its production. Thus, such projects donors become the primary owners of collective financing result.

The type of crowdfunding that provides the financial reward to donor has a separate name — crowdinvesting. There is a possibility to divide particular subtypes of crowdinvesting depending on the mechanism for obtaining of a financial reward:

a) The "royalty" scheme, when a donor (investor) receives a share of the funded projects income or profit. This scheme is promising, because, on the one hand, it allows keeping an element of the project ownership, and on the other hand — to provide financial motivation.

b) Joint-Stock Crowdfunding, when a donor (investor) receives as a reward a share of property, business shares, dividends or voting rights at the general shareholders meeting. In spite of its high potential, the current subtype is simultaneously the most controversial because of its effect on the organizational and legal business form. Moreover, it is associated with an increased risk for investors.

c) Crowdlending, when the project funding is based on the credit principles and the credit interest is reward for a donor. In this case, the main advantages for lenders are higher rates and credit possibility in a wide range of industries. The borrower benefits from lower tariffs and ease of obtaining a credit. The main peculiarity of the current subtype is the availability of a clear timetable for returning debts to investors. Thus, investor has in advance the whole information about the timeframe, when he receives his investments back with the specified interest. Meanwhile, donors are represented exclusively by individuals. At the same time, either individuals or legal entities can act as borrowers that make this mean especially interesting for SMEs.

Understanding the crowdfunding diversity nowadays is possible on the basis of main and the most popular crowdfunding platforms development analyze. The first of them appeared in the early 2000th and were special-

ized in supporting cultural projects, namely: ArtistShare (2001, which is engaged in music projects) and FilmVenture (2002, attracts funding for the film industry). Furthermore, there are much more such websites nowadays.

Thus, according to the World Bank study, conducted in 2013, there was a following number of investment-based crowdfunding websites in separate countries, namely: United States — 344, United Kingdom — 87, France — 53, Netherlands and Canada — 34, Brazil — 17, Spain — 27, Germany — 26, Italy — 15, Australia — 12, India — 10, South Africa and Russian Federation — 4 [26, p. 18].

The following platforms are to be mentioned among the biggest and the most popular ones:

1. Kickstarter is the most popular platform that started its activity in 2009. More than 107 thousand projects within 15 different categories for the sum of 2.5 billion USD were successfully funded during this time. Nearly 11 million people supported the projects financially. The main Kickstarter features are conditions, when only an adult person residing the USA or one of the European countries (otherwise, the intermediary will be needed) is able to initiate the project and the project will be funded only in case of the whole claimed amount collection. Kickstarter takes 5 % commission from those amounts.

2. Indiegogo is a platform, which has started its activities almost simultaneously with Kickstarter. The platform is available for each adult person, regardless of the country of residence, to register a project. The project will be funded according to one of the available and independently chosen by the project initiator schemes, namely: either funds are provided only in case when the whole claimed amount is collected or funds are provided in the amount that was collected. The platform takes 5 % commission. Currently, 10 million people have supported more than 650 thousand projects, which worth over 900 million USD.

3. RocketHub is one of the largest and the oldest among such websites. In compartment with the previous mentioned platforms, the RocketHub commission is higher and depends on either the whole claimed sum (8%) or only its part (12%) has been collected [27].

4. Ulule is the French crowdfunding platform, which supported funding of more than 4900 creative, innovative or public projects with a 67% probability of success since 2010. Ulule was the first platform that creates

possibility to raise funds in two ways, namely: either the project manager claims an appropriate amount for the project, or pre-sale of the goods (service) has to be arranged.

5. Crowdculture is Swedish platform, which was also founded in 2010. The unusual method of financing is its feature. The project is able to attract either funds of private investors or state budget funds (part of the national cultural budget). The share of public funds depends on the number of votes collected by the project from the platform participants.

6. Goteo is Spanish crowdfunding platform, which is intended both for socially important projects fundraising and their further common implementation. Goteo has also a unique funding method. There are two rounds, each lasting for 40 days. The task of the first round is to collect the minimum amount required to start the project. The optimal amount of money to improve the project is collected during the second round.

7. Derev is the strongest interactive platform in Italy, which deals with implementing social innovation. It provides both an opportunity to raise funds for projects and a possibility to collect signatures for petitions, to order the TV time for broadcasting conversations or interviews.

8. Wemakeit is the largest creative industry platform in Switzerland, which also supports non-profit organizations, providing their projects financing and assisting their community development. The platform has supported the launch of 550 projects worth 4 million CHF during the last two years.

The previously mentioned crowdfunding platforms are the most popular on the national level, but they are not exclusive ones. For instance, there are nearly two dozen platforms in France and more than thirty platforms in the USA. And eventually, such platforms started to appear in countries of the former Soviet Union. In particular, the following examples have to be mentioned:

1. Hive (Ulej) and Talakakosht (Talaka) are the initial crowdfunding platforms in Belarus. They allow collecting funds for any charitable goals. Meanwhile, the socio-cultural direction is the most popular, including the goals, which are related to national-cultural identity.

2. YguruYogur is a new crowdfunding platform, which was founded under the Azerbaijan Youth Foundation support. The platform is focused on cultural projects [28]

3. Planeta, «Every little bit helps» (S mira po nitki), Boomstarter are Russian crowdfunding platforms, intended to support both creative and cultural projects and projects in the field of business, education and ecology.

However, there are so far only two remarkable crowdfunding platforms in Ukraine, namely: Biggggidea (Spilnokosht), which was founded in 2012 for supporting education, health, literature, music, journalism and research projects; and Na-Starte, which was founded in 2014 for projects financing in the field of culture, publishing, art and sports.

In view of all that has been mentioned so far, one may suppose that the role of crowdfunding, especially web-enabled crowdfunding, in modern society is connected with the following tasks:

• Providing SMEs with access to capital.

• Cultivating high-growth entrepreneurs in developing countries.

• Supporting access to export markets.

• Catalyzing flows of capital within and between communities, irrespective of distance.

The first task is the basic one within the context of current research, because crowdfunding appears in response to the SMEs need to obtain support. SMEs, which are simultaneously outside the area of large financial corporations interest and require considerable amount of funds to start their own business or its recovery through innovations, are significantly interested in crowdfunding potential. Moreover, the attractiveness of this financial mean is formed both under the SMEs and projects donors influence (Table 2):

Table 2

Factors of crowdfunding attractiveness for donors and SMEs as project initiators*

Project donor	SME (project initiator)
1. Possibilities to invest funds directly into the production of fascinating product or innovative idea at the initial stage; 2. Prospects for a high level of return on investment;	1. Possibilities to realize idea, to find financing outside the traditional sources; 2. Minimal expenses unless the project is able to attract enough money; lower transaction costs 3. Funds allocation speed, considering the clearly limited duration of funds collection;

Project donor	SME (project initiator)
3. A remarkable amount of projects for investment; 4. Possibility of participation with small fund amounts; 5. A wide spectrum of branches for financing choice; 6. Transparency of project information, accountability and responsibility of the project initiator to the community	4. The cost of resources attracted through crowdfunding is much lower than such attracted through traditional financial means (for instance, bank credit) ; 5. Information asymmetry overcoming and collecting information about potential and currently active donors interests; 6. Access to possibilities for implementing innovations in their economic activity; 7. Promotion of own products at the initial stage of their development and production, as well as business popularization due to the successful project implementation

* Source: compared by authors

Meanwhile, the financial potential of crowdfunding for SMEs is limited in Ukraine. Firstly, the underdeveloped infrastructure creates the primary problem. Secondly, the low financial literacy in society causes the lack of interest from potential donors. Moreover, the lack of high-speed Internet in our country creates the difficulties for web-enabled crowdfunding development that is the most competitive nowadays. In addition, a significant number of economic entities still have some problems with on-line payments, in particular due to the high level of distrust for such operations. Similarly, a lot of experts consider fraud as the main crowdfunding risk, because the funds collection can be organized as a part of the criminal financial scheme instead of charitable initiative or an interesting project financing. Moreover, there is still a need to attract more attention to crowdfunding in society.

There are two main general problems, which solution provides conditions for SMEs opportunities extending through using crowdfunding for their projects funding, namely: minimizing risks and creating attractive project for investors.

The first problem solution consists of the regulatory control over the crowdfunding platforms activities strengthening. In particular, those belonging to a stock subtype are obligated to be registered as brokers / dealers. This means that the business meets formal requirements, which are

important for investors. Therefore, the uncertified platforms will eventually leave the market.

However, there are other platforms that are more suitable for SMEs. The stringent regulatory changes demotivate such platforms users and need to be relieved. On the other hand, there is a possibility to increase the quality requirements of the submitted projects, as well as requirements to the report implementation progress.

Considering the problem of potential donors (investors) interest, our attention is paid to the researches, conducted by Eric Gilbert and Tanushree Mitra. The list of the most successful phrases that contribute to raising funds was presented by them due to the survey of 45 thousand projects, placed on the Kickstarter crowdfunding platform [29].

The authors have selected 100 phrases out of the 20 thousand most commonly used ones. These phrases are considered as the most likely to guarantee the success or failure of a project. The results had been summarized by authors and the worlds were distributed within six main categories:

– Exchange — phrases that express the desire to respond mutuality to the sponsor actions (Becker): «also receive two ...», «good karma» and etc.

– Rarity, belonging to something exclusive, manifested in such expressions as «new opportunities», «to give a chance» and etc.

– Social proof — evidence, this means that people are focused on others in committing their actions, namely: «have already funded / appreciated / supported ...» and etc.

– Social identity or sense of belonging to a particular social group, including: «accessible to», «appropriate» and etc.

– Actuality, which shows the fact that entrepreneurs act in the interests of other people, satisfy their desires with their product.

– Authority is used to emphasize the expertise and effectiveness of the project decisions, including: «we are able to offer», «the project will be».

Thus, the entities involved in the project financing intent to be insured in the appropriate purpose and efficiency of their money use, including financial success of the project. There is also a need to get something in return for their money.

The results of this study indicate that crowdfunding has a potential to play the role of an innovative mean for attracting financial resources in Ukraine. In particular, the important finding is that crowdfunding is able

to turn into an effective mean for attracting financial capital into SMEs development. The main part of crowdfunding potential is based on the aggregate savings of households that do not trust in banks and other financial institutions.

In addition, this study has been unable to demonstrate that the rapid Internet technologies improvement, including development of social networks, promotes both the emergence of new crowdfunding platforms and creates new technical opportunities for additional SMEs investment resources formation.

However, the development of a civilized crowdfunding market in Ukraine is possible only in case of its effective regulation and normalization by public authorities. In addition, the further development of such market institutionalization is also important. These results further support the idea about possible transformation of crowdfunding financial potential into the investment resource for SMEs.

REFERENCES:

1. Dresner S. Crowdfunding: A Guide to Raising Capital on the Internet / S. Dresner. — Published by John Wiley & Sons, 2014. — 272 pages
2. Thompson M., Khambaita S. Crowd Funding Is The Greatest Con In The History Of The Human Race Or The Greatest Opportunity?: Learn How Billions Of Dollars In The Crowd Funding Space Is Being Unequally Divided & How Social Rewards Technology Can Enhance The Industry (Vol. 2 of Greatest Con In The History Of The Human Race) / M. Thompson, S. Khambaita. — Published by Pamper Me Network, 2016. — 70 pages
3. Micic I. Crowdfunding: Overview of the Industry, Regulation and Role of Crowdfunding in the Venture Startup / I. Micic. — Published by Anchor Academic Publishing, 2015. — 108 pages
4. Elliott Young T. The Everything Guide to Crowdfunding: Learn how to Use Social Media for Small-business Funding / T. Elliott Young. — Published by Everything Books, 2013. — 288 pages
5. Borner A. P. Crowdfunding — A successful Way of New Venture Financing? / A. P. Borner. — Published by Tredition, 2016. — 204 pages
6. Harrison R. T. Crowdfunding and Entrepreneurial Finance / R. T. Harrison. — Published by Routledge, 2017. — 148 pages
7. Васильчук I. Краудфандінг і краудінвестінг як фінансові інновації / I. Васильчук // Ринок цінних паперів України. — 2013. — № 11-12. — С. 59-67
8. Диба О., Гернего Ю. Краудфандинг: теорія та можливості використання в Україні / О. Диба, Ю. Гернего // Банківська справа. — 2015. — № 1-2. — С. 53-62
9. Gernego lu.O. Crowdfunding: worldwide conditions and prospects for use in Ukraine / lu.O. Gernego // Actual problems of economics. — 2015. — № 12. — P. 111-117

10. Шапран Н. Краудфандінг: розвиток індустрії / Н. Шапран // Цінні папери України. — 2016. — № 23-24. — С. 30-31.
11. Васильєв О. В., Матющенко С. С. Краудфандинг — сучасний інструмент фінансування розвитку інтелектуального капіталу / О. В. Васильєв, С. С. Матющенко // Інвестиції: практика та досвід. — 2016. — № 18. — С. 36-40
12. Меджибовська Н. С. Краудфандинг для малого бізнесу: міф чи реальність? / Н. С. Меджибовська // Економіка України. — 2016. — № 10. — С. 20-34
13. Іващенко А. І., Поліщук Є. А., Диба О. М. Перспективи розвитку краудфандингу в Україні як інструменту залучення коштів для підприємств малого та середнього бізнесу / А. І. Іващенко, Є. А. Поліщук, О. М. Диба // Інвестиції: практика та досвід. — 2016. — № 21. — С. 34-39
14. Ковтуненко К. В. Використання краудфандінгу як інструменту фінансування інноваційних проектів / К. В. Ковтуненко, О. В. Нестеренко // Інвестиції: практика та досвід. — 2017. — № 15. — С. 14-20
15. Что такое Краудфандинг? [Electronic resource] // Сайт CROWDSOURCING. RU. — 1.02.2015. — Available at: http://crowdsourcing.ru/article/what_is_the_crowdfunding
16. Санин М. К. История развития краудфандинга. Классификация видов. Анализ перспектив развития и преимуществ / М. К. Санин // Научный журнал НИУ ИТМО. Серия «Экономика и экологический менеджмент». — 2015. — № 4. — С. 57-63
17. Что такое краудфандинг? История появления, типы группового инвестирования [Electronic resource] // Сайт domik.ua. — 1.08.2017. — Available at: http://domik.ua/novosti/chto-takoe-kraudfanding-istoriya-poyavleniya-tipy-gruppovogo-investirovaniya-n252624.html
18. Sanin M. K., Bezuglova E.Yu. Crowdsourcing in innovative activity / M. K. Sanin, E.Yu. Bezuglova // Works of humanitarian faculty. Collection of scientific articles of NIU ITMO. — 2014. — pp. 301-306
19. Омельчук Н. Краудфандинг: популярные площадки и успешные проекты [Electronic resource] / Н. Омельчук // Сайт PaySpace Magazine. — 7.06.2017. — Available at: https://psm7.com/analytics/kraudfanding-kak-privlech-investicii-i-realizovat-mechtu.html
20. Howe J. Crowdsourcing: Why the Power of the Crowd is Driving the Future of Business / J. Howe. — Published by Alpinapablisher, 2012. — 288 pages.
21. Definition of crowdfunding [Electronic resource] // Сайт Merriam-Webster. — Available at: https://www.merriam-webster.com/dictionary/crowdfunding
22. Belleflamme P., Lambert T., Schwienbacher A. Crowdfunding: tapping the right crowd // Journal of Bussiness Venturing. — 2013. — vol. 7. — pp. 1-45
23. Hemer J. A snapshot on crowdfunding // The Open Access Publication Server of the ZBW. — 2011. — vol. 1. — pp. 1-39
24. Ley A., Weaven S. Exploring Agency Dynamics of Crowdfunding in Start-up Capital Financing // Academy of Entrepreneurship Journal. — 2011. — vol. 17. — № 1. — pp. 85–110
25. Петрушенко Ю. М. Краудфандинг як інноваційний інструмент фінансування проектів соціально-економічного розвитку / Ю. М. Петрушенко, О. В. Дудкін // Маркетинг і менеджмент інновацій. — 2014. — № 1. — С. 172–182

26. Crowdfunding's Potential for the Developing World — 2013 [Electronic resource] // World Bank. — Available at: https://www.infodev.org/infodev-files/wb_crowdfundingreport-v12.pdf
27. Огляд краудфандінгових майданчиків [Електронний ресурс] / BestInvestPro.com. — 14.03.2017. — Режим доступу: http://bestinvestpro.com/uk/ oglyad-kraudfandingovix-majdanchikiv/
28. 9 краудфандинг-платформ для финансирования культурных инициатив [Електронний ресурс] / Программа ЕС и восточного партнерства «Культура и креативность». — Режим доступу: https://www.culturepartnership.eu/article/9-kraudfanding-platform-dlya-finansirovaniya-kulturnyx-iniciativ
29. Mitra T., Gilbert E. The Language that Gets People to Give: Phrases that Predict Success on Kickstarter [Electronic resource] / T. Mitra, E. Gilbert // Materials of the 17th ACM Conference on Computer Supported Cooperative Work and Social Computing (Baltimore, Md., Feb. 15-19. 2014). — Available at: http://comp.social.gatech.edu/papers/cscw14.crowdfunding.mitra.pdf

USE OF CROWDFUNDING TO FINANCE THE INVESTMENT NEEDS OF SMALL AND MEDIUM-SIZED ENTERPRISES

P. Rubanov,

PhD, Associate. Professor.
Department of Finance and Credit
Sumy State University, Ukraine

The issue of financial support for small and medium-sized businesses is always one of the key issues. Small businesses has a smaller choice of available sources of formation of fixed and working capital compared to large enterprises, and state support programs for small enterprises are not always effective and efficient. Small and medium-sized enterprises (SMEs) can use short-term bank loans (including overdraft, credit lines), commercial loans, factoring operations to finance working capital, but traditional sources of attracting financial resources to finance the investment needs of small enterprises (renewal of fixed assets, changes in technology, capital formation for a newly created enterprise, investment to expand or change the direction of activity) is often insufficient or their use is associated with a number of difficulties.

The main sources of financing of enterprises investment activity are:
– self-financing (financing from internal sources);
– long-term bank loans;
– leasing loans;
– issue of equity and debt securities;
– alternative sources of funding.

In European countries, as well as in the whole world, the largest share of financing investment needs of functioning enterprises (about 60-70%) is provided by internal sources of financial resources. The structure of attraction of other funding sources is very different either for individual enterprises or types of activity, as well as for different countries as a whole. Based on the World Bank's statistical survey data [1], consider the structure of sources of financing for investment activities in Eastern European countries in 2013 (Table 1).

**Structure of financing sources of enterprises investment activity
in Eastern European countries in 2013,%**

Economy	Proportion of investments financed internally	Proportion of investments financed by banks	Proportion of investments financed by supplier credit	Proportion of investments financed by equity or stock sales	Proportion of investments financed by alternative finance
Belarus	78,2	14,3	3,9	1,1	2,5
Bosnia and Herzegovina	62,0	23,9	8,1	2,9	3,1
Bulgaria	73,3	15,0	3,9	3,5	4,3
Croatia	72,0	18,6	3,4	3,6	2,4
Czech Republic	65,5	18,5	3,6	2,9	9,5
Estonia	76,2	20,8	1,5	0,5	1,0
Hungary	76,3	15,5	3,3	1,4	3,5
Latvia	78,2	6,2	6,0	6,5	3,1
Lithuania	62,6	16,7	5,5	7,3	7,9
Macedonia, FYR	80,9	11,1	0,9	5,6	1,5
Moldova	80,0	7,7	4,1	6,2	2,0
Montenegro	54,8	16,6	14,1	9,7	4,8
Poland	73,8	12,1	9,5	1,7	2,9
Romania	72,7	14,6	2,9	4,6	5,2
Serbia	56,4	14,6	10,9	8,1	10,0
Slovak Republic	47,2	16,9	10,8	4,3	20,8
Slovenia	76,4	17,8	1,3	3,1	1,4
Ukraine	66,9	11,0	8,3	6,4	7,4

Source: compiled by the author according to [1]

The share of own financial resources of enterprises of Eastern Europe in the structure of sources of investment needs financing ranges from 47,2% to 80,9%. The largest share of internal sources of financial resources in financing investments has been in Macedonia (80.9%), Moldova (80.0%) and Latvia (78.2%). The smallest share of self-financing of enterprises exists in Slovakia (47.2%), Montenegro (54.8%) and Serbia (56.4%). The development of leasing and equity financing is characteristic for these countries (Montenegro), as well as a significant share of alternative sources of funding (Serbia, Slovakia). The development of leasing and equity financing is characteristic for these countries (in particular in Montenegro and Serbia), as well as a significant share of alternative sources of funding (in Serbia and Slovakia). It should be noted that the category of "alternative finance" sources in this case includes online alternative financing (crowdfunding, P2P-lending) and all other possible sources of funds of enterprises, such as microfinance, financial assistance from friends and relatives, charitable contributions, funding through the state programs.

Bosnia and Herzegovina (23.9%), Estonia (20%), Croatia (18.6%) and the Czech Republic (18.5%) are the leaders in banking lending to investment activity in Eastern Europe. The share of bank lending in countries such as Latvia (6.2%) and Moldova (7.7%) is almost three times smaller. The share of bank loans to provide investment needs of businesses in Ukraine (11.0%), Macedonia (11.1%) and Poland (12.1%) is also quite low.

The undisputed leader among the countries of Eastern Europe in terms of the share of leasing loans for the financing of fixed assets is Montenegro (14.1%). The share of this source of funding in providing the investment needs of enterprises is relatively high in such Eastern European countries as Serbia (10.9%) and Slovakia (10.8%). On the contrary, leasing and commercial loans to enterprises as sources of investment financial resources are almost not used in Macedonia, Slovenia and Estonia.

Such an instrument of attracting financial resources as the issue of equity securities is very limited in Estonia (only 0.5% in 2013), Belarus (1.1%), Hungary (1.4%) and Poland (1.7%). A sufficiently significant share of financial resources of enterprises is attracted through the stock market in such countries as Montenegro, Serbia and Lithuania (about 7-10%).

A significant share of attraction of funds through other alternative sources (funding from relatives and friends, crowdfunding and lending

through Internet platforms, charitable contributions, microfinancing, etc.) is observed in many Eastern European countries, including Slovakia (20.8%), Serbia (10.0%) and Czech Republic (9.5%). But the reasons for the spread and sources of these alternative finance in the countries surveyed are different. For example, the share of alternative sources of funding in Ukraine is also relatively high and according to World Bank statistics in 2013 it was 7.4% [1]. However, in Ukraine, such level of this indicator was caused by the high share of state financial support of small business what was observed till 2013. In particular, in 2012 the share of financing of small enterprises at the expense of state and local budgets amounted to 9.5% [2, p.11].

Despite the diversity of traditional forms of investment financing for small and medium-sized enterprises, most of them remain unavailable or used only in limited cases, because they do not allow to attract funds on favorable terms and for the required period and do not always correspond to the tasks of small and medium-sized businesses. Microfinance, money from relatives, friends and charitable organizations, state aid, etc. are alternative sources of funding for small and medium-sized enterprises. Due to the development of information technologies, specialized online platforms have become a new alternative to traditional financing, the use of which allows to attract funds to replenish working capital and financing investment projects directly from the lender to the borrower without the participation of financial intermediaries.

The main types of enterprises alternative financing that are implemented through the online platform are crowdfunding and peer-to-peer lending. Peer-to-peer lending are used by enterprises primarily to increase working capital. Formation of the required amount of peer-to-peer loans occurs by obtaining small amounts of unsecured personal loans from other individual and institutional lenders [3, p.17-18]. The type of peer-to-peer loan financing due to its availability, speed and low cost of obtaining has become interesting for small and medium enterprises that, in the absence of a credit history or low credit ratings, can not obtain the required amount of borrowed resources through traditional channels at affordable interest rates.

Crowdfunding in the broad sense is a voluntary pooling of financial or other resources through an online platform from a large number of individual and institutional investors (resource providers) to support efforts, ideas and projects of other people, organizations or individual communities [4,

p.174]. The following types of crowdfunding are distinguished, depending on the type of remuneration foreseen for the investor: equity-based crowdfunding, reward-based crowdfunding, real estate crowdfunding, profit sharing crowdfunding, donation-based crowdfunding.

Crowdfunding with non-financial reward is the most widespread type of crowdfunding. Its popularity is associated with the possibility of using this type of crowdfunding to raise funds for virtually any project and in the interests of any economic actors: individuals and entrepreneurs, small and medium-sized businesses, high-tech companies, transnational corporations etc. The main distinctive feature of this type of crowdfunding is the absence of a monetary payment for the use of financial resources. Instead, funds providers receive non-financial reward, which can also take different forms, such as participating in product development, meeting with project creators, mentioning in a movie, inviting a concert, getting a sample of a manufactured product etc. [3, p.17-18].

Donation-based (unrewarded) crowdfunding allows donors to support charitable, social and community projects that have no financial or material returns for the donors. In this case, the recipients of financial resources do not assume any obligations to donors (providers of capital).

Equity-based crowdfunding is the closest to venture capital, because the investor provides financing in exchange for shares, dividend or voting rights at the general meeting of shareholders [4, p.176]. However, unlike venture investments, equity-based crowdfunding provides financial resources from a large number of small investors, none of which obtains any preferential rights to manage an enterprise. Thus, the entrepreneurs have the opportunity to manage their businesses independently [5, p.27].

Real estate crowdfunding is a form of equity-based crowdfunding, where the recipient of financial resources is development company and the funds are attracted through the placement of mortgage-backed securities.

Profit-sharing (revenue-sharing, royalty model) crowdfunding is an intermediate model between equity-based crowdfunding and crowdfunding with non-financial reward. On the one hand, this model involves the investor receiving a part of the revenue or profit from the project in the form of dividends, royalties or other payments, and on the other hand it allows the recipient of financial resources to retain full control over the project (business) [3, p. 28; 4, p. 175].

Using crowdfunding can become a real and effective source of attracting financial resources for enterprises, primarily small and medium-sized businesses, both in developed countries and in developing countries. This is particularly relevant for many Eastern European countries in which small and medium-sized businesses are significantly limited in the use of traditional sources of long-term debt, but using the Internet can attract financing for their projects on the crowdfunding platforms worldwide.

Crowdfunding has several important characteristics that distinguish it favorably from traditional channels of obtaining investment financial resources (from banks, the stock market), as well as from business angels and venture capitalists [5, p.26-27]:

– unlike bank lending, the crowdfunding platforms allow attracting funds in the necessary amount and on favorable terms at the stage of the emergence of a business idea or for a newly founded company;

– unlike the issue of equity securities and venture finance, the crowdfunding allows simultaneously obtaining the required amount of relatively cheap financial resources from investors and maintain control over the business;

– both for providers and recipients of financial resources, alternative online business financing is characterized by the speed, simplicity and clarity of operations;

– unlike all other types of financing, the accessibility of crowdfunding platforms on the Internet allows to get funding irrespective of the geographic location of the recipient;

– crowdfunding can be applied in fact to any kind of activity, in particular to startups, social projects, media projects and anything else that may interest investors;

– for the recipient of financial resources, the crowdfunding platforms are simpler and more understandable, as often the only requirement is to post information on a project online;

– crowdfunding is not only a new direction of investment and getting profits for investors (financial resources providers), but also an opportunity to support important and interesting business ideas and innovative projects.

However, crowdfunding also has its drawbacks and risks of using both for investors and borrowers. First of all, crowdfunding, as well as other types of alternative financing implemented through online platforms are

carried out without any mediation of professional market participants and consequently the function of risk assessment and competent selection of projects depends on the investors themselves. Crowdfunding platforms can only make an initial selection of projects according to predetermined formal criteria.

The lack of investors control over the implementation of the project and the lack of responsibility of the crowdfunding platforms to investors leads to frequent cases of fraud, when the crowdfunding projects are created not for the purpose of doing a real business, but for the quick collection of money without the intention of investing in the proposed project.

In addition, as with any information technology project, crowdfunding platforms are vulnerable to cyber attacks, that also increases the risk of crowdfunding participants losing their money.

An investor selects projects for investment based on personal preferences, values and interests [6]. Therefore, another risk of using crowdfunding for business entities is the risk of not receiving the necessary amount of funds due to insufficient number of persons interested in financing the project. In fact, only about one fifth of all projects receive full funding through crowdfunding platforms. The ratio of fully funded and underfunded projects depends on their target direction (fig. 1).

The most popular projects that receive the most funding are projects in the field of creating comics and graphic novels, charity projects, game development, experimental projects. The share of fully funded small business projects is the lowest compared with other areas of funding and is only 3.2%.

Despite the noted shortcomings of crowdfunding, alternative online financing of small and medium-sized businesses is developing very rapidly in recent years. About 7,000 small and medium-sized enterprises were funded in 2014 for a total of around GBP 1 billion by peer-to-peer loans, crowdfunding and online factoring in the United Kingdom, which is a leader in the European alternative finance market. According to Cambridge Center for Alternative Finance estimation, the growth rate of the alternative financing business sector in the economy was 120% in 2015, which provided forming start-up (venture), working and investment (growth and expansion) capital of enterprises at 2.2 billion pounds sterling for about 20,000 small businesses in the UK [8, p.18].
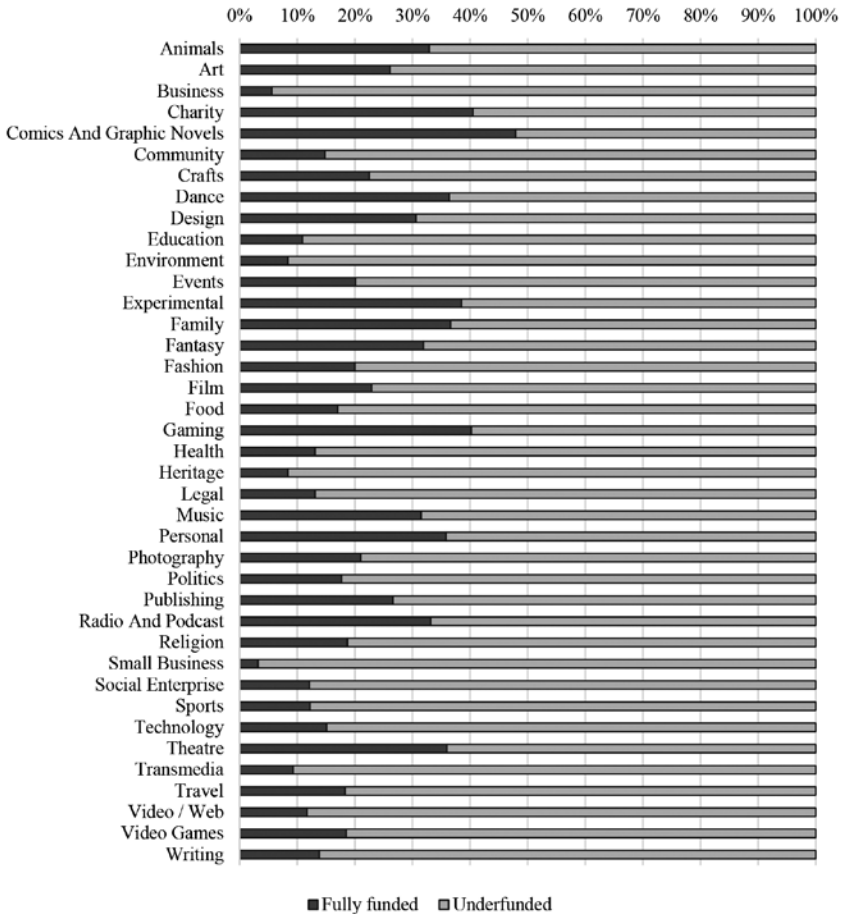
This chart shows the percentage of completed projects which ended or reached their target in each category between 01 Jan 2014 — 30 Nov 2017

Source: The Crowdfunding Centre [7]

Fig. 1. Projects success by category based on the number of projects fully funded
Source: The Crowdfunding Centre [7]

Markets of alternative financing of small and medium-sized enterprises in other European countries are smaller by volume, but no less dy-

namic in terms of development. Alternative financing small and medium enterprises received the greatest development in such European countries as France, Germany, Netherlands, Spain. The total market volume of alternative funding SMEs in Europe in the period of 2012-2015 increased by 7,7 times while the number of SME entities that attracted funds through alternative financing models increased by 8,7 times [3, p.16-22; 9, p.25-26].

Thus, financing most of the investment needs of small and medium businesses currently is provided by self-financing. The share of traditional sources of external financing, in particular banking and leasing loans, also remains significant. However, alternative financing of business, implemented through online platforms without the participation of financial intermediaries, in particular through peer-to-peer business loans and crowdfunding, is gaining increasing importance in the financial provision of investment activities for small and medium-sized enterprises. The dynamics of the European market of alternative financing business in recent years has demonstrated the effectiveness of using such models and their undoubted advantages for SMEs compared to traditional sources of financing.

REFERENCES

1. Data on Finance — World Bank Enterprise Survey of Business Managers [Electronic resource] // World Bank Group. — Access mode: http://www.enterprisesurveys.org.
2. Analytical report on the state and prospects of development of small and medium enterprises in Ukraine [Electronic resource] // State Service of Ukraine on Regulatory Policy and Entrepreneurship Development. — Kyiv, 2014. — 40 p. — Access mode: http://www.dkrp. gov.ua/info/3226.
3. Wardrop R. Moving Mainstream: The European Alternative Finance Benchmarking Report / Robert Wardrop, Bryan Zhang, Raghavendra Rau and Mia Gray. — 2015. — 44 p. — Access mode: https://www.jbs.cam.ac.uk/fileadmin/user_upload/research/centres/alternative-finance/downloads/2015-uk-alternative-finance-benchmarking-report.pdf.
4. Petrushenko Yu.M. Crowdfunding as an innovative tool for financing projects of social and economic development / Yu.M. Petrushenko, O. V. Dudkin // Marketing and Innovation Management. — 2014. — No. 1. — P. 172-182.
5. Medzhybovskaya N. S. Crowdfunding for small business: myth or reality? / N. S. Medzhybovskaya // Economy of Ukraine. — 2016. — No. 10 (659). — P. 20-35. — Access mode: http://nbuv.gov.ua/UJRN/EkUk_2016_10_3.
6. Belleflamme P., Lambert T., Schwienbacher A. Crowdfunding: tapping the right crowd // Journal of Business Venturing: entrepreneurship, entrepreneurial finance, innovation and regional development. — 2014. — № 29(5), P. 585–609. — Access mode: https://perso. uclouvain. be/paul.belleflamme/papers/JBV2013.pdf.

7. Categories Stats & Analytics [Electronic resource] // TheCrowdfundingCentre. — Access mode: http://www.thecrowdfundingcenter.com/data/categories.
8. Zhang B. Pushing Boundaries: The 2015 UK Alternative Finance Industry Report / Bryan Zhang, Peter Baeck, Tania Ziegler, Jonathan Bone and Kieran Garvey. — February 2016. — 56 p. — Access mode: https://www.jbs.cam.ac.uk/fileadmin/ user_upload/research/centres/ alternative-finance/downloads/2015-uk-alternative- finance-industry-report.pdf.
9. Zhang B. Sustaining momentum: the 2nd European alternative finance industry report / Bryan Zhang, Robert Wardrop, Tania Ziegler, Alexis Lui and others // Cambridge Centre for Alternative Finance. — September 2016. — 84 p. — Access mode: https:// www.jbs.cam.ac.uk/ fileadmin/user_upload/research/centres/alternative-finance/ downloads/2016-european-alternative-finance-report-sustaining-momentum.pdf.

SMALL BUSINESS FINANCING IN ISLAMIC ECONOMIC DOCTRINE

O. Subochev,
PhD, associate professor of the International Finance Department, Kyiv National University of Economics named after Vadym Hetman
O. Yurkevich,
PhD, associate professor of the Investment Activity Department, Kyiv National University of Economics named after Vadym Hetman

There is no single agreed definition of small business. Small businesses are generally considered to be non-subsidiary, independent firms, privately owned corporations, partnerships, or sole proprietorships that have fewer employees and/or less annual revenue (the most widely used measures) than a regular-sized business or corporation. Businesses are defined as "small" in terms of being able to apply for government support and qualify for preferential tax policy.

The legal definition of "small business" varies by country and by industry. In addition to number of employees, methods used to classify small companies include annual sales (turnover), value of assets and net profit (balance sheet), alone or as a combination of factors. The criteria for defining the size of a small business differ from country to country, with many countries having programs for taxes reduction and business-support programs.

The European Union generally defines a small business as one that has fewer than 50 employees and either turnover or balance sheet less than €10 m. [1]. A small company is defined in the UK's Companies Act 2006 [2] as one with: annual revenue of no more than £6.5 million; a balance sheet total of no more than £3.26 million and no more than 50 employees. As we can see, the levels are pretty high for what most of us would think of as "small". In the U.S. things are a little more complicated.

The U. S. Small Business Administration uses ownership structure, revenue and/or number of employees to define a small business, but it applies different standards in different industries [3]. The definitions can vary. Most farms qualify as small businesses if they make less than $750,000 a year. But for graphic design services, the standard is ten times higher: $7.5

million. It can even vary within industries. And some definitions are based on number of employees only — often with limits of 1,000 employees or even higher.

The table below summarizes criteria for defining the size of a small business by some countries.

Table 1

Small business size definitions by countries[1]

Country/Region	Employees	Turnover	Balance sheet total
European Union	< 50	≤ €10 million	≤ €10 million
United Kingdom	< 50	≤ £6.5 million	≤ £3.26 million
United States	< 10[1] — 1,000		≤ $750,000 — 7.5 million

The small business sector is regarded as a fundamental ingredient in the establishment of a modern, progressive and vibrant economy. It remains a significant source of new jobs in the economy. The creation of a new business venture provides an opportunity to transcend social inequality and the unemployment trap. Small firms are the natural avenues for self-development and individual achievement, being the natural expression of entrepreneurship.

Small businesses are largely thought to be more innovative than larger firms for three reasons: a lack of entrenched bureaucracy, more competitive markets, and stronger incentives (such as personal rewards). Small firms are better able to adapt to changing and sometimes disruptive economic circumstances. Due to its flexibility, the sector is in an advantageous position to face challenges and changes. The presence of small firms in an economy is an expression of healthy and necessary competition against the excesses of big business and monopoly power and exploitation, sustains technology upgrading and quality improvement.

Small businesses often face a variety of problems, some of which are related to their size. Money is known to be one of the major causes of problems that can lead small business to failure.

---

[1] Small office/home office (or single office/home office; SOHO) refers to the category of business that involves from 1 to 10 workers: lawyers, real estate agents, etc.

Small businesses use various sources to raise start-up capital:
- self-financing by the owner through cash savings or loans on different assets;
- loans or financial gifts from friends or relatives ("friends, family, fools" rule);
- grants from private foundations, government or other sources;
- forming partnerships;
- angel investors;
- loans from banks, credit unions, or other financial institutions
- SME finance[2], including collateral-based lending and venture capital, given sufficiently sound business venture plans.

In spite of various sources to raise start-up capital, a frequent cause of bankruptcy is *under capitalization*. Under-capitalization refers to any situation where a business cannot acquire the funds they need. An under-capitalized business cannot afford current operational expenses due to a lack of capital, which eventually can trigger bankruptcy.

There are several different causes of undercapitalization [4], including:
- financing growth with short-term capital, rather than permanent capital;
- failing to secure an adequate bank loan at a critical time;
- failing to obtain insurance against predictable business risks;
- adverse macroeconomics (reducing demand, increasing interest rates, etc.).

These causes of under-capitalization are often results of improper financial planning: lack of knowledge/skills and lack of direction and planning. This may led to *"SME finance gap"* [5] since a substantial part of the SME sector may not have the security required for conventional collateral based bank lending, nor high enough returns to attract formal venture capitalists and other risk investors.

To ensure that the business has enough capital, the small business owner must also be mindful of contribution margin (sales minus variable costs). To break even, the business must be able to reach a level of sales where the contribution margin equals fixed costs. Nevertheless over half of small firms lack a business plan, a tool that is considered one of the most important fac-

---

[2] SME (abbreviation) finance is the funding of small and medium-sized enterprises

tors for a venture's success. Business planning is associated with improved growth prospects. Funders and investors usually require a business plan [6].

There have been at least two distinctive approaches to try to overcome the SME finance gap.

The first has been to broaden the collateral based approach by encouraging bank lenders to finance SMEs with insufficient collateral. This might be done through an external party providing the collateral or guarantees required. Unfortunately, such schemes are counter to basic free market principles, and they tend to be unsustainable. This sector is increasingly called the Meso-finance sector.

Meso-finance is a relatively new concept in the financing world. Meso-finance loans start from an amount of 1000 euro and are specifically meant for small-and medium-sized enterprises. SMEs that are in need of extra capital are often too large for micro credits due to their higher level of firm complexity compared to small enterprises, but too small for regular loans from a bank. Banks often refuse loan requests from SMEs, due to a lack of in-depth accounting data and make SME finance very difficult. Since the reported financial information is often very basic, this means that these financial overviews often do not live up to the requirements set by banks. As a result, SMEs often miss out on capital access from either micro finance, or regular bank loans. Therefore, the SME sector is also named the "missing middle". Currently, this gap accounts for an amount of $0.7trillion [7].

However, there are some significant structural barriers for bank or private equity to finance suitable SME applicants on mutually satisfactory terms and conditions. The main obstacles to funding are:

- Lack of satisfactory business plans and reliable expertise, accounting and other information;
- Inadequate assets for use as security; and,
- Insufficiently high levels of profitability, gearing, liquidity, stability, and other business-financial performance criteria on the part of funding applicants.

The second approach has been to broaden the viability based approach. Since the viability based approach is concerned with the business itself, the aim has been to provide better general business development assistance to reduce risk and increase returns. This often entails a detailed review and

assistance with the business plan. A common aim or feature of the viability based approach is the provision of appropriate finance that is tailored to the cash flows of the SME.

These two approaches in overcoming the SME finance gap are implemented and consistent with *Profit and Loss Sharing Model*, also called *PLS* or "participatory" banking. Profit and Loss Sharing is a method of finance used by Islamic financial or Shariah-complaint institutions to comply with the religious prohibition on interest on loans that many Muslims subscribe to.

Islamic finance refers to a system of finance based on Islamic law (commonly referred to as Sharia[3]). Islamic financial principles are premised on the general principle of providing for the welfare of the population by prohibiting practices considered unfair or exploitative. The most widely known characteristic of the Islamic financial system is the strict prohibition on giving or receiving any fixed, predetermined rate of return on financial transactions. This ban on interest[4], agreed upon by a majority of Islamic scholars, is derived from two fundamental Sharia precepts [8]:

- Money has no intrinsic worth. Money is not an asset by itself and can increase in value only if it joins other resources to undertake productive activity. For this reason, money cannot be bought and sold as a commodity, and money not backed by assets cannot increase in value over time.
- Fund providers must share the business risk. Providers of funds are not considered creditors (who are typically guaranteed a predetermined rate of return), but rather investors (who share the rewards as well as risks associated with their investment).

Islamic finance, however, extends beyond the ban of interest-based transactions. Additional key financial principles include the following:

---

[3] Sharia is derived from four sources. The main source of Sharia is the Quran, considered by Muslims to be divine scripture. The second most authoritative source of Sharia is hadith—the practice, conduct, and sayings of the Prophet Muhammad. If further clarity is required, jurists seek consensus on rulings among Islamic scholars. In the event that none of these sources provides the necessary legal authority, a jurist may use reasoning by analogy and apply an accepted principle or assumption to arrive at a rule of law.

[4] There is only one type of permissible "loan" according to Sharia, the Qard-Hassan (or Benevolent) Loan, which is interest-free and often considered a form of charity because it is typically forgiven in the event of default.

- Material finality. All financial transactions must be linked, either directly or indirectly, to a real economic activity. In other words, transactions must be backed by assets, and investments may be made only in real, durable assets. This precludes the permissibility of financial speculation, and therefore, activities such as short selling are considered violations of Sharia.
- Investment activity. Activities deemed inconsistent with Sharia, such as those relating to the consumption of alcohol or pork and those relating to gambling and the development of weapons of mass destruction, cannot be financed. In broader terms, Sharia prohibits the financing of any activity that is considered harmful to society as a whole.
- No contractual exploitation. Contracts are required to be by mutual agreement and must stipulate exact terms and conditions. Additionally, all involved parties must have precise knowledge of the product or service that is being bought or sold.

The jurisprudence used to engineer Sharia-based financial contracts is rather complex. Scholars must complete several years of training before becoming certified to issue financial rulings. However, there is no centralized Sharia finance authority, and consequently, there can be conflicting views on the implementation of these principles in designing and extending Islamic financial products.

Many sources state there are two main schemes for profit and loss sharing model used by Islamic banks — *Musharakah* (equity participation contract) and *Mudarabah* (trustee finance contract or passive partnership). Other sources include Sukuk (also called "Islamic bonds") and direct equity investment (such as purchase of common shares) as types of PLS.

The profits and losses shared in PLS are those of a business enterprise or person which/who has obtained capital from the Islamic bank/financial institution (the terms "debt", "borrow", "loan" and "lender" are not used). As financing is repaid, the provider of capital collects some agreed upon percentage of the profits (or deducts if there are losses) along with the principal of the financing. Unlike a conventional bank, there is no fixed rate of interest collected along with the principal of the loan. Also unlike conventional banking, the PLS bank acts as a capital partner serving as an intermediary between the depositor on one side and the entrepreneur/borrower

on the other. The intention is to promote "the concept of participation in a transaction backed by real assets, utilizing the funds at risk on a profit-and-loss-sharing basis" [9].

The profit and loss sharing (PLS) schemes are the Islamic financial contracts most encouraged by Sharia scholars. Musharakah is equity participation in a business venture, in which the parties share the profits or losses according to a predetermined ratio. Musharakah can be used for assets or for working capital.

The picture below defines structure of simple Musharakah contract.
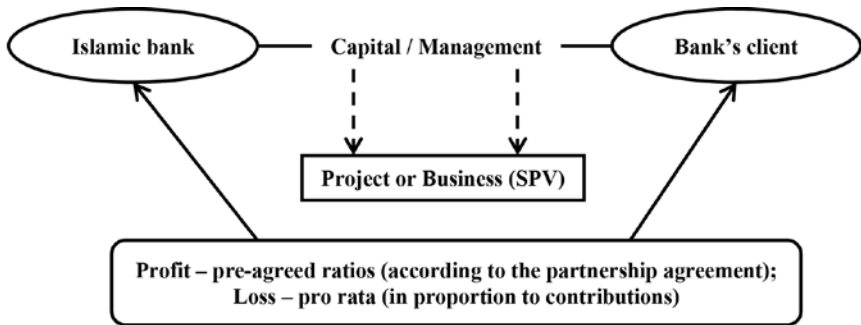
Fig. 1. Structure of simple Musharakah contract.

Musharakah is a joint enterprise in which all the partners share the profit or loss of the joint venture. The two (or more) parties that contribute capital to a business divide the net profit and loss on a pro rata basis.

Musharakah is often used in investment projects and the purchase or real estate or property. In the case of real estate or property, the bank assesses an imputed rent and will share it as agreed in advance. All providers of capital are entitled to participate in management, but not necessarily required to do so. The profit is distributed among the partners in pre-agreed ratios, while the loss — strictly in proportion to respective capital contributions. This concept is distinct from fixed-income investing (i.e. issuance of loans).

Musharaka is used in business transactions and often to finance a major purchase. Islamic banks lend their money to companies by issuing floating rate interest loans, where the floating rate is pegged to the company's

rate of return and serves as the bank's profit on the loan. Once the principal amount of the loan is repaid, the contract is concluded [10].

There are two types of Musharakah contract. First of them is Permanent Musharakah, where investor/partners receive a share of profit on a pro-rata basis. In this case the period of contract is not specified and the partnership continues for as long as the parties concerned agree for it to continue. This is a suitable structure for financing long term projects needing long term financing.

Another type is Diminishing partnership that can be either a "consecutive partnership" or "declining balance partnership". In a "consecutive partnership" the partners keep the same level of share in the partnership until the end of the joint venture, unless they withdraw or transfer their shares all together. It's used when a bank invests in a project, a joint venture, or business activity.

In a "diminishing partnership" one partner's share diminishes as the other's gradually acquires it until that partner owns the entire share. This mechanism is used to finance a bank customer's purchase, usually (or often) of real estate where the share diminishing is that of the bank, and the partner acquiring 100% is the customer. The partnership starts with a purchase, the customer starts renting or using the asset and shares profit with (or pays monthly rent to) its partner (the bank) according to an agreed ratio.

If default occurs, both the bank and the borrower receive a proportion of the proceeds from the sale of the property based on each party's current equity. Diminishing Partnership is particularly popular way of structuring an Islamic mortgage for financing homes/real estate and resembles a residential mortgage. The Islamic financier buys the asset on behalf of the other "partner", the ultimate buyer who then pays the financier monthly installments combining the amounts.

Mudarabah denotes trustee financing, in which one party acts as financier by providing the funds, while the other party provides the managerial expertise in executing the project. In mudaraba, profits are shared according to a predetermined ratio; any losses are borne entirely by the financier. If the mudaraba joint venture results in a loss, the financier loses the contributed capital and the manager loses time and effort.

The picture below defines structure of simple Mudarabah contract.
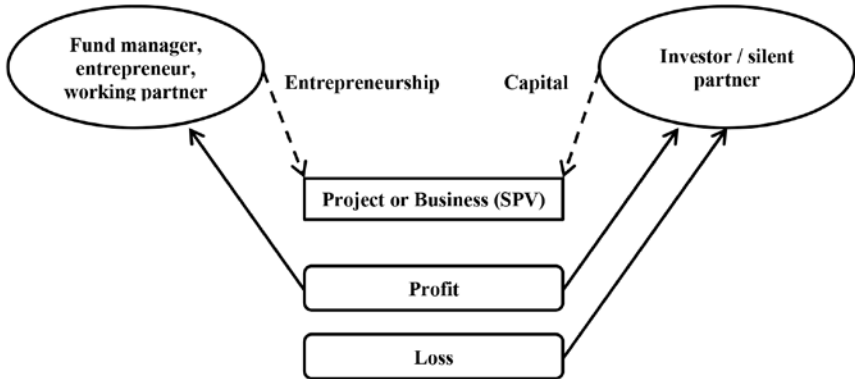
Fig. 2. Structure of simple Mudarabah contract.

Mudarabah is a partnership where one partner (rabb-ul-mal) gives money to another (mudarib) for investing in a commercial enterprise. The rabb-ul-mal party provides 100 percent of the capital and the mudarib party provides its specialized knowledge to invest the capital and manage the investment project. Profits generated are shared between the parties according to a pre-agreed ratio. If there is a loss, rabb-ul-mal will lose his capital, and the mudarib party will lose the time and effort invested in the project. The profit is usually shared 50%-50% or 60%-40% for rabb ul mal-mudarib.

Further, Mudarabah is venture capital funding of an entrepreneur who provides labor while financing is provided by the bank so that both profit and risk are shared. Such participatory arrangements between capital and labor reflect the Islamic view that the borrower must not bear all the risk/cost of a failure, resulting in a balanced distribution of income and not allowing the lender to monopolize the economy.

Mudarabah contracts may be restricted or unrestricted.

In restricted mudarabah, the rabb-ul-mal may specify a particular business for the mudarib, in which case he shall invest the money in that particular business only. For the account holder, a restricted mudarabah may authorize the IIFS (institutions offering Islamic financial services) to invest their funds based on mudarabah or agency contracts with certain restrictions as to where, how, and for what purpose these are to be invested [11].

In unrestricted mudarabah, the rabb-ul-mal allows the mudarib to undertake whatever business he wishes and so authorizes him to invest the money in any business he deems fit. For the account holder funds are invested without any restrictions based on mudarabah or wakalah (agency) contracts, and the institution may commingle the investor's funds with their own funds and invest them in a pooled portfolio [11].

A variation of mudarabah that has caused some complaint is one that replaces Profit and Loss Sharing between depositor and bank with Profit Sharing — the losses being all the problem of the depositors. Instead of both the bank and its depositors being the owners of the capital (rabb al-mal), and the entrepreneur the mudarib, the bank and the entrepreneur are now both mudarib, and if there are any losses after meeting the overhead and operational expenses, they are passed on to depositors. One critic (Ibrahim Warde) has dubbed this "Islamic moral hazard" in which the banks are able "to privatise the profits and socialize the losses" [12].

Another critic — M. A. Khan [13], has questioned the mudarabah's underlying rationale of fairness to the mudarib. Rather than fixed interest lending being unfair to the entrepreneur/borrower, Khan asks if it isn't unfair to the rabb al-mal (provider of finance) to "get a return only if the results of investment are profitable", since by providing funds they have done their part to make the investment possible, while the actions of entrepreneur/borrower — their inspiration, competence, diligence, probity, etc. — have the power (at least in part) to make the investment profitable or a failure.

The table below summarizes differences between Mudarabah and Musharakah contracts.

Table 2

Differences between Mudarabah and Musharakah.

In Mudarabah	In Musharakah
• investment is the sole responsibility of rabb-ul-maal, not all partners; • the rabb-ul-maal has no right to participate in the management which is carried out by the mudarib only; • the loss, if any, is suffered by the rabb-ul-mal only, because the mudarib does not invest anything.	• unlike mudarabah, investment comes from all the partners; • unlike mudarabah, all the partners can participate in the management of the business and can work for it; • all the partners share the loss to the extent of the ratio of their investment;

In Mudarabah	In Musharakah
His loss is restricted to the fact that his labor has gone in vain and his work has not brought any fruit to him, unless losses are due to the mudarib's misconduct, negligence, or breach of the terms and conditions of the contract; • all the goods purchased by the mudarib are solely owned by the rabb-ul-maal, and the mudarib can earn his share in the profit only in case he sells the goods profitably. Therefore, he is not entitled to claim his share in the assets themselves, even if their value has increased.	• as soon as the partners mix up their capital in a joint pool, all the assets of the musharakah become jointly owned by all of them according to the proportion of their respective investment. Therefore, each one of them can benefit from the appreciation in the value of the assets, even if profit has not accrued through sales.

Liabilities

• In musharakah all the partners share the financial loss to the extent of the ratio of their investment while in mudarabah the loss, if any, is suffered by the rabb-ul-mal only, because the mudarib does not invest any money. This is considered just because his/her/their time and effort has been in vain and yielded no profit. This principle is subject to a condition that the mudarib has worked with the due diligence required for whatever the business involved is. If there has been negligence or dishonesty, the mudarib is liable for whatever loss was caused by their negligence or misconduct.

• The liability of the partners in musharakah is normally unlimited, so that if the liabilities of the business exceed its assets and the business goes in liquidation, all the exceeding liabilities shall be borne pro rata by all the partners. However, if all the partners have agreed that no partner shall incur any debt during the course of business, then whichever partner has incurred a debt on the business in violation of the aforesaid condition shall be liable for that debt. In the case of mudarabah the liability of rabb-ul-maal is limited to his investment, unless he has permitted the mudarib to incur debts on his behalf.

Appreciation of assets

• In musharakah, as soon as the partners add their capital together in a joint pool, these assets become jointly owned by all of them according to the proportion of their respective investment. Therefore, each one of them can benefit from the appreciation in the value of the assets, even if profit has not accrued through sales.

In Mudarabah	In Musharakah
• The case of mudarabah is different. Here all the goods purchased by the mudarib are solely owned by the rabb-ul-maal, and the mudarib can earn his share in the profit only in case he sells the goods profitably. Therefore, he is not entitled to claim his share in the assets themselves, even if their value has increased.	

Source: [14].

Both PLS schemes require particularly vigilant reporting and a high level of transparency for profits and losses to be distributed justly. So these two types of contracts within Profit and Loss Sharing Model are used to overcome the SME finance gap and to finance small businesses in Islamic economic doctrine.

Profit and Loss Sharing has been called "the main justification" or even "the very purpose" of the Islamic finance and banking movement and the "basic and foremost characteristic of Islamic financing" [13].

Proponent of Profit and Loss Sharing Model, Taqi Usmani, envisioned it transforming economies by:
• rewarding "honest, honorable and forthright behavior";
• protecting savers by eliminating the possibility of collapse for individual banks and for banking systems;
• replacing the "stresses" of business and economic cycles with a "steady flow of money into investments";
• ensuring "stable money" which would encourage "people to take a longer view" in looking at return on investment;
• enabling "nations and individuals" to "regain their dignity" as they become free of the "enslavement of debt" [15].

Despite of having obvious positive aspects, such as focusing on financing the real sector of economy and encouraging direct interrelationship between financial and productive sectors, in our view, the mechanism of PLS in some ways is at variance with a number of fundamental principles of effective economic activity.

Critics have in turn criticized PLS advocates for remaining "oblivious to the fact" that the reason PLS has not been widely adopted "lies in its inefficiency" (Muhammad Akram Khan) [13] and their "consequence-insensitive" way of thinking, assuming that "ample supply" of PLS "instruments

will create their own demand" (Nawab Haider Naqvi), consumer disinterest notwithstanding [16].

Because clients can share losses with banks in a PLS financing, they (the clients) have less financial incentive to avoid losses of risky projects and inefficiency, than they would with conventional or debt-based lending [13]. Moreover regarding the rate of profit and loss sharing — i.e. the "agreed upon percentage of the profits (or deduction of losses)" the Islamic bank takes from the client -– there is no market to set it or government regulation of it. This leaves open the possibility the bank could exploit the client with excessive rates.

In conventional banking, the banks are able to put all their assets to use and optimize their earnings by borrowing and investing for any length of time including short periods such as a day or so. The rate of interest can be calculated for any period of time. However, the length of time it takes to determine a profit or loss may not be nearly as flexible, and banks may not be able to use PLS for short term investment [13].

PLS is also not suitable or feasible for non-profit projects that need working capital, (in fields like education and health care), since they earn no profit to share.

So today PLS schemes to finance small business originally operate in an unclear regulatory landscape. However, as they expanded, they presented several regulatory challenges that governments have attempted to address to various degrees. In parallel with increased attention by regulatory authorities, international organizations also have been created to set Islamic finance accounting and other standards:

- The Islamic Financial Services Board (IFSB), based in Malaysia, issues prudential standards and guiding principles for Islamic finance. IFSB has issued guidelines on risk management and capital adequacy for Islamic banks.
- The Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), based in Bahrain, promotes financial reporting standards for Islamic financial institutions.
- The Islamic Development Bank (IDB), a multilateral body headquartered in Saudi Arabia, fights poverty and promotes economic development in Islamic country members. It promotes microfinance and poverty alleviation programs through its Islamic Solidarity

Fund for Development (ISFD) with Microfinance Support Programs (MFSP).

Despite a shared core of Islamic values, these institutions often diverge with national regulators (and each other) over Sharia standards and crucially require further unification and standardization to be effective and convenient in small business financing.

REFERENCES:

1.   European Commission (2017), "What is an SME?", available at: http://ec.europa. eu/growth/smes/business-friendly-environment/sme-definition_en (Accessed 22 January 2018).
2.   Companies Act 2006. CHAPTER 46, available at: http://www.legislation.gov.uk/ ukpga/2006/46/pdfs/ukpga_20060046_en.pdf (Accessed 22 January 2018).
3.   The U. S. Small Business Administration (2017), "Summary of Size Standards by Industry Sector", available at: https://www.sba.gov/contracting/getting-started-contractor/make-sure-you-meet-sba-size-standards/summary-size-standards-industry-sector (Accessed 22 January 2018).
4.   Levinson, David (1998). Increase Your Cash Flow. San Francisco: T.B. G. Publishers.
5.   Equicapita (2014), "Who will buy baby boomer businesses?" available at: http://www. equicapita.com/wp-content/uploads/2013/04/Equicapita_May_050214.pdf (Accessed 22 January 2018).
6.   Coleman, A., (2013), "Targeting networking and social media; how to win new business effectively", The Guardian, [Online], available at: https://www.theguardian. com/small-business-network/2013/nov/27/targeted-networking-social-media-business (Accessed 22 January 2018).
7.   The World Bank. World Bank Group Finances (2010), "IFC Enterprise Finance Gap Database", available at: https://finances.worldbank.org/Other/IFC-Enterprise-Finance-Gap-Database-Summary-Data/b4d6-42j9 (Accessed 22 January 2018).
8.   Nimrah Karim, Michael Tarazi, and Xavier Reille (2008), "Islamic Microfinance: An Emerging Market Niche", Focus Note, № 49, available at: https://www.cgap.org/sites/ default/files/CGAP-Focus-Note-Islamic-Microfinance-An-Emerging-Market-Niche-Aug-2008.pdf (Accessed 22 January 2018).
9.   Institute of Islamic Banking and Insurance (2017), "Islamic Banking", available at: http://www.islamic-banking.com/profit_and_lose_sharing.aspx (Accessed 22 January 2018).
10. Financial Islam — Islamic Finance (2016), "Islamic banks commercial transactions", available at: http://www.financialislam.com/investment-and-transactions.html (Accessed 22 January 2018).
11. El Tiby, A. and Amr M. (2011), "*Islamic Banking: How to Manage Risk and Improve Profitability*", Wiley Online Library.
12. Warde, A. (2000), "*Islamic finance in the global economy*", Edinburgh University Press, Edinburgh, UK.
13. Khan M. A. (2013), "*What Is Wrong with Islamic Economics?*", Edward Elgar Publishing, Inc., Northampton, USA.

14. Concepts in Islamic Economics and Finance (2015),"Mudarabah", available at: https://cief.wordpress.com/2006/04/02/mudarabah/ (Accessed 22 January 2018).
15. Albalagh (2017), "The Text of the Historic Judgment on Interest", paragraphs: 150, 168, 204, 205, available at: https://www.albalagh.net/Islamic_economics/riba_judgement.shtml (Accessed 22 January 2018).
16. Naqvi, S.N.H. 2000. Islamic banking: An evaluation. IIUM Journal of Economics and Management 8 (1), pp. 41-70.

CHAPTER 2.

TAX INCENTIVES AND INSTRUMENTS OF DEVELOPMENT INNOVATIONS AND INVESTMENTS IN SME

FISCAL INSTRUMENTS OF SUPPORTING INVESTMENT AND INNOVATIONS: EXPERIENCE OF SOME DEVELOPED COUNTRIES OF EUROPEAN AND NON-EUROPEAN CONTINENT

O. Tymchenko,
D.Sc. in economics, Professor of the Department of Finance,
Kyiv national economic University named after Vadym Hetman
Yu.Sybirianska,
PhD in economics, Associate Professor
of the Department of Finance, Kyiv national economic
University named after Vadym Hetman
Yu. Vasylyshen,
PhD in economics, Associate Professor
of the Department of investment Activity

Economic growth of every country depends not only from smart governance but also from development of high-tech innovative export oriented SMEs. The share of Singapore, one of the smallest countries in the world, in the global hi-tech export accounts 6.4%, South Korea — 6.21%, Poland — 0.67%, Check Republic — 1.07%, Ireland — 0.99%. At the same time, Ukraine's share is less than 0.1%. Moreover, the GDP composition by sector in countries with significant technological advancement differs from Ukrainian. In such countries as Finland, USA, Ireland, Japan, South Korea, Singapore and other advanced countries (average, without of Ukraine) the agriculture has relatively low share of GDP, below 3%. However, all of them has rather high share in global hi-tech exports. Ukraine has a substantial high share of agriculture in its GDP structure, at about 14%. In general, GDP structure in Ukraine is similar to the technologically advanced countries; but taking a closer look at the

Ukrainian export composition in 2015, can be seen a relatively high share of services and commodities in it (62%), however industry accounts only 38% of all exports. Even in Ukrainian IT industry services 79% export are mostly outsourcing and bring low added value. Therefore, Ukraine creates a commodity economy with many risks: citizens of Ukraine could not find well-payed job within the country and will not be able to use their potential in it. At the same time, European governments are fighting for potentially highly qualified taxpayers. Countries with the same human capital index as in Ukraine, have an average GDP at 30 000$ per capita, but in Ukraine it is less than 8000$. Consequently, we can observe a constant brain drain in Ukraine.

To stop such situation, we should study experience of highly developed countries in attracting investments and boosting interest to innovations, determine priority areas of government supporting innovations in these countries and ways of usage fiscal instruments to stimulate investments. Finally, these will help to develop substantiated decisions how to apply the best practices in this sphere in Ukraine.

Practice shows that all highly developed countries has programs to attract highly qualified professionals from abroad. For example, Iceland is a relatively innovative country which innovation strategy to 2020 targets eco-innovation as a key growth sector. In line with this, 3% of the public R&D budget was allocated to environment, which is one of the highest shares in the OECD countries. Industry is the main funder of environment– and energy-related R&D, and there are several eco-innovative companies in Iceland [1]. However, while patenting activity in general has been on par with that in other OECD countries, there have been very few Icelandic patent claims in environmentally relevant sectors.

Sustainable Economic Growth Strategy in Canada follows three paths:

– building economic foundations (support willing governments to build the necessary legislative and regulatory business, industrial, and financial framework upon which sustainable growth can take place);

– growing businesses (enhance the financial viability, productivity, and competitiveness of SMEs, resulting in increasing employment opportunities for the poor);

– investing in people (improve the employment potential of individuals to increase access to and benefits from opportunities in the informal and formal business sectors) [2].

Key efforts of Canadian Government are directed on achieving such goals as: establishment of more micro, small and medium-sized viable enterprises, especially those led by women; micro, small and medium-sized enterprises that are strengthened and that have improved their productivity and return on investments, resulting in increased stable formal employment opportunities for the poor; and the development and accessibility of suitable credit and financial services that result in business, trade, and industry growth to benefit the poorest population groups.

Canada's government supports activities that:

- strengthen support for the development and growth of SMEs with a special emphasis on women;
- aim to increase the productivity and sustainability of businesses, based on realistic market potential to fill value chain gaps, which will result in increased long-term formal employment opportunities for the poor;
- strengthen and increase the availability of financial institutional products and services, including microfinance, which will result in greater job creation for the poor.

On the other hand, among priority sectors that are defined and regularly reviewed by Government's diversification policy in Luxemburg are ICT, space, life sciences, materials and production technologies, automotive components and smart mobility, Eco innovation and logistics [3]. The priority spheres in Denmark are R&D and ecological assistance. Government create some funds, for example, Innovation Fund Denmark, which invest in perspective projects. Moreover, tax policy in Denmark stimulates eco-friendly businesses.

The priority spheres in Slovakia are automotive & mechanical engineering industries, production and processing of iron and steel, ICT and services, consumer electronics and electrical equipment; in Latvia — smart energy, advanced ICT, knowledge intensive bio-economy, biomedicine, medical technologies and biotechnology, smart materials, technology and engineering; in Hungary — advanced technologies in machine industries, ICN and information services, sustainable environment, agricultural innovation, clear and renewable energies, healthy society and wellbeing. In Poland among priority spheres of innovative development are innovative agriculture and agree-food industry, modern textile and fashion industry

(including design), medical industry, pharmaceuticals and cosmetics (including health resort medicine), energy (including EE, RES), IT and telecommunications (ICT). In Estonia — ICT in industry, data analysis and information management, e-health, knowledge-based construction, biotechnologies in food.

In the USA Environmental Sustainability, Economic Sustainability, Social Sustainability [4] are among main spheres of economic development. They suggest that in a truly sustainable environment, an ecosystem would maintain population, biodiversity, and overall functionality over an extended period of time. Ideally, decisions that are made should promote equilibrium within our natural systems and seek to encourage positive growth.

Similar to environmental sustainability, economic sustainability in the USA involves creating economic value out of whatever project or decision you are undertaking. Economic sustainability means that decisions are made in the most equitable and fiscally sound way possible while considering the other aspects of sustainability.

Social sustainability in the USA is based on the concept that a decision or project promotes the betterment of society. Future generations should have the same or greater quality of life benefits as the current generation do. This concept also encompasses many things such as human rights, environmental law, and public involvement & participation.

We can conclude that innovations and investments in R&D are among the priority spheres in most developed countries. At the same time in the strategy of Ukraine "Ukraine 2020" the innovation development as a priority is not even defined at all. Top 10 priorities in Ukraine strategy 2020 are reform of national security and defence system, renewal of authorities and anti-corruption reform, judicial and law enforcement reform, decentralization and public administration reform, deregulation and development of entrepreneurship, healthcare reform, tax reform, energy independence, popularization of Ukraine in the world, as well as promotion of state interests in the global information space [5].

To enhance investment in most developed countries various fiscal instruments and tax preferences are used. For example in Canada there are tax credits of the federal government Scientific Research and Experimental Development (SR&ED). From these tax credits benefit many small businesses by providing broad support for their R&D investments. The SR&ED

tax credits provide over 3 billion Canadian dollars in R&D tax credits annually [6, p. 31-34]. This tax credit is focused on supporting R&D expenditures, whereas other complementary support is also required for non-R&D based innovation and innovation projects directly focused on achieving productivity and employment growth in SMEs. There are also several direct SME innovation programmes in Canada, although total expenditures on these programmes is well below that on the SR&ED investment tax credits. In 2014-2015 near 2500 SMEs received contribution funding for technology projects from the National Research Council's, Industrial Research Assistance Program and approximately 10000 SMEs benefited from technical and business advisory services, often delivered by the programme's 250 Industrial Technology Advisors [6, p. 31, 33].

In Luxembourg companies usually pay around 29.22% corporate tax, that is higher comparing to Ukraine (18% tax rate on CIT). However, the net income connected with intellectual property rights (for example when exploiting a sub licence) enjoys an 80% exemption of the corporate income tax [7]. In other words, one pays a maximum effective tax rate of 5.8% on intellectual property income. Net income under this intellectual property regime is the difference between the gross revenue from the intellectual property right and any expenses directly related to such rights, including the annual write-offs and, where appropriate, the deduction of losses. When an intellectual property company sells qualifying intellectual property rights with a profit, then the 80% exemption also applies to these realised capital gains [7].

In Denmark, tax preferences are just for R&D. Denmark also allows tax credits for R&D, which are most commonly used by new SMEs, although they are not restricted by firm size. For entities that have a tax loss of up to 25 million Denmark crones that results from R&D expenditure, the company can have the tax value of the deficit (up to Denmark crones 5.87 million) paid out [8]. The loss that is able to be carried forward is reduced by the loss that forms the basis of the amount paid out. Denmark has one of the highest environmental tax rate in the EU. So, it encourage eco-friendly businesses. Denmark has been promoting eco-innovations since 2006, when the Danish Parliament requested the Danish Government to launch the first eco-innovation scheme, underpinned by a comprehensive policy framework in support of activities and initiatives in favour of the environment and combating climate change. After the Danish Local

Government Reform in 2007 created five completely new regions in Denmark, green growth initiatives got off due to the synergy effects that the reform offered. Industrial symbiosis and public procurement are two areas that seem particularly to have benefitted from this. However, the new Danish Government (June 2015) has taken a more market oriented approach to green transition with the view that enterprises will implement green business models without the need of comprehensive state support, hence some drastic cuts have been proposed and taken place that will affect circular economy developments. In view of this, the latest Scoreboard results are a result of the work of previous governments and it needs to be seen how the latest policy developments will affect Denmark's result in the future [8].

According to Denmark's Statistic, the amount spent on research and development corresponds to 2.96 percent of Denmark's GDP and includes all research efforts carried out in the country, both by public institutions and private sector. The Danish government helped fund projects worth 21.6 billion kroner (1.07 percent of GDP), while private companies invested 38.3 billion kroner. Only Sweden and Austria invest more in innovation among the OECD countries in the EU.

One of the significant measures implemented in the Slovak Republic is tax deduction for research and development expenses, which will cover a broad selection of eligible costs, including 25 % of research costs, 25 % of the wages of all newly hired employees in the first year of employment and 25 % of the yearly increases in R&D costs [9]. The tax deduction is managed by the Slovak Ministry of Finance.

Moreover, Slovak government has implemented measures to boost research activities in SMEs, promote development and innovation competences and support high-growth innovative companies. The government also continued to implement its innovation vouchers scheme. The areas in which the most important policy initiatives were adopted in the reference period are [9]:

– Entrepreneurship, for which the adopted and ready-to-implement measures include a government-approved plan for a start-up postgraduate scholarship programme and a voucher system to support the protection of intellectual property in start-ups.

– Responsive administration on which Slovakia set up a National Business Centre, providing a comprehensive business support system under a single umbrella organisation.

– Skills and innovation on which tax deductions for R&D expenses were introduced, and Slovakia intended to establish regional innovation offices.

From the beginning of 2016, Polish entrepreneurs conducting activities in the area of research and development (except from those, who pursue SEZ activities) could benefit from an income tax reliefs. Part of the following costs related to R&D works can be additionally deducted from the tax base [10]:

- Gross wages and compulsory contributions of R&D employees;
- Cost of materials and resources directly related to R&D activities;
- Cost of expertise, opinions, advisory and other equivalent services as well as costs associated with the acquisition of R&D results provided or performed by scientific institutions
- Costs of use of R&D equipment dedicated exclusively to R&D activities
- Tangible and intangible assets' depreciation write-offs for the assets used within R&D activities

Small and medium entrepreneurs may additionally deduct the costs of obtaining a patent for an invention. The additional write-off from the tax base in the 2016 amounted to: 30% of the wages and compulsory contributions of R&D employees and 20% for micro, small and medium entrepreneurs and 10% for large entrepreneurs of all the other costs.

However, since 2017 the amount of tax credit is increased to:

- 50% of all the costs for SMEs;
- 50% of the wages and compulsory contributions of R&D employees for large entrepreneurs;
- 30% of all the other costs for large entrepreneurs [10]

According to the signed Strategy of development 2030, priority areas in Russia Federation are:

– integration of support functions for small and medium-sized businesses;

– stimulation for the production of small and medium-sized enterprises, including through increased access to enterprises, procurement of goods, works, services of public sector organizations;

– creation of conditions for increasing labour productivity in small and medium-sized enterprises;

– ensuring the availability of resources for small and medium-sized enterprises;

– improving the policy in the field of taxation and non-tax payments;

– Improvement of the quality of state regulation in the sphere of small and medium business;

– stimulating the development of entrepreneurial activities in certain territories.

So, as can be seen from Development strategy declared principles, the main instruments, which Russian Federation uses, are tax benefits and subsidies for stimulation SMEs development. Government of Russia Federation also makes all possible to simplify access to financial recourses for SME by different Federal programs. They are not always fiscal instruments. Until 2030, government wants to have micro– and small business' part in GDP at the level of 40 % (now it is only 20%). State support for innovation, according to the Federal Law, can be realized in the following forms: granting of privileges on payment of taxes, fees, customs payments; provision of educational services, information and consulting support, assistance in the formation of project documentation; formation of demand for innovative products; financial security (including subsidies, grants, loans, loans, guarantees, contributions to the authorized capital); implementation of targeted programs, subprograms and implementation of activities within the framework of the state programs of the Russian Federation; export support; provision of infrastructure. Official data shows that in 2016 Russian Federation spent only 0,2 % of GDP for innovation support and development, in 2014 — 0,18 %. It is rather a law level, which hardly could boost their economy.

Talking about the USA, its tax-related fiscal policy affects retail businesses by changing the amount of disposable income people have to spend. Higher taxes, or an expansion of taxable items, lowers consumers' net income, making them more budget conscious and apt to limit expenditures to necessities [11]. Lower taxes leave more money in consumers' pockets to spend on goods and services retailers offer. Fiscal policy that involves government spending and adds to the federal deficit can lead to higher interest rates. This can increase the cost of credit and mortgages that may make consumers think twice about purchases. It also may encourage them to save, leaving less of their take-home pay for trips to the store.

Among variety of incentives that countries in a global market offers to attract businesses, especially innovative business, are the next:

– France provides cash grants, loans, tax credits and tax holidays, reduced SSC, reduced tax rates, accelerated depreciation on R&D assets, patent-related incentives.

– Belgium offers tax credits, cash grants, income tax withholding incentives, patent-related incentives, tax exemptions, reduced tax rates, tax deduction (including super deduction), loans, VAT reimbursement, reduced SSC

– Hungary provides cash grants, reduced tax rates, tax credit, patent-related incentives, reduced SSC, tax deduction (including super deduction)

– Netherland delivers income tax withholding incentives, reduced tax rates, tax credit, patent-related incentives, reduced SSC, tax deduction (including super deduction), accelerated depreciation on R&D assets, cash grants

– UK offers cash grants, tax credit, patent-related incentives, accelerated depreciation on R&D assets.

From the mentioned above information we can conclude that each country use rather large scope of instruments to stimulate investments and increase interest to innovations. There should be mentioned that the EU countries strategy for 2020, "the Strategy of smart sustainable and inclusive growth" includes three main goals: smart growth — development of knowledge-based economy and innovation; sustainable growth that means more efficient usage of resource, develop environmentally friendly and competitive economy; and inclusive growth that indicates high employment, economic, social and territorial unity. Public servants in Ukraine should take the EU and non-EU countries experience into consideration when they develop decisions concerning boosting innovations and economic development in Ukraine in order to achieve goals of sustainable development. tax policy in Ukraine should stimulate eco-friendly businesses, development of innovative agriculture and agree-food industry and provide tax preferences for R&D.

Ukraine has all chances to join the global community and great possibilities to become a highly developed country with a knowledge-based environmentally friendly and competitive economy. The key reasons of it are great advantages comparing to other countries: high quality human capital, competitive hi-tech developments, space and aviation industry, outstanding math and biotech schools, leading position in the global market of IT industry. Ukraine ranks third in the world by the number of certified IT specialists, after the USA and India.

Therefore, Ukrainian government should reconsider the priorities of the Development Strategy and encourage informal investors, including business angels and crowdfunding network, which play important role in financing innovative SMEs in developed countries. This will force the development of innovative SMEs and make them more competitive in the global world. It needs to enforce government support of both innovations and SMEs development due to the types of government support in political, legislative and economical spheres. Moreover, well-balanced government policy of supporting innovations will contribute to improving wellness, prosperity and achieving goals of sustainable development in Ukraine.

REFERENCE:

1. Incentives and Support. Available from: http://www.invest.is/doing-business/incentives-and-support
2. Development Sustainable Economic Growth Strategy / Government of Canada (international). Available from: http://international.gc.ca/world-monde/issues_development-enjeux_developpement/priorities-priorites/segs-sced.aspx?lang=eng
3. Luxembourg economic promotion strategy: Trade and Investment Board / Luxembourg, 28 February 2017. Available from: https://www.luxinnovation.lu/wp-content/uploads/2017/05/Luxembourg-economic-promotion-strategy.pdf
4. The Environmental, Economic, and Social Components of Sustainability. Available from: https://soapboxie.com/social-issues/The-Environmental-Economic-and-Social-Components-of-Sustainability
5. Decree of the President of Ukraine of 05.26.2015, № 287/2015 "On the Strategy for Sustainable Development "Ukraine — 2020"
6. SME and Entrepreneurship Policy in Canada. OECD Studies on SMEs and Entrepreneurship. Available from: http://www.oecd.org/publications/sme-and-entrepreneurship-policy-in-canada-9789264273467-en.htm
7. Doing business in Luxembourg. Available from: http://www.nomoretax.eu/doing-business/minimise-taxes-luxembourg/
8. Eco-innovation: at the heart of European policies. Eco-innovation Action Plan. European Commission. Available from: https://ec.europa.eu/environment/ecoap/denmark_en
9. SBA Fact Sheet 2016: Slovakia. European Commission. Available from: https://ec.europa.eu/docsroom/documents/22382/attachments/31/translations/en/renditions/pdf
10. Grants and tax incentives for investments in Poland // Available from: http://www.ey.com/Publication/vwLUAssets/ey-grants-and-tax-incentives-for-investments-in-Poland/$FILE/ey-grants-and-tax-incentives-for-investments-in-Poland.pdf
11. How Do Fiscal Policies Impact the Retail Business? Available from: http://smallbusiness.chron.com/fiscal-policies-impact-retail-business-73966.html

TAX INCENTIVES AND LEVERAGE OF SMALL AND MIDSIZE BUSINESS DEVELOPMENT: THE EU AND UKRAINE

Z. Varnalii,
Doctor of Economics, Professor,
Taras Shevchenko National University of Kyiv
M. Romanyuk,
candidate of economic sciences, associate professor,
Taras Shevchenko National University of Kyiv
D. Nikytenko,
candidate of economic sciences, associate professor,
doctoral student,
National University of Water and Environmental Enginiering

Implementation of the European integration incentives of Ukraine is possible only with the formation of a competitive market environment, the formation of the middle class, the developmet of civil society, the solution of the problems of employment and ensuring stable economic growth. The decisive role of large enterprises in ensuring economic stability of the country is hardly to be denied. However, small and midsize businesses (SMBs) as integral constituents of the market economy continue to be objects of constant attention and special interest of the governments of developed and developing countries.

From this, the study of the regulatory impact of taxation on the SMBs' activities, their sensitivity to taxation changes is an important issue. Large companies with significant financial resources are more resistant to changes in the external environment and doing business. They react to technical and technological changes, changes in the market conditions or tax laws by making additional investments at the expense of their own resources. At the same time, the SMBs may not have at their disposal such resources. Therefore, taking into account their social and socioeconomic significance, the tax rules established for SMBs should provide the system of tax incentives and influence leverage that facilitate the tax burden or stimulate the direction and scope of a particular activity.

These issues are of considerable interest to entrepreneurs, owners and management of enterprises, organizations and unions that are created to represent the interests of entrepreneurs and to develop a favorable business environment, practitioners and scholars. The interest in the issue is steadily growing; also because the simplified taxation system of SMB`s is a subject of consideration during the annual budget campaign. And the task of practitioners and scholars is to objectively study the impact of such tax system instruments on the economic situation of the country, as the vacuum of the researches creates the basis for political bidding and populism. In this respect, it is difficult to overestimate the work of Ukrainian scholars in the economical field such as O. Baranovskyi, V. Bazylevych, S. Dryga, T. Efimenko, V. Geeyts, Yu. Ivanov, T. Kovalchuk, I. Lyutyi, A. Sokolovska T. Vasyltsiv, L. Vorotin, Yu. Yekhanurov, V. Zyan'ka and others, as well as classical works of foreign researchers who have studied the taxation issues in general and the issues of SMBs' taxation, in particular, namely A. Atkinson, P. Gutman, F. von Hayek, S. Hunt, P. Krugman, M. Porter, F. Schneider, J. Stiglitz and others.

Permanent changes in Ukrainian tax legislation as well as changes in the legislation regulating the relations of economic entities and classifying them by size require constant research on these issues. The Tax Code of Ukraine is the main legislative act of tax relations regulation, which, since its adoption in December 2010, has undergone significant changes, including in the part regulating tax payment by SMBs. Also, another aspect of the study should be the classification of economic entities by size, its criteria and awareness of differences in these issues that are characteristic for foreign and Ukrainian tax practices, as well as some inconsistencies and contradictions that can be found in the regulatory legal acts of Ukraine.

SMALL AND MEDIUM BUSINESS AS AN OBJECT OF TAX STIMULATION

The role and place of small and midsize business (SMB) in the national economy is best reflected in its functions. Considering the functions of SMB in a stable market economy, the following factors need to be emphasized:

First, it is an invaluable contribution of SMB to the formation of a competitive environment. It is known that in a free market economy, the competition is a reflection of the competitive relationships between economic

elements, when their independent activity effectively limits their possibilities to influence the general conditions of circulation of goods within the market, and also stimulates the production of the goods needed by a consumer. Then their activities become dynamic, they are associated with the economic responsibility and the entrepreneur's risk, who transforms it into a peculiar social engine of economic development. The SMB helps to establish a competitive relationship, because it is antitrust in nature, which is manifested in various aspects of its functioning. On the one hand, SMB due to the large number of its components and its high dynamism is much less exposed to the monopolization than large enterprises. On the other hand, under the conditions of narrow specialization and the use of innovative technology, it acts as an effective competitor that undermines the monopolistic position of large corporations. It is this feature of the SMB that played a significant role in mitigation and sometimes in overcoming the tendencies of monopolization and delay in technical processes, which are inherent for the developed countries'.

Second, responding promptly to the changing market conditions, the SMB provides the market economy with the necessary flexibility. This feature has gained a special significance in modern conditions because of rapid individualization and differentiation of consumer demand, acceleration of scientific and technological progress (STP), growth of the nomenclature of industrial goods and services.

Third, the contribution of SMB to the breakthrough in many important areas of STP is enormous, especially in the fields of electronics, cybernetics and informatics. By contributing to accelerated implementation of the latest technical and commercial ideas, to production of high-tech products, the SMB acts as a leader of STP.

Fourth, the SMB makes a significant contribution to solving the employment problem. This feature manifests itself in the ability of SMB to create new jobs and absorb excess labor during cyclical recessions and structural changes in the economy.

Fifth, the SMB's important function of is to mitigate social tension and to democratize market relations, as they comprise a fundamental basis for the middle class formation. Consequently, it fulfils the function of weakening the social differentiation tendency inherent for the market economy and expanding the social base of reforms being are carried out at this stage.

Without orientation towards the middle class as a social base of the market environment, the introduced reforms are doomed to failure [1, p. 122-125].

As it is stated in the Strategy for the Development of Small and Medium Entrepreneurship (SME) in Ukraine till 2020, approved by the Resolution of the Cabinet of Ministers of Ukraine dated on May 24, 2017 No. 504, SME has had operated for a long time in Ukraine under difficult conditions of socio-economic development [2].

The year 2014 was marked with the beginning of the economic crisis in Ukraine (the third one since the country was declared independent), caused by a geopolitical conflict (temporary particial occupation of the territory of Ukraine as a result of armed aggression of the Russian Federation and the realization of the anti-terrorist operation), which led to the destruction of production facilities and transport infrastructure, to the loss of inter-branch and logistic links, to the complication of international relations, to the inaccessibility of energy raw materials (coal), to the significant growth of investment risks and negative expectations of the country's population. Also, the accumulated systematic imbalances also had a significant negative impact on devaluation and inflationary processes.

According to the latest statistical data, there were 423 large business entities (or 0.02 per cent of the total number of business entities) in Ukraine in 2015, the rest comprised SMBs, including 15,510 entities of medium entrepreneurship, 1.96 million small business entities (327,814 small businesses and 1.6 million entrepreneurs). A significant devaluation of the hryvnia in 2014-2015 led to the fact that a part of business entities traditionally perceived as large businesses began to receive revenue from their activities less than 50 million euros. Therefore, their data were included to the statistical information as incomes of midsize enterprises.

In 2015, compared to 2014, the number of SMBs decreased by 15 and 7 percent, respectively, which may cause the transfer of small and medium enterprises to another group due to limited demand and liquidity problems. More than 2 thousand enterprises declared bankruptcy and started the process of liquidation within 2014-2015 (according to the database of the Supreme Economic Court of Ukraine). At the same time, the number of microenterprises has increased, new enterprises were formed (or restored their activities) by the people who had lost their jobs or had migrated from the territory of the anti-terrorist operation. In addition, in 2015, the vol-

ume of production (products vs services) of small and midsize enterprises increased by 28.9 percent at the expense of rising consumer prices, and amounted to 63 percent of the total volume of sales. In general, the number of SMBs increased within 2014-2015.

The loss of positions by some large businesses and the stability of SMBs under the crisis conditions led to the increase of proportion of SME in Ukraine. In Ukraine, in 2015, SMBs accounted for 79.1 percent of all employees and 59 percent of added value in terms of production costs; and these indicators are higher than in Poland and Germany.

The midsize enterprises in Ukraine, in general, are larger than in the EU countries, and they form a significant share of added value in terms of production costs (39.1 percent) and employment (32.2 percent). The subjects of micro-entrepreneurship constitute a large group, but not a very productive one — 35.2 per cent of employees and 8.9 per cent of added value in terms of production costs. In the EU, microenterprises also face the problem of low productivity (29.2 and 21.1 percent, respectively).

In 2015, SME provided 59 percent of the total added value in terms of production costs in Ukraine. A significant share of added value in terms of production costs of SME lies in trade and industry, with a significant contribution from enterprises operating in agricultural field and providing a variety of services. The subjects of microentrpepreneurship are focused on providing services in those areas that do not require significant investments in production; and 32.1 percent of added value in terms of production costs of these entities falls into the trade. This factor reflects the relative simplicity for starting an entrepreneurial activity, sufficient level of profitability and possibilities for optimizing the taxation system. Subjects of medium-sized entrepreneurship are mostly concentrated on service provision, but 30.3 percent of added value in terms of production costs is provided by manufacturing industry. The share of added value in terms of production costs of business entities operating in agriculture is significant in the segment of small entrepreneurship (excluding micro-entrepreneurship), i.e. 20.5 percent. This factor can be explained due to the balancing between higher productivity of manufacturing industry and additional costs necessary for administering a large number of leasehold contracts for land plots in different locations.

In the sphere of providing services there are more SMBs than subjects of large entrepreneurship. In 423 large enterprises, 400 carry out activities

in the field of agriculture, industry, trade or transport, 11 — in construction, information and telecommunications sectors, and the rest — in other areas. In addition, for it is difficult some SME subjects to switch to another group of companies, in particular to leave the group of microentrepreneurship and enter the group of small business entities. In general, SME in Ukraine is heterogeneous, which requires different approaches to policy development and, accordingly, its implementation tools [2, p.7].

SMBs are good at flexible and fast meeting of consumers' needs, serve as an effective tool for solving socio-economic problems at both the national and regional levels. It is confirmed, in particular, by the fact that small enterprises produce up to 60% of gross domestic product (GDP) and provide jobs for more than half of the population of Western Europe and the United States, make a significant contribution to the export potential (their share in total export volumes varies from country to country from 15 to 40%), contribute to the rapid implementation of the latest scientific and technological achievements into the production, etc. [3].

DIFFERENCES OF CRITERIA FOR IDENTIFICATION OF SUBJECTS OF ECONOMIC ACTIVITIES IN THE EUROPEAN UNION AND UKRAINE.

Implementing the foreign experience of tax incentives for SMB development in Ukraine, it is important to understand common features and differences regarding the criteria for identifying business entities, which are used by foreign researchers, and existing criteria in the legislation of Ukraine.

According to the recommendations of the European Commission, the number of employees, turnover and amount of balance make up quantitative criteria for identification of economic entities by size. Das Institut für Mittelstandforschung in Bonn/Germany (the IfM Bonn) defines only two such criteria, namely the number of employees and the volume of turnover (Table 1).

SMBs account for 99% of all EU enterprises. The definition of SMBs is important for entering the EU's funding and support programmes targeted specifically at these enterprises.

Ultimately, the tax legislation of most developed countries, by defining the concept of "small enterprise", "medium enterprise" use quantitative indicators as basic ones, but they are mostly complemented by qualitative characteristics.

Table 1

Quantitative criteria for identification of economic entities by size

Defined by the European Commission (from 01.01.2005)			
Size of the entity	Number of employees, persons	Turnover, million euros / year	Value of the balance, million euros / year
Micro	Up to 10	Up to 2	Up to 2
Small	Up to 50	Up to 10	Up to 10
Middle	Up to 250	Up to 50	Up to 43

Source: compiled by authors after [4]

Modern Ukrainian legislation does not apply a single approach to the classification of business entities into small, medium and large. There are also no single criteria for such a classification. For example, in accordance with paragraph 3 of Article 55 of the Commercial Code of Ukraine, the average number of employees of the business entity for the calendar year and its annual income from all activities should be used as such criteria.

According to these criteria, business entities may belong to small businesses, including microenterprises, medium or large enterprises [5].

– microenterprises are individuals and legal entities whose average number of employees for a calendar year does not exceed 10 persons and the annual income from any activity does not exceed the equivalent of 2 million euro, which is determined by the average annual change rate of the National Bank of Ukraine;

– small business entities are individuals and legal entities, the indicators of do not exceed 50 people and 10 million euros, respectively;

– the subjects of large business are legal entities of any organizational and legal form and ownership, in which the average number of employees for the reporting period (calendar year) exceeds 250 persons and the annual income from any activity exceeds the amount, equivalent to 50 million euros, which is determined by the average annual change rate of the National Bank of Ukraine.

– other business entities belong to medium-sized entities.

Other criteria for classifying enterprises by size are described in the recently adopted amendments to the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" [6], according to which three criteria are

defined: number of employees, book asset value and net income from sales of products (goods, works, services). According to these criteria, enterprises are divided into:

– microenterprises — their indicators on the date of annual financial statements preparation for the year preceding the reporting period correspond to at least two of the following criteria: the book asset value — up to 350 thousand euros; net income from sales of products (goods, works, services) — up to 700 thousand euros; the average number of employees — up to 10 people.

– small-sized enterprises — their indicators do not meet the criteria for microenterprises and their indicators on the date of annual financial statements preparation for the year preceding the reporting period correspond to at least two of the following criteria: the book asset value — up to 4 million euros; net income from the sale of products (goods, works, services) — up to 8 million euros; the average number of employees — up to 50 people.

– medium-sized enterprises — their indicators do not meet the criteria for small enterprises and their indicators on the date of annual financial statements preparation for the year preceding the reporting period correspond to at least two of the following criteria: the book asset value — up to 20 million euros; net income from the sale of products (goods, works, services) — up to 40 million euros; the average number of employees — up to 250 people.

– large enterprises — their indicators do not meet the criteria for mid-size enterprises and thier performance on the date of annual financial statements preparation for the year preceding the reporting period corresponds to at least two of the following criteria: the book asset value — more than 20 million euros; net income from the sale of products (goods, works, services) — more than 40 million euros; the average number of employees — more than 250 people.

Thus, according to the Commercial Code, micro and small-sized enterprises include entrprises with the annual income of up to 10 million euro, while according to the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" this criterion is fixed by up to 8 million euros. Regarding the quantitative criterion, it is defined in both legal identically, i.e. not more than 50 people. In addition, the Law contains another criterion,

namely the book asset value, which is 4 million euros for small businesses. From this, the criteria for midsize entrepreneurship (with the annual income ranging between 10 and 50 million) and midsize enterprises (within 8 and 40 million euros of net income) do not coincide, as well.

It is also worth mentioning that according to the Law of Ukraine "On Development and State Support of Small and Midsize Entrepreneurship in Ukraine", the state support is provided for the subjects of small and midsize entities, which exactly correspond to the criteria, set by the Commercial Code of Ukraine [7].

According to the analysis of most literature on tax incentives and their impact on the development of SMBs, a simplified tax, accounting and reporting system (STARS) is considered to be the main activ leverage of such influence. However, the Tax Code of Ukraine (TCU) [8], by implementing STARS, also establishes different criteria for economic entities, from those above, which can make use of this system. It should be noted that none of the groups of single tax payers, except for those of group four, for which the TCU does not set the value limit of annual income, meets either the requirements of the Commercial Code or the requirements of the Law of Ukraine "On accounting and financial reporting in Ukraine" according to the criterion (the maximum — for the third group of 5 million UAH) applied to small-sized enteties (respectively, at least — 2 million or 700 thousand euros).

Thus, the consideration of the STARS as a valid and current tax incentive for the development of SMBs is a misleading approach. In our opinion, the STARS is exclusively applied to micro-enterprises. Small and midsize enterprises can not make use of this system due to the fact that they do not meet the criteria set by the TCU.

From this, it can be argued that f tax incentives and leverage of SMB development should concern, on the one hand, small and midsize enterprises, for which the Ukrainian tax legislation does not define specific incentives and leverage; on the other hand, there are micro-enterprises, for which the TCU offers a special tax regime, the STARS. It should be kept in mind that the sector of micro-business is limited by a more strikt criteria (the volume of sales in the amount of UAH 5 million), in comparison with the above criteria, which are used by the European Union and in the legislation of Ukraine.

EUROPEAN EXPERIENCE OF TAX INCENTIVES AND LEVERAGE APPLICATION FOR SMALL AND MIDSIZE BUSINESS DEVELOPMENT.

Taking into account the above mentioned features, we will consider some aspects of application of tax incentives and leverage of SME development in a number of developed countries, exemplified by the corporate tax.

The European Commission's Directorate General for Internal Market, Industry, Entrepreneurship and SMEs carried out a study on "SME taxation in Europe — an empirical study of applied corporate income taxation for SMEs compared to large enterprises", where the impact of taxes and tax incentives on financing, investment behaviour and the choice of legal form were studied, examplified by corporate tax [9]. This study was aimed at provision of an in-depth analysis of SME and R&D tax incentives for 20 EU Member States and — in some parts of the analysis — five non-EU countries (Canada, China, Japan, Switzerland, and the USA) for the period from 2009 to 2013[5]. Its findings and recommendations are based on a comprehensive review of tax codes, modelling of tax burdens using two different models, a descriptive analysis of company financial ratios, and the opinions of tax advisers and companies in each country.

Based on the Report, we can draw the following conclusions, which, in our opinion, are important for building a tax incentive system for the development of SMB in Ukraine:

– corporate income tax burdens for SMB across Europe significantly varies from one country to another. While Italy, Germany, Finland and Belgium exhibit some of the highest fiscal burdens, Ireland, Estonia and Bulgaria are at the other end of the spectrum. In addition, the analysis of financial indicators shows that only five countries (France, Greece, Bulgaria, the UK and the Netherlands) treat SMBs more beneficially than large enterprises (LSEs) in terms of the actual burden of taxes paid.

– tax incentives for SMB are not as frequently implemented as tax incentives for R&D for such enterprises. Mostly, reduced tax rates (special tax rates) are employed to support SMBs. Reductions in tax rates show rather

[5] The next EC study, intended to draw conclusions and make recommendations on how to improve the competitive situation of SMB in the light of administrative costs, i.e. the costs of complying with the tax legislation faced by SMBs, will be introduced by the Directorate General at the end of 2017.

unfavorable trends, as the tax burden is shifting to other members of the tax system. Other tax incentives related to tax credits, investment deductions and allowances, accelerated depreciation schemes and special regimes for certain types of income are rare and often related to very restrictive eligibility criteria (i.e., only large corporations that are involved in certain industries, activities, or regions have the right to do so). In entrepreneurs' opinion R&D tax incentives, deductions and special or accelerated depreciation rates are very important tools for corporations other then for SMBs.

– R&D tax incentives are more advantageous for SMB, but large-sized enterprises (LSEs) can circumvent high tax burdens by means of optimized location and financing strategies. In many EU member-states, the latter more than offsets the advantages incurred by SMBs due to tax incentives;

– most SME tax incentives are benefitial for only micro and small enterprises. Midsize enterprises basically benefit only from R&D tax incentives, whereas small and micro entities additionally incur relief from SME tax incentives. In this way, there is some kind of discrimination regarding the midsize company, which tends to withstand the same burdens as LSEs.

Taking into account the conclusions from the given analysis of tax incentives and leverage of SMB development in the EU, it is necessary to formulate appropriate approaches to reform the tax regulation in Ukraine.

SYSTEM OF TAX INCENTIVES AND LEVERAGE OF SMALL AND MIDSIZE BUSINESS DEVELOPMENT IN UKRAINE AND ITS IMPROVEMENT

Ensuring the effectiveness of tax incentives for SMB should be one of the basic conditions and grounds for the incentives to be introduced. Researchers of the problems of the current state of applying tax incentives substantiate both its advantages and disadvantages. The main disadvantages are complicated administration, decrease of budget revenues, strengthening of tax unfairness and distortions of competition, business abuse, corruption by the authorities, etc. [10].

For microenterprises in Ukraine, the most effective leverage of tax regulation of their economic development is the application of the STARS. The single tax is paid to local budgets, and its dynamics indicates that income from a single tax is growing at a much faster pace than other tax sources

of the local budget. This, in particular, illustrates the revenues of the single tax paid by microbusinesses to local budgets during 2016, which are given in Table 2

Table 2

Local taxes and their revenue structure in 2016

INDICATORS	Together: General and Special Funds		
	Approved by local councils for 2016, subject to changes	Plan for 2016, taking into account the changes made	Completed for 2016
Local taxes	37 646 970 451	37 648 481 203	42 261 496 693
Property tax	22 672 253 195	22 672 842 916,06	24 989 363 360,16
Parking fees for vehicles	112 321 984	112 321 984,00	66 173 923,33
Tourist fee	42 357 734	42 357 734,00	54 094 787,60
Single tax, including	14 820 027 373	14 820 948 404	17 167 102 075
– single tax on legal entities accrued before January 1, 2011	25 800	25 800,00	-848 881,34
– single tax on individuals, accrued before January 1, 2011	352 631	352 631,18	-30 771,83
– single tax on legal entities	2928653428	2928656452	3300617191
– single tax on individuals	9423104461	9423184957	10326543406
– single tax on agricultural producers, in which the share of agricultural com- modity production in the previous tax (reporting) year is equal to or exceeds 75 percent	2467891053	2468728564	3540821132
Single tax / local	39,37%	39,37%	40,62%

Source: compiled by authors on the basis of [11]

The single tax revenue over the planned values in 2017 has become a steady trend. Thus, local tax and fees revenues to the local budget during January-March 2017 amounted to 12.3 billion UAH, which is 36% more than within the same period in 2016. The single tax is second in the struc-

ture of tax revenues of local budgets — 46.49%, which is 6.47% more than in the corresponding period of 2016. It should be noted that as of January-March 2017, the revenue from the single tax amounted to UAH 5.7 billion, which is almost 2 billion, or 58% more than in the same period of the last year, with the upward trend remaining during the subsequent periods.

At the same time, as noted above, the STARS is not applied by entities, which, in accordance with the Commercial Code of Ukraine and the Law of Ukraine "On Accounting and Financial Reporting in Ukraine", refer to small and midsized enterprises. By the way, according to European experience, EU member states also do not "bind" the application of tax incentives to SMBs due to the criteria and threshold values proposed by the European Commission's definition of SMBs (number of employees, net income and total assets), but are guided by other criteria prescribed in the tax law. However, as a rule, this criterion is net income, the amount of which significantly exceeds the maximum value stipulated by the TCU for single tax payers in the amount of 5 million UAH.

Therefore, in our opinion, the analysis of tax incentives and leverage for SMB development will be incomplete if we do not analyze the general principles, possibilities and direction of other tax incentives available in the tax legislation that small and midsize enterprises apply.

Such tax incentives, in particular, include tax incentives that stimulate innovation, privileges for certain industries or for production of certain commodities.

Taking into account the targeted nature of tax incentives, their effectiveness should primiraly include the realization of such goals as:

– SMBs' obtaining of direct benefits from the use of privileges and improvement of the financial and economic results of their activities;

– achievement of multiplier effect of the socio-economic level increase of the industry, region and country as a whole.

At the level of business entities, the effectiveness of tax incentives can be manifested in the increasing of financial resources for development as a result of reduction of tax liabilities (reduction of rates, exclusions from the tax base, deferral of payments) and reduce of expenses for administering tax liabilities. The reverse effect on financial resources will have a complicated procedure for obtaining the right to use tax incentives, corruption expenses and risks.

Modern researchers of the national tax system draw attention to the fact that the effectiveness of the nation in the field of economic relations regulation depends to a large extent on the choice of the doctrine of its socio-economic development, in accordance with declared commitments to the society, the current state of the economy, traditions and perspective directions of macroeconomic regulation, as well as on the formation of a balanced decision-making system. The decisive place in this system is taken by the decisions regarding the analysis of the impact of tax levers on the conditions of SMB'seconomic activity. Such impact should be considered in the following directions:

– first, the direct effect, i.e., the effect of the taxation system influences the conditions of the enterprises' activity through the immobilization of working capital, which economic entities use for the tax payment. Thus, with the increasing tax burden on a taxpayer, there will be less working capital for extended reproduction at the disposal of an economic entitty. In the context of the growth of bills receivable, that appears in the adverse phases of the economic cycle, the immobilization of working capital to pay taxes actually stops the economic growth and may, under certain conditions, lead to a "technical" bankruptcy of a business entity;

– second, the indirect influence on the conditions of the SMB's activity is due to the fact that the inclusion of some taxes into the cost, administrative expenses and sales costs does not only affect the profit, but is also a price-forming element of the commodity value. The tax increase automatically leads to a reduction in the total revenue, to stockpiling, to reduction in output, to loss of markets share, to refusal from certain activities, or even to the bankruptcy of the entity;

– third, taxation can either restrain and slow down the technical re-equipment of a SMB, or accelerate it and cause its rapid development as a result of tax incentives for enterprises engaged in innovation activities. It should be noted that in determining the period of such incentives, it should be taken into account that an enterprise will gain an economic effect only when it monetizes the results of innovation activity;

– fourth, taxation itself is a source of increasing administrative expenses, as it requires the formation of a tax policy of an enterprise that is connected with other components of its financial policy: accounting, debt, dividend and other constituents. Simplifying the tax and fees administration at

the enterprise level leads to the transparency of its financial and economic activity, and, can result in entering the capital markets (initial public offering — IPO, private investments).

Thus, analyzing the identified levers of tax influence, it is possible to identify both the main effects of such influence and formulate proposals regarding its orientation to ensure sustainable economic growth by increasing the investment attractiveness of the economy of Ukraine, by counteracting the shadowing of the economy, by development of domestic production and the competitiveness of Ukrainian goods and services in the world market by means of legal and regulatory introduction of a new version of the TCU.

In general, tax incentives should be directed at the interest of enterprises in manufacturing the goods needed by the nation, in development of the regions defined by the state as regions of preemptive development, as well as at the increase of the competitiveness of goods and enterprises.

CONCLUSIONS: The state support and stimulation of economic development includes a number of mechanisms and tools, among which the tax component is one of the priorities. The current conditions of economic development characterized by a critical level of unbalanced public finances, exchange rate instability, reduced production and the growth of social tensions require the most radical reforms in the tax area. Hence, the improvement of the taxation system and tax incentives for the development of SMBs, in particular, should become one of the central economic reforms.

At the same time, ensuring the effectiveness of preferential taxation of SMBs requires consideration of both internal and external conditions and constraints.

The analasis of the general conditions of classification of economic entities by size, taxation of SMBs in Ukraine, and the practices of tax incentives in the European Union, indicates the following.

First, the STARS provided by the TCU is a tax leverage, which stimulates the development of micro-enterprises exclusively; its application by SMBs is not foreseen.

Second, according to the European experience, not all EU countries use direct levers of tax influence on the support of SMB's, but they mainly stimulate the SMBs' innovation activities, R&D work and production implementation of their results, in particular.

Third, the stimulating potential of the current tax system of Ukraine is not limited to STARS, which isn't used to its fullest extent. Legislative changes in the mechanisms for calculating and collecting taxes and the Single Social Fee may more fully activate, under certain circumstances, the stimulating function of the main budget-forming taxes (income tax, value added tax (VAT), and Single Social Fee) and others (excise tax, resource and rent payments, etc.) while maintaining their fiscal capacity.

Fourth, the development of such legislative changes requires serious justification and economic calculations, since even at the level of the preliminary analysis of the general taxation conditions in terms of main taxes and fees there is a mutual linkage and interdependence between them, which results in the structural dependence of the tax revenues of the consolidated national budget and fees into social funds. At the same time, we can conclude that there is a noticeable increase in economic processes in Ukraine due to improvement of the existing taxation system for SMBs and increase of the effectiveness of tax incentives towards promoting the fastest recovery and further sustainable growth of the economy of Ukraine.

Thus, the system of tax incentives for SMBs has to:

– be complex and e sufficiently harmonized with the general system of national stimulation of the real sector economic development;

– be limited to optimal periods during which tax incentives are effective, compared to budget losses;

– associate the application of tax privileges of a general nature (investing in innovation, ensuring energy efficiency, etc.) and directly for certain industries (agro-industrial complex, power engineering, etc.) with the possibility of assessing their efficiency for both economic entities and the budget;

– harmonize the existing tax levers (e.g, the STARS) with the generally accepted legislative provisions in the field of economic law, accounting and reporting.

Taking into account these principles of the tax incentives system for SMB's development will maximally bring it closer to the pan-European principles.

REFERENCE

1. Varnalii, Z.S., (2015). Konkurentsiya i pidpryyemnytstvo [Competition and entrepreneurship]. Kyiv: Knowledge of Ukraine.

2. Stratehiya rozvytku maloho i serednóho pidpryyemnytstva v Ukrayini na period do 2020 roku [Strategy for the development of small and medium-sized enterprises in Ukraine up to 2020] (2017, May 24). *Uryadovyy kur'yer — Uriadovy Courier, 144,* pp. 7-12 [in Ukrainian].

3. Ofitsiynyy sayt Ukrayin´skoho fondu pidtrymky pidpryyemnytstva [Official site of the Ukrainian Fund for Entrepreneurship Support]. *ufpp.gov.ua.* Retrieved from: http://ufpp.gov.ua [in Ukrainian].

4. Entrepreneurship and Small and medium-sized enterprises (SMEs). *ec.europa.eu.* Retrieved from: http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en.

5. Hospodarskyi kodeks Ukrainy [Commercial Code Ukraine]. (2003, January 16). Vidomosti Verkhovnoi Rady Ukrainy — Bulletin of Verkhovna Rada of Ukraine. Kyiv: Parlam. vyd-vo [in Ukrainian].

6. Zakon Ukrayiny Pro bukhhalters´kyy oblik i finansovu zvitnist´ Ukrayiny : pryiniatyi 16 lypnya 1999 roku № 996-14 [Law of Ukraine On Accounting and Financial Reporting of Ukraine from July 16, 1999 № 996-14]. *zakon3.rada.gov.ua.* Retrieved from: http://zakon3.rada.gov.ua/laws/show/996-14/print [in Ukrainian].

7. Zakon Ukrayiny Pro rozvytok ta derzhavnu pidtrymku maloho i seredn´oho pidpryyemnytstva v Ukrayini : pryiniatyi 22 bereznya 2012 roku № 4618-VI XIV [Law of Ukraine On development and state support of small and medium enterprises in Ukraine from March 22, 2012 № 4618-VI XIV]. *zakon2.rada.gov.ua.* Retrieved from: http://zakon2.rada.gov.ua/laws/show/4618-17/print [in Ukrainian].

8. Podatkovyy kodeks Ukrayiny [Tax Code of Ukraine]. (2010, December 2). *zakon3.rada.gov.ua.* Retrieved from: http://zakon3.rada.gov.ua/laws/show/2755-17/print [in Ukrainian].

9. Spengel, Christoph et al. (2015): SME Taxation in Europe: An Empirical Study on Applied Corporate Taxation for SMEs compared to large enterprises. CIP Program 186 / PP / ENT / CIP / 12 / F / S01C24, ZEW Gutachten / Forschungsberichte, ISBN 978-92-79-44335-0, http://dx.doi.org/10.2769/027673 Retrieved from: http: //hdl.handle.net/10419/123313

10. Taranhul, L. L. (Eds), Vdovychenko, A.M., & Chekhovs´ka I. V. (2012). Byudzhetna pidtrymka ta podatkove stymulyuvannya natsional´noyi ekonomiky Ukrayiny [Budget support and tax incentives for the national economy of Ukraine]. Irpin [in Ukrainian].

11. Sait Derzhavna kaznacheys´ka sluzhba Ukrayiny [Site of State Treasury Service of Ukraine]. *treasury.gov.ua.* Retrieved from: http://www.treasury.gov.ua/main/uk/publication/ article/150868 [in Ukrainian].

CHAPTER 3.
ENTREPRENEURIAL CULTURE AS A BACKGROUND FOR THE SMES DEVELOPMENT

ECONOMIC MENTALITY AS AN INFORMAL SIDE OF FINANCIAL ASSETS

Z. Matsuk,

PhD in Economics, Associate Professor,
Ivano-Frankivsk National Technical University of Oil and Gas

Financial assets trading is carried out with the restrictions, which are installed by the state and the participants of securities market. Usually such restrictions are useful, because in the conditions of the asymmetry of information they allow to make trading operations faster and with less costs. But, when we talk about informal restrictions in the organization of financial assets trading, everything is ambiguous. To predict the behavior of participants of securities market is more difficult in the conditions of uncertainty which increases time and costs for making necessary financial decisions [1, p. 67].

The problem of influence of psychological indicators on the economic behavior of individuals in the process of economic decision making is extensively explored by foreign scientists. It is worth to pay attention to the research results of such scientists as John Keynes (Psychological Law of Consumption); Nobel Laureate R. Lucas (Theory of Rational Expectation), D. Kahneman and Tversky (Theory of Perspectives), B. Smith (Model of Securities Market) etc. In contradistinction to the traditional belief stating that market participants are guided by pursuing own benefit and are able to make intelligent decisions for the goal achievement, D. Kehneman proved that the participants made very often irrational economic decisions in the process of the financial assets trading [2]. In particular, the widespread form of irrational decisions is the postponement of making important economic decisions: economic agents who make economic decisions are often mistaken and this allows to analyze the chaos of human decisions. Simi-

larly to possibility to predict and classify financial assets, it is also possible to predict and classify human mistakes [3].

The irrational actions of investors are confirmed by the Model of Securities Market (proposed by B. Smith), where market periodically appears to be in the state of boom or bust, regardless of real value of financial instruments [4]. Definitely it complicates the activity on the securities market and requires the use of new financial technologies, which are based on modern mathematical methods. The real reasons or such behavior are not solved yet, but without a doubt one part of them can be explained by stereotypes of thinking of economic agents, the other one is connected with subconscious factors of human activity (tabl.1)

Table 1

Moral, ethical and socio-psychological principles of a participant of the stock market [5]

Principles	Short characteristics
biological and social unity	in his own behavior and habits the participant of the market is programmed by financial environment and cultural norms, that's why the actions of the subject of securities market are determined not only by current incentives, but also by all experience of his previous life;
evolution	change in the development of technologies and mechanisms of work in the stock market occurs after the emergence of appropriate prerequisites;
increase of entropy	market participants spontaneously seek to move from less risky position (lower profitability) to more risky (higher level of profitability) in the absence of internal and external barriers;
relative behavior	in different conditions the same factors are perceived differently and provoke different reactions;
cumulative effect of external factors	the reason of behavioral actions is not one previous event, but a number of them, therefore it is important to take into account the totality of social, economic, political and psychological phenomena, and also the fact that each stock market participant has its own goal.
general inertia	the human brain usually works in the same direction regardless of different circumstances

Principles	Short characteristics
guideline	the activity of participant of securities market is determined by the system of values, which characterizes his state of readiness to the activities on the market and his activity level;
dominant	fixed in the process of activity in the stock market dominants can not be transformed into logic, as long as there is no other experience of application of new methods of regulation of work in the stock market, which is quite complicated today, since the rules and norms of the command — administrative economy that operated in Soviet times failed because of their ineffectiveness, yet the new rules of financial behavior of a participant as a subject of stock market are not yet fully defined;
correspondence to surrounding requirements	level of manifestation of personal qualities and realization of human opportunities are determined by the influence of environment, in particular by numerous normative legal acts, which don't promote trust of population to the securities market;
adaptation	strengthening of government regulation forces the participants of securities market to spend the effort for adaptation to the existing regulation system;
influence of norms and regulations	current formal norms of securities market cover typical social connections and relationships for most participants, and their observance is the duty of the market participant, but additional regulations suppress personal activity and independence;
reflexive nature of activity	conditional and unconditioned reflexes that ensure the biological and social survival of the participant in the market, his self-development
traditions and customs	in this aspect Information reform NCSSM, aiming to raise the level of financial literacy and financial culture in the stock market is crucial;
previous action validity	economic and political-legal environment predicts the occurrence of events in the dynamics and development, that is, the consciousness of a participant in the stock market makes a decision with a predetermined time-space advance ahead of event, where all its reactions

Principles	Short characteristics
	and actions depend on the past and do not occur without interconnection with the future;
expected beneficial effect	all stock market participants make decisions that anticipate a beneficial effect in the form of income, so regulating their activities regulator must take into account their needs and interests.

It is essential to take into consideration that financial assets trading is largely determined by specific cultural conditions, which are formed in process of historical development. It is necessary to appeal to mental factors, because the specific of national mentality can make impossible any reforms and positive transformations in the securities market. Secondly, taking into account the peculiarities of the national mentality is needed in order to ensure that in the process of establishing rules of financial assets trading not to lose the defining for them characteristic features. Thirdly, it is crucial to determine adequately what is the essence of the "economic mentality" in order, if necessary, pragmatically to use it , and on the other hand — more resolutely overcome the mental gravity of it. And, finally, relatively impartial and critical analysis of current thoughts on national mentality allows to distance from unjustified extremes in the study of mentality.

Economic mentality is defied as the values and norms of behavior of management that characterize representatives of a certain group in one degree or another. Economic mentality represents part of culture that gives the person the opportunity to orientate in activities related to the production of consumer values. Peculiarity of economic mentality directly depends on national character and religious affiliation. Quite logical is the definition of economic consciousness, which specific character is determined by biosocial factors, cultural originality, ethno national and others peculiarities of carriers of mentality [6]. In general sense economic mentality is connected with financial activity of human and society on the securities market — the activity which is connected with assets trading. In the securities market trading activity combine both conscious (algorithms, models, habits, thoughts and behavior) and unconscious (which works automatically on the level of automatism of thought and behavior) parts at the perception of the economic agent of one or the other real or imaginary

(conditional) situations, in which he exists or which he "programs" as a strategy of behavior [7].

To understand the specifics of the influence of mentality on formation of the securities market, we have to take into account special condition of our society during last twenty five years , the society that was formed of people who have experienced the difficult stages of financial crises, fragmentation and reformation. Previously, almost everyone felt like a Soviet man, had a clear place in society, felt secure, the future was completely connected with the existing environment, almost deterministic. Today there is a complex and contradictory process of transformation of economy. The established structure of society is destroyed, majority of the population found himself in a situation of "forced adaptation".

In many respects the development of securities market depends on how national economic culture responds to advanced foreign experience: repels it, creatively perceives, or automatically copies. The economic history of Ukraine is a series of attempts to copy foreign experience followed by periods of rejection of it. Till the end of XX centuries economists studied economic life of society as passive object of social design, where experienced "architect" could build "beautiful castle" instead of "outdated cottage". Failure of attempts to transform the countries of the socialist camp in 'normal" western society proved that architect had to account "material resistance".

Even after 25 years from the beginning of "capitalist revolution" in Ukraine the capitalism feels itself uncomfortable. That's why there is a question: is Ukrainian culture compatible with the idea of capitalist modernization? Will such modernization demand a cardinal refusal of Ukrainian national mentality? Or due to the features of national mentality such modernization, in principle, can not be successful in our country? For answering to this question we tried to use principles of ethnometry — new interdisciplinary direction, which helps to find out how much the Ukrainian mentality differs from the mentality of other nations and which of foreign models of securities market are more suitable for Ukraine.

One of the most popular ethnometry methods was developed in 1960-1970 by Dutch psychologist G. Hofstede: different nations with six indicators that describe prevailing value systems of representatives of different countries and ethnic groups are compared. This makes it possible to deter-

mine the place of each country on global mental map: Power Distance — PDI, Individualism — IDV; Masculinity — MAS; Uncertainty Avoidance — UAI; Long-Term Orientation — LTO; Indulgence versus Restraint — IND (tabl. 2). All indicators are in the range of 0 to 100 points.

Table 2

National cultural indicators [8]

Indicator	Characteristics
Power Distance — PDI	This dimension expresses the degree to which the less powerful members of a society accept and expect that power is distributed unequally. The fundamental issue here is how a society handles inequalities among people. People in societies exhibiting a large degree of Power Distance accept a hierarchical order in which everybody has a place and which needs no further justification. In societies with low Power Distance, people strive to equalize the distribution of power and demand justification for inequalities of power.
Individualism — IDV	The high side of this dimension, called Individualism, can be defined as a preference for a loosely-knit social framework in which individuals are expected to take care of only themselves and their immediate families. Its opposite, Collectivism, represents a preference for a tightly-knit framework in society in which individuals can expect their relatives or members of a particular in group to look after them in exchange for unquestioning loyalty. A society's position on this dimension is reflected in whether people's self-image is defined in terms of "I" or "we."
Masculinity — MAS	The Masculinity side of this dimension represents a preference in society for achievement, heroism, assertiveness, and material rewards for success. Society at large is more competitive. Its opposite, Femininity, stands for a preference for cooperation, modesty, caring for the weak and quality of life. Society at large is more consensus-oriented. In the business context Masculinity versus Femininity is sometimes also related to as "tough versus tender" cultures.
Uncertainty Avoidance — UAI	The Uncertainty Avoidance dimension expresses the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity. The fundamental issue here is

Indicator	Characteristics
	how a society deals with the fact that the future can never be known: should we try to control the future or just let it happen? Countries exhibiting strong UAI maintain rigid codes of belief and behaviour, and are intolerant of unorthodox behaviour and ideas. Weak UAI societies maintain a more relaxed attitude in which practice counts more than principles.
Long-Term Orientation — LTO	Every society has to maintain some links with its own past while dealing with the challenges of the present and the future. Societies prioritize these two existential goals differently. Societies who score low on this dimension, for example, prefer to maintain time-honoured traditions and norms while viewing societal change with suspicion. Those with a culture which scores high, on the other hand, take a more pragmatic approach: they encourage thrift and efforts in modern education as a way to prepare for the future. In the business context, this dimension is referred to as "(short term) normative versus (long term) pragmatic" (PRA). In the academic environment, the terminology Monumentalism versus Flexhumility is sometimes also used.
Indulgence versus Restraint — IND	Indulgence stands for a society that allows relatively free gratification of basic and natural human drives related to enjoying life and having fun. Restraint stands for a society that suppresses gratification of needs and regulates it by means of strict social norms.

Calculation of correlation coefficients allowed to detect correlation between indicators of mentality (after Hofstede) of different countries in the world. Significant connection were detected between the level of human mentality of Ukraine and Romania, Russia, Bulgaria, Slovenia, Turkey and Portugal (tabl. 3)

The results in the Fig. 1 prove that West is West and East is East and it cannot be changed. At the bottom the western countries including Canada and USA, are clearly grouped. No surprises — there is no country there without European cultural roots. Higher are the eastern countries — coun-

tries of Islamic, Confucian, Indo-Buddhist, Orthodox and Ibero-American Civilizations. It is not strange that such European country as Spain get into this group, because due to historical reasons this Iberian country has closer affiliation with the culture of the East, than other European countries.

Table 3

The value of the indicators of mental characteristics by the method of G. Hofstede

Countries	Tightness of correlation	Mental indicators					
		PDI	IDV	MAS	UAI	LTO	IND
Ukraine		92	25	27	95	55	18
closest connection							
Romania	0,99	90	30	42	90	52	20
Russia	0,96	93	39	36	95	81	20
Bulgaria	0,93	70	30	40	85	69	16
Slovenia	0,88	71	27	19	88	49	48
Turkey	0,87	66	37	45	85	46	49
Portugal	0,85	63	27	31	99	28	33
weakest connection							
Norway	−0,12	31	69	8	50	35	55
Germany	−0,12	35	67	66	65	83	40
Nederland	−0,20	38	80	14	53	67	68
Sweden	−0,43	31	71	5	29	53	78
Austria	−0,48	11	55	79	70	60	63
Australia	−0,63	36	90	61	51	21	71
USA	−0,67	40	91	62	46	26	68
Canada	−0,71	39	80	52	48	38	68
New Zealand	−0,78	22	79	58	49	33	75
United Kingdom	−0,91	35	89	66	35	51	69

Source: calculated by author
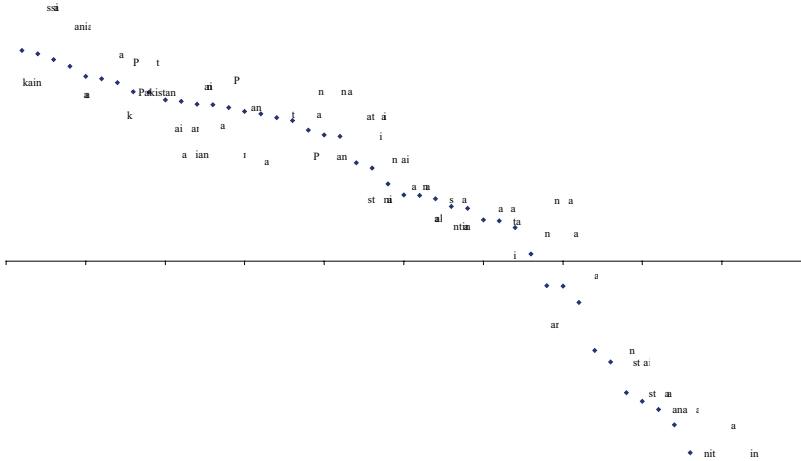
Fig. 1. Ukraine on the map of mental differences (after G. Hofstede)
Source: calculated by author

As we can see on the Fig. 1 Ukraine is placed between the East and West, but closer to the West. The nearest neighboring countries — Russia , Turkey , Romania , Bulgaria , Slovenia — are countries that belong to both — the West and Central Europe . Therefore, the answer to the question: Is Ukraine a European country can be answered as follows: yes, it is, approximately to the same extent as Turkey . As strange as it sounds, such is a reality.

It is obvious, that there is correlation between indicators of efficiency of securities market (tabl.4) and indicators of mentality by G. Hofstede.

The countries, which were chosen for research, have the strongest correlation with Ukraine in terms of mental characteristics. Output data for the study are presented in tabl. 5.

Results in tabl. 6 once again confirm that there is a tight correlation between mental characteristics in selected countries and their indicators of the development of the securities market.

Table 4

International indicators of the efficiency of the securities market [9]

Indicator	Characteristics
GCF	gross capital formation
EPMI	easy of protecting minority investors
MC	market capitalization
VCD	venture capital deals

Table 5

Value of indicators of mental characteristics by G. Hofstede's method and international indicators of the efficiency of the securities market [9]

Countries	International indicators				Mental indicators					
	GCF	IPMI	MC	VCD	PDI	IDV	MAS	UAI	LTO	IND
Ukraine	15,8	56,7	15,7	2,5	92	25	27	95	55	18
Romania	25,0	60	7,6	3,4	90	30	42	90	52	20
Russia	21,6	60	29,5	0,3	93	39	36	95	81	20
Bulgaria	22	73,3	14,4	2,0	70	30	40	85	69	16
Slovenia	18,8	75	14,1	1,7	71	27	19	88	49	48
Turkey	17,4	70	26,3	2,6	66	37	45	85	46	49
Portugal	15,0	56,7	30,1	26,6	63	27	31	99	28	33

Table 6

Coefficients of correlation of mental characteristics indicators by G. Hofstede method and international indicators of efficiency of the securities market

	Ukraine	Romania	Russia	Bulgaria	Slovenia	Turkey	Portugal
Ukraine	1						
Romania	0,97852	1					
Russia	0,965656	0,937471	1				
Bulgaria	0,933308	0,942352	0,948487	1			
Slovenia	0,900485	0,879555	0,844061	0,880173	1		
Turkey	0,874122	0,880198	0,835159	0,877568	0,946267	1	
Portugal	0,860135	0,819772	0,743879	0,755223	0,846219	0,846411	1

Source: calculated by author

Over the past decades Ukraine tries to copy foreign model of economy and in search of answer to the question " which countries to follow?", we tried to implement American liberal model and German market economy, but no one was talking about Slovenia, whose experience of a combination of "normal" entrepreneurship and "communist" kibbutz may provide a sufficient basis for reflection on the prospects for the development of the securities market in Ukraine. These thoughts are extremely relevant, because Slovenia's experience shows a successful model of capitalist modernization in conditions of complex political composition of the population.

Mentality of economic agents is not the same, which at first glance contradicts the axiom of modern economic theory, stating that the main principal of rational activity is to maximize behavior. It means, that making responsible decisions, individual strives to maximize his own benefits by usage of scarce resources or to minimize cost of resources to achieve the corresponding result. But it is important to remember that for economic agent is necessary not only to achieve maximum possible market yield, but also "to save his own face" in the eyes of other participants. That's why, maximizing behavior involves maximizing both income and prestige. If income is more or less interpreted in the same way, the concept of prestige may vary for different market participants.

Taking into account the role of mental norms in the financial behavior of participants in the securities market, we have identified their correspondence according to possible changes in the securities market (tabl.7).

Table 7

The correspondence of national mental traits to the development of the securities market

Positive characteristics		Negative characteristics	
Individualism	Carrying out risky operations; relying on yourself	distrust	Low level of institutional trust
Economic independence	Propensity for disobedience	Underdeveloped financial culture	Absence of moral principals
Patience	Achievement of investment goals; increase of the investment horizon	Avoidance	The need for constant coercion in the financial management process

Positive characteristics		Negative characteristics	
Intuition	Adaptability to securities market fluctuations, active monitoring	Imitation	Blind use of foreign experience
		Conservatism	Inert perception of financial innovations

Source: developed by the author using [5, p. 327].

Economic culture forms strong restrictions on social design, carries out a kind of "testing" of new institutes on their compatibility with previously prevailing values and norms, implant only those innovations that are tangent to old cultural traditions (congruent to them). Thus, national economic mentality is fundamental informal institution, which is very different from the "typical western" mentality and from the "typical eastern" one. This allows us to question the success of institutional import in general — from the West and from the East and confirms the importance of economic mentality and the necessity of its consideration as a part of the institutional field of the securities market.

The rapid and qualitative development of the securities market can only be achieved through national mentality, but in long-term perspective the predominance of informal institutions over formal ones can lead to increased abuses and opportunistic behavior. Informal agreements are formed in general terms and are not secured by reliable sanctions. As a result market participants trading financial assets remain unprotected, and the level of trust between them becomes extremely low.

REFERENCES:

1. Paentko, T.B. (2013). *Institutionalization of fiscal regulation of financial flows: monograph*. Kyiv: DKS Center (in Ukr.)
2. Kahneman, D., Krueger, A. B., Schkade, D., SchwarzArthur, N., Stone, A. (2006) *Would You Be Happier If You Were Richer? A Focusing Illusion*. Vol. 312, Issue 5782: 1908-1910 DOI:10.1126/science.1129688. Retrieved from: http://science.sciencemag.org/content/312/5782/1908.full
3. Allenykh, M. A. *The role of informal institutions in the development of banking systems*. Retrieved from: http://econ-old.asu.ru/lib/sborn/iimer2007/pdf/stat17.pdf (in Russ.)
4. Smith, B. M. (2004). *A history of the global stock market: from ancient Rome to Silicon Valley.*– University of Chicago Press edition
5. Kovalenko, Yu. M. (2013). *Institutionalization of the financial sector of the economy: monograph*. Irpin: National un. state tax service of Ukraine.(in Ukr.)

6. Gaidai, T.V.(2008). *Paradigm of institutionalism: the methodological aspect: monograph.* Kyiv: Publishing and printing center "Kyiv University" (in Ukr.)
7. Bondarenko, O.V. (2009). *Ukrainian national economic mentality and the spirit of "capitalism"* Humanitarian Bulletin ZDIA. No. 37 (in Ukr.)
8. *The Hofstede Centre. National cultural dimensions.* Retrieved from: http://geert-hofstede.com/national-culture.html
9. *The global innovation index.* Retrieved from: https://www.globalinnovationindex.org/analysis-indicator

ENTREPRENEURIAL CULTURE AS A BACKGROUND FOR THE SMES DEVELOPMENT

V.Gura,
PhD, Assosiate Professor,
of Department of Entrepreneurship
Taras Shevchenko National University of Kyiv
I.Mazur,
Doctor of Science in Economics, Professor
of Department of Entrepreneurship
Taras Shevchenko National University of Kyiv

The dissemination and deepening of international cooperation among entrepreneurs from different countries contribute to the development of the global economy, which activates the introduction of innovations as one of the main factors of entrepreneurship. To ensure effective communication, business negotiation, signing of contracts and fulfillment of various obligations in order to obtain a positive result, it is necessary to know and understand certain rules, namely the enterprise culture. Today this concept is widely used, therefore the study of its features and forms of manifestation is very relevant for the development of small and medium enterprises.

The enterprise culture is a way of entrepreneurial behavior and their perceptions of diverse values. There are many interpretations of this category. We find interesting the interpretation of the Ukrainian scientist Sumaruk L. V. which defines the enterprise culture as a system of unique norms, values, ideas, beliefs to each organization that are shared by all members of the team and manifest in the form of rules, traditions, histories, rituals, myths, symbols [1].

Western economists view the enterprise culture as the most valuable aspect of the company's activity, which begins to emerge from the first day of its functioning [2].

In particular, for Polish colleagues, enterprise culture is the presentation of a company in the external environment, which consists of the behavior of employees in certain business situations, as well as the general idea of it, which is formed on the market in the course of economic activity [3].

However, it is worth to consider the origins of the enterprise culture in Ukraine. From the second half XV century and to the XIX century chumatstvo played a huge role in the establishment and development of not only trade networks for the modern territory of Ukraine but also in the formation of economic relations, culture, motivation, and psychology of modern entrepreneurs.

Chumaks had their own clear rules for doing business, that is, everything had to be done «in accordance with the law». In addition, they had their own customs and beliefs. They learned about the news during meetings with other chumaks or anyone traveling. All chumaks were friends.

In general, chumaks were distinguished by a higher cultural level compared with other strata of the population. For example, during the winter parking, they read (everyone was literate), sang, played chess, told various stories. It speaks of their self-discipline, curiosity (creativity), independence in decision-making and responsibility that are the main features of the entrepreneur.

An interesting fact is that chumaks went not only in the territory of modern Ukraine but beyond its borders. That is, that time entrepreneurship was already of an international nature, namely, it developed worldwide economic relations with the modern territory of Ukraine.

The first reason that caused the disappearance of chumatstvo was the construction of railroads. But for a long time, the peasantry was engaged in the resale of goods. They transported goods from the Dnieper to different cities where there were no railways. Chumaks could not compete with the cheap and fast rail transport.

For the second reason, was the reducing of free land for grazing, which was an important resource for oxen, which pulled carts.

Thus, chumatstvo has not only historical and economic significance but also socio-educational. It served as a preparatory material for the development of higher economic relations in the present times [4].

It should be noted that the enterprise culture has been formed for many centuries. A significant influence on its development took place in the XVI century when Protestantism a new religion that encouraged entrepreneurial endeavors and human activity emerged and established in Europe. Later in the XVI century there was a division of labor, large enterprises were formed, and this, in its turn, caused the emergence of new professions such

as managers as managers and administrators of large manufacturing outfits. Entrepreneurial functions that were performed by one person before, were differentiated according to specialized directions. Such professions as economists, accountants, lawyers, designers and production engineers had appeared. The work of manager is focused on the management and organization of production. The internal enterprise culture is formed with the help of such a factor as the discipline of labor. It is a manifestation of the behavior of employees, their relationship to each other, to their work and to the enterprise as a whole.

Considering various definitions of the enterprise culture and the peculiarities of its origins in Ukraine and the West, it can be argued that it consists of two parts: internal and external. The internal culture reflects the relations within the enterprise, that is, relationships between the leaders and subordinates. The external culture reflects the observance of the rules of cultural behavior with customers, consumers, suppliers, various public organizations, authorities, which entrepreneurs contact with in the course of their activity.

As you can see, the culture of entrepreneurship is a multifaceted dynamic concept, which requires constant research, analysis, synthesis as it undergoes changes in connection with the changing market environment, as well as the appearance of various innovations in all spheres of the functioning of society.

Consequently, we can single out the main factors influencing the enterprise culture, which shape its features in the modern business environment.

Nowadays, the discipline of labor is determined by five main components:

– time management;
– systematic execution of the tasks according to qualitative and quantitative parameters;
– sustainable use of resources;
– unconditional adherence to the rules of health and safety;
– the exact execution of operational orders of direct supervisors [5].

Another important factor that shapes the internal enterprise culture is the microclimate in the enterprise, that is, relations between workers of different levels. If it is positive, the productivity increases, efficiency increases, innovations are being implemented more often, the enterprise develops dynamically.

Elton Mayo, the representative of the theory of human relations, is the supporter of this statement. He conducted the «Hawthorne experiment», the essence of which was that the company raised the salaries of workers, reduced the length of the working day, provided the appropriate sanitary conditions, but the productivity did not increase. When the attention was paid to relationships in the team, creation of conditions for more frequent communication, interaction, then labor productivity increased significantly. From this, we can conclude that in order to ensure highly effective functioning of the enterprise and obtain the maximum possible profit, it is necessary to pay significant attention to the formation and development of interpersonal relations in the labor collective, that is, the level of culture that has developed on it. In particular, in the work «Human problems of industrial civilization» E. Mayo states: «Industry leaders should focus more on people than on products because it ensures social stability of society and the satisfaction of the individual with the labor» [6].

First, the national culture should be attributed to the factors influencing the formation of external culture, because it is national peculiarities, traditions, and values which determine individual motivation, professional expectations, and the organizational processes. According to Joachim Heintze, a professor at the Technical University of Braunschweig (Germany), cooperation at various levels of multinational corporations requires a diverse exchange of information. Communication with carriers of foreign cultures may face unforeseen difficulties and lead to undesirable consequences. J. Heintze believes that the distortion of the perception of reality can be be mitigable if not only the possibility of different interpretations by the carriers of one culture but also the existence of a common cultural-specific "prism of perception" in each nation. For example, the top manager of a multinational corporation who travels to the Netherlands, Sweden, and stops at a five-star hotel, be criticized by local counterparts for unnecessary luxury. At the same time, it will be regarded as a common occurrence in Ukraine, Italy or Thailand [7, 294].

It is worth nothing that during business negotiations with foreigners it is necessary to pay attention, in addition to the previously studied features of their national culture, to the style of behavior. In the modern information space the following factors of influence on the external enterprise culture are presented:

– peculiarities of behavior and traditions of business communication of representatives of different countries;

– external market environment (favorable or unfavorable conditions for creation, management, and business development);

– public and state mentality (positive or negative attitude towards small, medium and large businesses);

– actually operating in the country legal norms that define the rights, obligations, responsibility of entrepreneurs, protect them from unfair competition and promote their further development [8].

Also, the entrepreneur himself, his level of culture and education, faith in his own business, adherence to the standards of high-quality products and services significantly affect the formation of enterprise culture. Particularly, these characteristics play an extremely important role in the development of small and medium-sized businesses, because the owner, both in subordinates and business partners, is associated not only with certain person but with the firm itself and its philosophy.

Thus, the peculiarities of enterprise culture are formed by a variety of factors, the consideration, and study of which creates opportunities for its further successful functioning in a dynamic globalized space.

It should be noted that there is an open and closed enterprise culture. An open culture is the culture, which is exposed to the public, and closed one is true, hidden from the outside environment, behavior of entrepreneurs.

If open and closed enterprise cultures coincide, one can argue about the high quality of goods, services, truthfulness as an advertising company, and the observance of the mission, the development strategy of the leadership of a particular enterprise. Otherwise, it is a situation of unscrupulous and disreputable entrepreneurship. Quite often, such owners of enterprises form a negative image of the country from which they originate.

The combination of an open and closed enterprise culture creates a reputation. The company's reputation is now an important asset, as it increases its capitalization. Thus, the growth of reputation by 1% increases the market value of the business by 3%. The well-known saying for a long time has become a real rule, which works in practice with 100% probability: it takes years to create your reputation, and it takes a second to destroy it. That is why today more and more entrepreneurs understand the need for reputation management.

This category means managing the reputation of some enterprise. It may be a large company with long history and small or middle firm which only starts its business. In any case, each wants to have a good attitude of the whole environment for further developing.

Reputation management involves the formation of a corporate code of conduct, the development of philosophy, the concept of activity, the image of the owner. This is a complex, painstaking everyday work that requires monitoring of the processes taking place in the organization, the quality of goods and services, their correspondence to the price of similar products of competitors, and the behavior of the employees to the developed behavior models in accordance with the development strategy.

Reputation management outside an organization is a form of expectation for all business participants: partners, clients, and other counterparties.

That's why the goals of reputation management can differ a lot according to the enterprise size and its behavior at the market.

1. Building. This type of reputation management has to do with building the reputation for business that is just getting started. It includes building a good reputation to maintaining it for business developing.

2. Maintenance. Reputation management meant to just keep a company's good image superior in the public eye. This is used for companies that are already established, and have a good reputation already.

3. Recovery. If business has gotten a bad reputation for any reason, then the recovery methods of reputation management are needed. In this case, the task of reputation management is to hide the bad reputation with good marketing and self-promotion [9].

Nowadays it has become very popular online reputation management (ORM) as a subset of reputation management. ORM includes social media monitoring, community management, and conversation influence. Also, it has such instrument that is called SERM — Search Engine Reputation Management. It means management of reputation in searching systems: actions, aimed at eliminating negative feedback about a company, product or service in the results of the issuance of a search engine. Creation of a website's image is just as important as its promotion in search engines. After all, if a user discovers a resource known to him in the TOP, the probability that it will be selected for the purchase/order of the service is much higher than if there is a site of some unknown company on its place [10].

This kind of activity has appeared as a response to the e-commerce development and social media rapid growing. If enterprise isn't presented in the Internet and in social media it would have very small chance to further successful functioning. And we should admit that online reputation management has become a new and required element of contemporary entrepreneurship culture. That's why SME must use it very intensively, because it forms image which can lead to increasing or decreasing of efficiency in case of incorrect reputation strategy.

The online reputation management takes a lot of forces and special marketing knowledge. It is really a very important part of further development. Following to the modern tendencies SME should use such instruments as (table 1):

Table 1

Instruments of online reputation management

Name of instrument	Meaning
Blogging	Blogs that are updated every day
Directory listings	Listing a website in directories using optimized keywords
Direct reviews	Hiring someone to write good reviews of the company on websites
Online publicity	Syndicated article writing, links, and banners
Social networking	Posting pages on Facebook, Instagram, Twitter etc.

Source: created by authors on the base of [9].

Analyzing these instruments, we can see that owner of business can organize all activities using personnel or ask some company, which is specialized at promoting online reputation. In any case, the decision making must be grounded at the enterprise culture. The main aim of SERM is to increase positive mentioning about enterprise and its products in the Internet searching systems and social media. Modern customers before buying something very often make a research in the Internet about product and its producer, examine everything. It has become a new model of clients' behavior in our modern globalized world.

Summering up we can say that reputation management has to be an inherent part of each enterprise. And for any small, middle or big compa-

ny it is a unique one, because depends on peculiarities of business. Some instruments of reputation management are efficient for some enterprise, and for others are needed another combination. Therefore, the owner of business must feel the pulse of the current events and trends in the market. Competitors are also in dynamic development and implement innovations. Reputation management will bring positive results when it is a really important element of entrepreneurship culture.

The enterprise culture must be strong and serve as the basis for the dynamic development of the economy. It reflects how a society of a particular country supports the ideas and initiatives of entrepreneurs, and most importantly how young people can be engaged in entrepreneurship, raising their level of practical experience. A strong enterprise culture means that dysfunctional actions by business representatives are viewed by society as a failure, exit from the market, and honest entrepreneurs play a crucial role in job creation in the country's economy.

We will analyze one more important factor that influences on the enterprise culture, without which it is impossible to imagine the market today, — innovations. In developed countries, the culture of society itself gives impetus to the creation of innovations in business ideas, services, products and technologies. The enterprise culture in these countries is characterized by high efficiency and quality of ongoing research, offers ways of practical use of new, original, non-standard ideas. Such tendencies promote the activation of entrepreneurship and present the existing opportunities to those who want to pursue a career in business.

In support of these provisions, we can cite the results of a study that Ernst & Young analysts conducted in 2011.The aim was to establish the attitude of the society of different countries to entrepreneurship. Company representatives asked entrepreneurs whether they believe that culture in their country contributes, encourages and supports the development of entrepreneurship? The results are presented in the table 2.

As we can see, the results of the study show that the culture of entrepreneurship is particularly strong in countries the markets of which are rapidly developing. This is particularly pronounced in India and China, where more than 90% of respondents perceive their culture as creating conditions for entrepreneurship development.

Table 2

The results of a survey of entrepreneurs on promoting, stimulating and developing of entrepreneurship by their country's culture

Country	Results of quiz	
	Absolutely agree, %	Partly agree, %
France	4	20
Japan	18	48
Great Britain	20	46
Italy	20	56
Germany	26	52
Turkey	26	54
Australia	38	42
USA	60	28
Canada	44	44
China	54	38
India	57	41

Source: Source: created by authors on the base of [11].

In spite of this, innovative activity in fast-growing markets is very small compared to mature markets with a much larger concentration of promising researches (USA, Japan, France, Great Britain, Italy, Germany).

Ernst & Young analysts made some conclusions based on their research:

– there should be certain preconditions for the development of entrepreneurship in the country;

– there is a great deal of dependence between culture and innovations.

The most important result was the understanding that mass media and leading universities are driving forces in changing the culture of entrepreneurship around the world today.

Interesting facts from the survey of 1,000 entrepreneurs from the G20 countries (the G20, which includes Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia,

Saudi Arabia, South Africa, South Korea, Turkey, the United Kingdom, the United States and the EU account for about 90% of world GDP and two thirds of the world's population) are the following:

– 76% believe that culture in their country contributes to entrepreneurship development;

– 88% think that their ability to provide innovative products has a high or medium impact on the enterprise culture;

– 61% believe that their role in creating new jobs is very significant for improving the culture of entrepreneurship [12].

Consequently, we can observe a direct link between the development of entrepreneurship and the introduction of innovations, as it enables the further development of socio-economic development of society and the transformation of the enterprise culture to a new level. Therefore, for the economy, it is important what level of innovations is in the country and what policy the government is leading in this regard. In order to determine the current situation Ukraine in the world today with regard to the implementation of innovations, it is necessary to consider ratings based on certain indices that characterize the level of technological development of the country.

One of them is Global Innovation Index, published annually by the INSEAD Business School, the World Intellectual Property Organization, and the Cornell University. According to the given index, Ukraine in 2017 occupies the 50th place among 127 countries, with a total rating of 37.62 out of 100. Countries are evaluated by 81 indicators, and then a certain value which creates the top countries is shown on their basis. The next countries are in the top 10 (table 3):

Table 3

Global Innovation Index 2017 rankings

Country/Economy	Score (0–100)	Rank
Switzerland	67.69	1
Sweden	63.82	2
Netherlands	63.36	3
United States of America	61.40	4
United Kingdom	60.89	5
Denmark	58.70	6

Country/Economy	Score (0–100)	Rank
Singapore	58.69	7
Finland	58.49	8
Germany	58.39	9
Ireland	58.13	10
Ukraine	37.62	50

Source: [13].

Among the achievements of Ukraine within the limits of the given rating, it is possible to allocate the first place by the number of applications for the utility model, and a stable tendency to increase the given index and as a consequence, upward ranking. However, such a significant gap with the top ten is due to the fact that in the past 26 years an innovative enterprise culture has not been formed at the state level. Such inaction in this direction has led both the representatives of the authorities and the public to the formation of a lack of understanding of the opportunities and importance of innovation. For comparison, the top ten countries of the Global Innovation Index have created conditions for the active development of enterprise culture and the spread of innovations. It is also very important to create a supportive business environment. Thus, the availability of finances, the proper regulatory policy, the absence of corruption, etc., belong to the functions of state regulation for the development of entrepreneurship.

If we talk about the formation of a culture of SME entrepreneurship in Ukraine, then there are a number of negative factors that hinder its development in the traditional sense. On the contrary, a culture with "Ukrainian peculiarities" is formed.

To confirm the opinion above, let us consider the results of a comprehensive study conducted by the Ukrainian Center for Social Reforms (UCSR) with the support of the International Labor Organization and the Federation of Employers of Ukraine.

During a survey of 2000 entrepreneurs from different regions of Ukraine, 17 factors that contribute to the establishment of a sustainable business environment in the economy, the social sphere, and the environment were analyzed. The most important factors that influence on the formation of enterprise culture are the following:

1. 63.8% of businessmen recognized that they were forced to give bribes.

2. Almost 55% of respondents noted that the most widespread cases of pressure on enterprises are burdensome laws and the existence of excessive controlling functions of state structures. First of all, this is manifested through the maintenance of high taxes, penalties, sufficiently frequent inspections of controlling bodies, bureaucracy, and the complexity of procedures for doing business.

3. Assessing the effectiveness of the authorities' efforts to encourage and promote entrepreneurship to expand activities, almost 46.7% of surveyed employers gave a negative assessment of the actions of the authorities (that is, they do not make any efforts at all).

4. Almost 60.8% of employers noted the impact of the interest rate on the competitiveness of the company and 81.1% have confirmed the dependence of this indicator on the exchange rate policy.

5. 78.4% of employers predict a three-year-long increase in average selling prices and 79.5% average costs per unit of output. At the same time, almost 55.6% of employers do not expect any changes in the number of employed, which is practically comparable with the share of respondents who do not consider it is possible to change any amount of production (45.8%), and changes in demand for products (47.4%).

6. Among the most important reasons that hinder business development, respondents noted high national taxes (47.5% of the total number of respondents), frequent changes in rules and business laws (30.3%), high interest rates on bank loans (25.1%), corruption (24.5%), lack of business support programs at the state level (22.1%).

7. According to the polls, the main source of threats to the property rights of Ukrainian entrepreneurs is state bureaucratic structures, raids, state corruption and organized criminal gangs. The highest level of threats identified by entrepreneurs is related to raiding (43.6%) and bureaucracy of state institutions (39.9%).

Identifying the most important tasks faced by employers' organizations in ensuring a stable macroeconomic policy, the participants of the study singled out the following. First of all, it is a contribution to the improvement of the regulatory framework (24.0%), ensuring dialogue with the authorities (11.0%), establishing contacts with investors (10.3%), providing consulting services (9.4%) [14].

These factors undermine Ukraine's position in the Global Innovation Index. In such difficult circumstances it is really difficult for entrepreneurs, and especially for the owners of small and medium-sized businesses, to think about innovations, reputation and other components of the enterprise culture. The external environment establishes rules of survival and constant struggle with controlling and fiscal authorities, corruption. However, entrepreneurs are aware of their role in the development of not only the economy but also the enterprise culture, which, in its turn, contributes to the formation of a new generation of entrepreneurs and society as a whole.

We can propose the following recommendations for the development of enterprise culture in Ukraine, taking into account its features in developed countries.

1. To encourage the introduction of innovations and emphasize the important role of entrepreneurs in their dissemination.

2. To increase the importance of entrepreneurship in job creation.

3. To distribute stories of successful entrepreneurs in the media.

4. To study examples of enterprises with many years of history at universities, explore the causes of their development, competitive advantages, strategies for achieving success.

5. To analyze the causes of entrepreneurs' failures and to find out how to use negative experience for further activity, turning it into opportunities.

6. Deregulation of entrepreneurial activity.

7. Creation of favorable conditions for entrepreneurial activity (unshadowing of entrepreneurship).

REFERENCES:

1. Сумарук Л. В. Культура підприємництва / [Електронний ресурс]. — Режим доступу: http://www.rusnauka.com/17_AND_2010/Psihologia/69048.doc.htm
2. Cornwall J. Creating an entrepreneurial culture // [Electronic source]. — Available at: http://www.csmonitor.com/Business/The-Entrepreneurial-Mind/2011/0802/Creating-an-entrepreneurial-culture
3. Fundacja Akademia Liderów Innowacji i Przedsiębiorczości dr. Bogusława J. Federa // [Electronic source]. — Available at: https://mikroporady.pl/pomocne-definicje/209-kultura-przedsiebiorstwa-korporacyjna.html
4. Мазур І. І. Чумацтво як передумова виникнення підприємництва в Україні. // Теоретичні та прикладні питання економіки. — К.: ВПЦ «Київський університет». — Випуск 24, 2011. — С. 191-196.

5. Cornwall J. Creating an entrepreneurial culture // [Electronic source]. — Available at: http://www.csmonitor.com/Business/The-Entrepreneurial-Mind/2011/0802/Creating-an-entrepreneurial-culture

6. Mayo E. The Social Problems of an Industrial Civilization // [Electronic source]. — Available at: http://www.library.hbs.edu/hc/hawthorne/04.html

7. Майовецька В. Б. Фактори формування організаційної культури підприємства // Науковий вісник БДФА. Економічні науки: зб. наук. праць / МФУ, БДФА; гол. ред. В. В. Прядко. — Чернівці: технодрук, 2008. — Вип. 2. — С. 293-298.

8. Библиотека успешного бизнесмена / [Электронный ресурс]. — Режим доступа: http://www.club-energy.ru/j8_3.php

9. What is reputation management? // [Electronic source]. — Available at: http://www.brickmarketing.com/what-is-reputation-management.htm

10. Clearly Defining Search Engine Reputation Management (SERM) // [Electronic source]. — Available at: https://www.searchenginejournal.com/clearly-defining-search-engine-reputation-management-serm/173427/

11. Entrepreneurship culture: strength breeds success // [Electronic source]. — Available at: http://www.ey.com/GL/en/Issues/Business-environment/G20-Entrepreneurship-Barometer-2011---Entrepreneurship-culture

12. G20 // [Electronic source]. — Available at: http://www.g20.org/

13. The Global Innovation Index 2017 // [Electronic source]. — Available at: http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017.pdf

14. Сприятливе середовище для сталих підприємств України. Федерація роботодавців України. — К., 2017. — 138 с.

CLUSTER APPROACH IN INNOVATION AND INVESTMENT ENTREPRENEURIAL ACTIVITY IN FREE ECONOMIC ZONES PROMOTING

P. Jarosh,
Doctor Ph.D., Associate Professor,
Higher socio-economic school in Pshevorsk
I.Britchenko,
Doctor of Economic Sciences, professor,
State Higher Educational Institution named prof. Stanislaus Tarnowski

In markets globalization and increasing competition context, governments of the world's leading countries are forced to use complex organizational and economic instruments to support the countries' economy. One of such instruments is creation of Free Economic Zones (FEZ) with favorable conditions for doing business. Over the last decade activation process of Free Economic Zones mechanism disposal for the economy of a particular country development has been possible to observe. If in 1995 there were approximately 500 zones in the world, now there are more than 4,300 zones in more than 130 countries which employ more than 68 thousand workers. In addition, global practice has shown that FEZ activities effective organization is efficient not only in giving impetus to the country's economy development, but in bringing it into the world leaders as well [1].

In the world practice Free Economic Zone or Free Enterprise Zone is a specially designated area with preferential customs, tax and currency regimes, which encourages foreign capital in industry and services inflow, joint production with foreign capital in trade and in other types of entrepreneurial activities, as well as export of capital development.

Free Economic Zones as national economy territorial subsystems, are capable of improving its development efficiency by attracting necessary investments [2].

Global development contemporary realities indicate contradictions between different regions, blocks and groups of countries deepening. Competition between individual countries for «the right to develop» foreign investors' capital is becoming more and more evident. This leads to the role of different tools and mechanisms to attract investors increase. The

most effective and proven tool for increasing economic competitiveness of a country is a Free Economic Zone creation [3].

The following FEZ characteristics are distinguished [4]:

1. FEZ is an isolated territory (a part of national area).
2. A special entrepreneurial activity regime is applicable on FEZ territory.
3. A special management body is established to regulate FEZ activity.
4. The objectives of the zones creation are different depending on the state socio-economic development level.
5. FEZ functioning is aimed at promotion domestic and foreign entrepreneurs.

The objectives of Free Economic Zones creating depend on the level of socio-economic development of the countries organizing them, their strategic national economic plans, etc. Therefore, reasons and objectives of Free Economic Zones creating may vary in each specific case. According to the world experience, Free Economic Zones were often created to enhance foreign economic relations of regional policy aimed at revitalizing small and medium-sized businesses in the areas that are prone to economic depression implementation, as well as for inter-regional differences equalization.

Along with this, FEZ objectives in different groups of countries in the world economy despite their differences possess some commonality within which they can be divided into economic, social and scientific-technical.

Thus, the main economic objectives of Free Economic Zones creating are:
– general foreign trade and foreign economic activities perimeter intensification and extension;
– foreign exchange earnings to the state budget and budget of regions growth;
– exports increase and imports rationalization;
– innovative-investment activities activation;
– national competitiveness increase.

Social objectives of Free Economic Zones creating are:
– population welfare and living standards growth;
– regions infrastructure creation and development;
– new jobs creation, employment growth;
– qualification level of workers, engineering, economic and managerial personnel by means of the world experience increase;

– national market with high quality goods and services, industrial and consumer goods saturation;

– depressive regions socio-economic development level alignment.

Scientific-technical objectives of Free Economic Zones creating are:

– innovation activity enhancing;

– innovative technologies in production activities diffusion;

– scientific and technical specialists, including foreign specialists, for priority areas concentration;

– science and production integration, research and scientific-technical centers (labs), as well as venture companies creating.

According to the world practice in special economic zones creation and efficient functioning emerge some objective prerequisites of their organization and successful operation, the neglect of which leads either to the investment project complete failure or to inadequate results of its implementation. Among such fundamental conditions are [5, p. 21]:

1) favorable transport and geographical position concerning external and domestic market, as well as advanced communications availability. According to practice, such economic zones in the interior regions of large countries that are remote from transport hubs of national and international scale creation is inefficient;

2) well-developed industrial and social infrastructure. These include power supply facilities, roads, modern means of communication, developed transport network and service, modern educational, healthcare, cultural, leisure, etc. institutions.

It is noteworthy that the country-organizer of special economic zone as a rule should ensure such infrastructure for the future investors creation. In extremely rare cases special economic zones creation proves to be expedient in new economic development areas without initially developed industry, production and social infrastructure, but enabling to solve strategic national programs;

3) human resources, namely relatively cheap and at the same time skilled labor availability;

4) high level of banking and other financial services provision, available link with international financial market;

5) lack of administrative and bureaucratic barriers for business organization, including foreign participation;

6) an adequate investment barrier level, i.e. the size of funds that an investor is obliged to invest in special economic zone development for the right to conduct entrepreneurial activity on preferential terms;

7) special economic zone well-developed and stable legal framework. According to practice, such zones creation should be based on legislative acts, but not on executive authorities' rapidly changing decisions;

8) providing investors, including foreign ones, with clear state guarantees of their investments and other property located in the special zone safety;

9) formation of special management bodies on the basis of their authorities and responsibilities with other authorities' clear division;

10) general favorable investment climate in the country, which is composed of political stability degree, taxes level, legislation transparency and criminal situation in the society.

It should be understood that a special zone creation is by no means a panacea for all economic diseases and a hundred percent guarantor of any territory rapid booming. Special economic zone is an innovative project with a high degree of risks and a considerable variety of final results.

However, if the project starts to operate successfully and bear fruit due to the result of a well-considered development area program and joint efforts of the government and private investors, its positive role for a particular region and the economy as a whole can be quite significant; in particular, special economic zones [6, C. 62]:

• serve as a catalyst for socio-economic, scientific-technical and human development of a given region by stimulating new jobs creation and high technology industry growth;

• serve as one of the main communication channels between the global economy and the economy of a particular country (region);

• represent the most advanced forms of production, management, and technology standard that can have a positive impact on economic development of other regions of the country;

• are the most important tool to attract foreign investment and mobilize local economic resources;

• stimulate new forms of business development, are a kind of «field experiments» for emerging economy countries.

Enterprises located on FEZ territory activities regulation should be aimed at creating a favorable investment climate for a foreign investor so that

investment conditions would not only be more profitable than in capital-exporting country but, if possible, more favorable than in neighboring countries and regions, able to compete as foreign investments recipients [7].

In the world practice Free Economic Zones actively influence entrepreneurship and investment activity development, which are mainly characterized by the following factors and mechanisms:

– residents engaged in entrepreneurial activity tend to receive customs, fiscal, non-monetary incentives, special exchange rate regimes, business registration simplified procedures and other preferential benefits for infrastructure facilities and real estate disposal;

– in many FEZs strategic tasks are primarily associated with state, private, as well as foreign investments stimulation and investment resources and capital attracting;

– free economic zone focused on commercial-industrial, industrial-production, import-substituting, export-oriented, industrial, scientific-industrial parks, technoparks and innovation centers creation increases positive impact on competitive products and exportable goods list development, forms the base for import-substituting products increasing, stimulates investment and entrepreneurial activities by creating research-and-production companies, research companies, cluster and other holdings.

There is an important factor that 2/3 of existing and functioning FEZs in the world are engaged in entrepreneurial activity and more than 70% are directly or indirectly related to attracting investment resources.

It should be emphasized that FEZs can expand not only entrepreneurial and investment activities, but enrich them with innovative elements and innovative functions in the world economic system globalization and international economic relations serious transformations context [8].

Various kinds of incentives and benefits in FEZ territory provision can perform stimulating of innovative products manufacturing function, like, for example, in the USA, but only subject to objective prerequisites availability. According to foreign experience study, the following initial conditions for innovative development are considered:

- technological and intellectual potential sufficient for the innovation process launch;
- constant growth of innovation «chain» participants number, including a result of new social groups engaging;

- institutional system (including both formal and informal elements) focused on innovative development;
- demand for innovation by the majority of economic entities and newly industrialized economy as a whole [9].

A well-known tool for the economy innovative and investment development is special economic zones creation and clusters formation. Their application has become a notable trend of modern world development; it has become widespread and firmly established in the practice of many countries [10].

Whereas the Institute of Special Economic Zones has become the focus of the global economy researchers, then clusters are still remained the object of research primarily for specialists in economic geography or national economy management. In addition to that clusters hold a fairly noticeable external economic potential, the study of which represents an important challenge for the economic science [11].

A very important aspect in FEZ formation is these zones competitive advantage which can be explained within the cluster approach framework. The cluster contributes to the performance improvement on the basis of the following factors:

– access to specialized inputs and labor;
– access to information;
– complementarity;
– access to institutions and public goods;
– incentives to the efficiency increase [12].

That is why many countries provide assistance for these areas with expectation that they will become engines of national development growth and stimulation.

In a literal and the most general sense «cluster» is defined as a «closed group of things» in The Concise Oxford Dictionary [13, 325].

According to Michael Porter theory, cluster is a group of geographically neighboring interconnected companies (suppliers, producers, etc.) and related organizations (educational institutions, governmental bodies, infrastructure companies) operating in a certain area and mutually complementary [14].

Since a particular industry or sector functioning, unlike cluster, is prone to competition distortion [15, p. 26], a cluster now is defined as a

group of geographically localized interconnected companies, suppliers of equipment, components, specialized services, infrastructure, research institutes, universities and other organizations complementary to each other and enhancing competitive advantages of individual companies and the cluster as a whole. In other words, a cluster is a group of entities (companies, enterprises, infrastructure, research institutes, universities, etc.) linked by territorial proximity relations and by functional dependence on the production sphere, its realization and resources consumption [16, p. 278].

FEZ creation and functioning presupposes the three subsystems organic unity, that is economic (production, exchange, distribution, consumption), natural-geographic (area with climatic conditions complex, specific geographical location) and social (population and the whole social infrastructure complex), which means a fairly significant similarity with clusters formation, which are represented by a group of interrelated and complementary enterprises of a certain activity.

Comparing FEZs and clusters on the economies of different countries development impact the conclusion is seemed to be suggested that the both tools are created to ensure a higher level of labor employment, investment in a freely convertible currency attraction, export potential without domestic market compromising increasing [11].

According to some estimates, about 50% of the world's leading economies are currently clustered. In such case 380 clusters operate in the USA, 206 in Italy, 168 in Britain, 106 in India, 96 in France. Coincidently more than half of enterprises in the USA operate within clusters framework, and the share of GDP generated by them exceeds 60%. In the EU 38% of workforce is employed in clusters. Due to a powerful cluster policy Finland now provides 30% of world exports of mobile communication equipment, 10% of wood processing products, 25% of paper; and Italy 30% of national exports [17, p. 19].

Currently the largest economic growth is recorded in those FEZs which are formed in a single ethno-cultural space where compatriots' capital dominates or makes a significant contribution. For example, large areas in China, Jebel Ali in UAE, Izmir in Turkey, and Mumbai in India.

Numerous examples from world practice confirm that the cluster form of production organization is the most efficient for innovation-investment process.

Clusters formation contributes to regions spatial development and further industry strengthening; priority of enterprises in cluster supply chains cooperation is formed. Cluster approach provides a comprehensive vision at the state policy in a region development area. Clusters provide economic diversification, enhancing competitiveness, facilitating high-tech industries emergence, as well as stimulate regions development [18].

A dual approach to clusters is presented in the world practice. Firstly, a Free Economic Zone may be a part of a cluster. And secondly, a cluster may be a part of a FEZ [19]. I. V. Klim in his study emphasizes that areas into clusters transformation occurs either as zones in cluster form of production organization alignment, or as zones and clusters development «closure» [20].

It should also be noted that despite the fact that the main goals and objectives of Free Economic Zones and clusters are similar, important differences are still existing. Firstly, a cluster territory is not legally restricted, its dimensions depend only on economic feasibility. Secondly, clustering does not involve customs, foreign trade, financial, and tax benefits. Thirdly, a cluster creation and development is mainly aimed at internal development and enterprises interaction; exports development is a secondary task [18].

Along with this, obvious is the fact that cluster approach application positively directly effects competitive advantages of regions and the country as a whole increase. And this in turn means that Free Economic Zones are a kind of a base, preparatory infrastructure for clusters development. They are one of the cluster policy components. Large enterprises, which are often main forming elements of Free Economic Zones (base) are capable of forming a market, which in turn forms a cluster.

This scheme of clusters in Free Economic Zones framework creating possesses many advantages. Firstly, it is communications between executive authority and business optimization. Secondly, it is the established relations between producers, suppliers, financial and governmental institutions that operate under the FEZ framework development [18].

Cluster approach is a form of regional development strategies implementation (in this case referring to a specifically allocated territory – FEZ), the developers of which often include clusters formation in the hope that clusters will contribute to productivity growth, innovativeness, competitiveness, profitability and employment of the region entrepreneurial activities entities.

Creating a cluster free economic zone will allow participants not only to interact and develop domestic enterprises, but to increase export potential of the region and the state in the world market as well. Thus, for example, in the UAE Technology & COMmunications is a unique cluster consisting of Dubai Media City, Dubai Internet City, International Media Production Zone, Dubai Outsource, Empower, Knowledge Village, Dubai Studio City and Dubiotech (Biotechnology Park) free economic zones. Interacting clusters can also be a FEZ parts that in general will have a positive impact on socio-economic development of the region and, ultimately, of the country [21].

Cluster policy of FEZ in modern conditions is to fully support the projects of cluster systems in depressed regions advanced development. It consists in the search for such economic structures that would maximize the «new shoots» potential in every Free Economic Zone. It is worth noting that if the task of optimization of budgetary funds disposal efficiency is to be achieved, then such a policy is not optimal. But in addition to economic feasibility, target system criteria still exist as well. Viewed in this way a cluster of objectives related to the most acute social and economic problems of regional development, as well as the need to implement technological development priority areas, should occupy the most important place for cluster policy of FEZ purposes.

In this context, cluster strategy of FEZ refers to a structural component of a coherent national strategy for socio-economic development, involving active participation of governments at national and regional levels in the creation and support of cluster systems on the territory of special development, an adequate level of development of social and economic potential of the regions of their localization, consistent with modernization policy principles and criteria, ensuring the key objectives achievement and actual problems of socially-economic development of the territories solution and technological development priorities supporting. Thus, cluster strategy of FEZ is aimed at sectoral and territorial principle of the state management integration.

We believe that the state and social institutions main strategy in clusters formation and support should be a targeted impact on cluster management of FEZ subjects coordinated with their internal structures, social and institutional development trends; involvement executive authorities, institutions of science and education, media and civil society, financial

institutions, large, medium and small businesses into this management process. At the same time, the world experience of clusters developing and effective development of society and organizations understanding are essential to be employed.

At the same time, when solving clusters strategic development issue, cluster policy and cluster initiatives formation issues, it must be realized that a cluster is not a strategic management subject, but a polysubjective environment, the evolution of which is determined on the one hand by the clusters subjects' dynamics, and on the other hand by the state strategy, cluster policy of the region and cluster initiatives [22].

It should be particularly noted that cluster type free economic zones possess a high capacity for innovative development, enhanced by centralization processes, as a result of which a synergistic effect is observed. Within its framework, new qualities are emerging, which are not possessed by separate elements of the system, that is by clusters and governmental regulatory bodies. In this context it is referred to cluster free economic zone with external environment inseparable unity, thereby national economy competitiveness is increased.

Cluster free economic zone is an area intended for the full production cycle of high-tech finished products of strategically important sectors of national economy, divided into several cluster formations, applying a differentiated approach to benefits distribution [23, p. 152].

This cluster economic zone model provides for the cluster with external environment integration record keeping: with small and medium-sized enterprises of various industries, with other clusters, as well as considers interaction with other regions in economic, social and political terms, free economic zones and higher-order management structures. In addition, with minor upgrading, a similar model when regions and enterprises strategic orientation planning and developing is applicable.

In this regard, the idea of a cluster of FEZ creating rationality and timeliness can be argued first and foremost by obvious integrative efficiency. A cluster free economic zone creation will result in modern high-performance competitive production accelerated development, additional investments attracting and new technologies introduction.

Cluster free economic zones consolidated development initiative is advisable to be fully supported at the state level. As a result of FEZ and

cluster characteristics integrative combination the state will receive additional benefits.

Based on the conducted research, it can be concluded that compared to classical free economic zones, FEZs created according to cluster principles are a more effective tool for primarily strategically important sectors of the economy development.

REFERENCES:

1. Корнейко О.В. Опыт развития специальных экономических зон и промышленных кластеров в Китае / О.В. Корнейко, А.В. Пестерева // Вестник Удмуртского университета. Серия: Экономика и право. — 2016. — Т. 26. — № 6. — С. 34-40

2. Соловьева О.И., Соловьева Е.А. Состояние и тенденции развития предпринимательской среды // Международный журнал экспериментального образования. — 2014. — № 11 — С. 41–43.

3. Свободные экономические зоны в России и проблемы их функционирования / А.А. Козловская, А.В. Кравченко // Международный студенческий научный вестник. — 2015. — № 4–3. — С. 402–405.

4. Коробова О. В. Анализ теоретических подходов к понятию «свободная экономическая зона» / О. В. Коробова, Н. В. Наумова // Ученые записи Тамбовского отделения РоСМУ. — 2015. — № 3. — С. 1–4.

5. Соловьева, Жанна. Особые экономические зоны как инструмент привлечения прямых иностранных инвестиций [Текст] / Жанна Соловьева // Международная экономика. — 2007. — № 3. — С. 18-26 .

6. Зубченко Л.А. Иностранные инвестиции: учеб. пособие / Л.А. Зубченко. — Москва : ООО «Книгодел», 2006. — 160 с.

7. Кузнецов А. Свободные экономические зоны и национальная экономика. /Мировая экономика и международные отношения, №12, 1990. — С. 75-84.

8. Алиев Ш.Т. Роль специальных экономических зон в развитии предпринимательства и инвестиционной активности / Ш.Т. Алиев // [Электронный ресурс] — Режим доступа: https://creativeconomy.ru/lib/7434

9. Кешишева Н.Г. Проблемы и перспективы развития особых экономических зои в России / Н.Г. Кешишева // [Электронный ресурс] — Режим доступа: https://cyberleninka.ru/article/n/problemy-i-perspektivy-razvitiya-osobyh-ekonomicheskih-zon-v-rossii

10. Семенова Н.Н. Стимулирование региональных кластеров и обмен знаниями // Капитал страны [Электронный ресурс]. Режим доступа: http://www/capital-rus/articles/article/1020

11. Баженова Ю.В. Мировой опыт применения кластерного подхода в развитии свободных экономических зон и российские перспективы: автореф. дис. ... канд. экон. наук. М., 2009. 24 с.

12. Бабаев Х.С., Каримов Р.А. Кластерная модель конкурентных отношений в СЭЗ / Х.С. Бабаев, Р.А. Каримов // [Электронный ресурс]. — Режим доступа: https://cyberleninka.ru/article/n/klasternaya-model-konkurentnyh-otnosheniy-v-sez

13. Краткий Оксфордский словарь [Текст] // Oxford University Press, Oxford, (7-е издание),1982. — 544 с.

14. Цихан Т.В. Кластерная теория экономического развития / Т.В. Цихан // [Электронный ресурс]- «Теория и практика управления», №5, 2003 г. — Режим доступа: http://www.subcontract.ru/Docum/DocumShow_DocumID_168.html

15. Пятинкин С.Ф. Развитие кластеров: сущность, актуальные подходы, зарубежный опыт / С.Ф. Пятинкин,Т.П Быкова. — Минск: Тесей, 2008. — 72 с.

16. Краус Н. М. Кластерна стратегія інноваційного розвитку економіки на мікрорівні: регіональний аспект / Н. М. Краус, Ю. М. Бібенко// Вісн. Хмельниц. нац. ун-ту. Серія «Економічні науки». — 2012. — № 1. — С. 277-280.

17. Инновационно-технологические кластеры стран — членов МЦНТИ. — М.: МЦНТИ. — 2013. — 46 с.

18. Фатихова Л.Э. Роль ОЭЗ в кластерном развитии региона (на примере Республики Татарстан) [Электронный ресурс]. — Режим доступа: https://cyberleninka.ru/article/n/rol-oez-v-klasternom-razvitii-regiona-na-primere-respubliki-tatarstan

19. Клим И.В. Роль особых экономических зон в инновационном развитии мировой и российской экономики : автореф. дис. ... канд. экон. наук. М., 2008. 24 с.

20. Шмонов Н.Н. Историческое исследование проблем развития особых экономических зон /Н.Н. Шмонов // [Текст]. — Казань, 2010. — 158 с.

21. Челпанова Ю.О. Кластерные структуры в особых экономических зонах / Ю.О. Челпанова // [Электронный ресурс] — Режим доступа: https://nsportal.ru/ap/library/drugoe/2017/12/12/klasternye-struktury-v-osobyh-ekonomicheskih-zonah

22. Тарасенко В. Стратегии развития территориальных кластеров / В. Тарасенко // [Электронный ресурс] — Режим доступа: http://www.inesnet.ru/wp-content/mag_archive/2011_11/ES2011-11-tarasenko.pdf

23. Еспаев С.С. Киреева А.А. Концепция формирования и развития перспективных национальных кластеров / С.С. Еспаев, А.А. Киреева// [Текст]. — Алматы. 2013. — 234 с.

CHAPTER 4.
SOCIAL INVESTMENTS AS A CONTRIBUTION TO SMES DEVELOPMENT

SOCIAL INVESTMENT AS A STEP TOWARDS AN INNOVATIVE STRATEGY FOR EUROPEAN SMES

Iu. Gernego
PhD in Economics,
Associate Professor of Investment Activity Department,
SHEI "Kyiv National Economic
University named after Vadym Hetman"
O. Dyba
PhD in Economics,
Associate Professor, Doctoral Student
of Investment Activity Department, SHEI "Kyiv National
Economic University named after Vadym Hetman"

The competitiveness and innovative development of national economy significantly depends on competitiveness of enterprises. Generally, entrepreneurship means an individual's ability to transform ideas into action, including creative decisions, innovation, and ability to manage projects and their risks in order to achieve the goals. The vast majority of enterprises that operate within highly developed national economies are small and medium-sized enterprises (SMEs). Therefore, SMEs have emerged as a driving force for more inclusive and prosperous societies. At a time of total globalization SMEs contribute not only to the separate countries' economic growth. Their fostering also benefits the growth of separate regions and international organizations.

The general belief about SMEs as the drivers of growth and prosperity are presented in a number of recent empirical studies and applied researches [1 — 6]. In particular, SMEs are often concerned as the backbone of the economies development in Europe (EU SMEs), providing not only a significant part of regional value added, but other kinds of innovative opportunities for further economic growth. The European Commission pays

attention to the main pillars, which are considering as the SMEs' activities results, including job creation, development of innovation, economic growth and social integration in the EU. However, the EU SMEs official statistics currently is able to identify SMEs only by employment size, namely by representing them as enterprises with fewer than 250 persons employed.

Within the 2016 — 2017 timeframe, 99 out of 100 European enterprises were SMEs. This is all but 0,2 % of entities which operated in the EU non-financial sector and 57 % of value added in the EU non-financial business sector. In recent ten years, there has been a total increase in the number of EU SMEs for 10,8 % or 2,3 million enterprises, which have increased value added for more than 10,9 % or 497 billion EURO.

However, in 2016, these SMEs also accounted for 67 % of EU employment or employed 91,71 million people. The last ten years have seen a growing trend towards employment by EU SMEs by 0,6 % or 531 000 jobs. In 2016, SMEs employment increased by 1,6 % in compartment with 2015 [1; 2; 3].

The compartment on the latest data on number of people employed by SMEs in different EU countries is represented in Fig. 1.
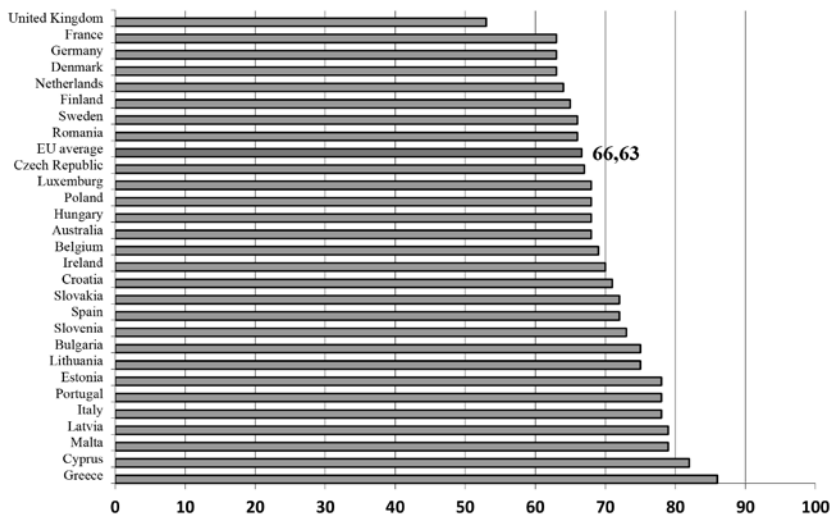

Fig. 1. The number of people employed by SMEs in different EU countries, %*
* *Source: compared by author on the basis of [1]*

Data from European Commission researches suggest that SMEs can generate diversified types of outcomes, including such of social nature (Fig. 2).
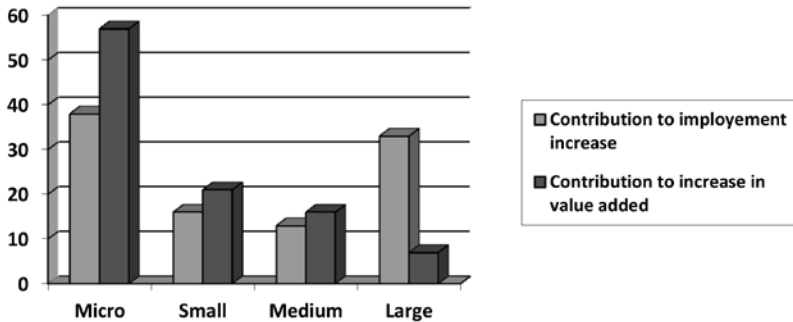
Fig. 2. SMEs' contribution to European economic and social increase, %*
Source: compared by author on the basis of [1; 2]

Thus, in some cases, strong economic prospects are not only associated with the value added. For example, a high level of SMEs' activities creates a capacity to pursue further employment growth.

However, support measures for SMEs development quit often are still unbalanced in European countries. There are still some European national economies, which legislation and national strategies are not able to pay enough attention to small business' peculiarities [7]. Traditionally, SMEs' activities are still mostly held within the national market. Generally, the internal factors are used to identify the main conditions for SMEs' building and further management, namely:

– the timeframe of business existence;
– the level of innovativeness;
– high growth strategies, which were implemented by SMEs;
– pursuing sound investment strategies;
– high-skilled management;
– marketing researches, concerning level of competitiveness and potential customers.

At the same time, SMEs' competition worldwide need to complete a number of external conditions, including:

– positive international image of entrepreneurship;

– favorable macroeconomic and international conditions;
– supportive business regulations;
– effective public and regional services;
– access to external finance, including regional and international funds;
– high-skilled resources availability increase;
– labour and production costs management [1].

The above mentioned factors represent the different sides of society. Therefore, we concern them within four main components within PEST analysis, namely political, economic, socio-cultural and technological components in Europe. PEST analysis describes the current framework of macro-environmental factors and is used to develop different strategies within a managerial conception (Fig. 3).

Political component	**Economic component**
1. SMEs' tax policy 2. Environmental law 3. Preferential tariffs for SMEs 4. Political stability 5. Labour law, including self-employment politic	1. Economic growth both on the national and European levels 2. The level of interest rates 3. Exchange rates' level, including cost of capital for SMEs' development 4. The inflation rate 5. The cost of exporting goods and services 6. The cost of imported goods and services
Social component	**Technological component**
1. Traditions and SMEs' culture within European framework 2. Health politic 3. Population growth rate and age distribution 4. Career attitude and safety politic 5. European SMEs' ethical policy	1. Innovative SMEs' widespread 2. SMEs' R&D activities 3. The rate of SMEs' technological changes 4. Automation and technology incentives 5. EU SMES' outsourcing decisions

Fig. 3. EU SMEs' PEST analysis*
* *Source: compared by author*

The scanning of above mentioned components is used to manage the different EU SMEs' development strategies. Such methodology supports an overview of wide range of macro-economic and environmental factors that

are able to be taken into consideration within an external analysis, conducting a strategic analysis and market researches.

The barriers for EU SMEs development mean that there is often limited access to international markets because of the perception of higher risk and competitiveness. For instance, up to now, 25 % of EU SMEs' representatives have mentioned the finding of customers as the main problem for their development (Fig. 4).
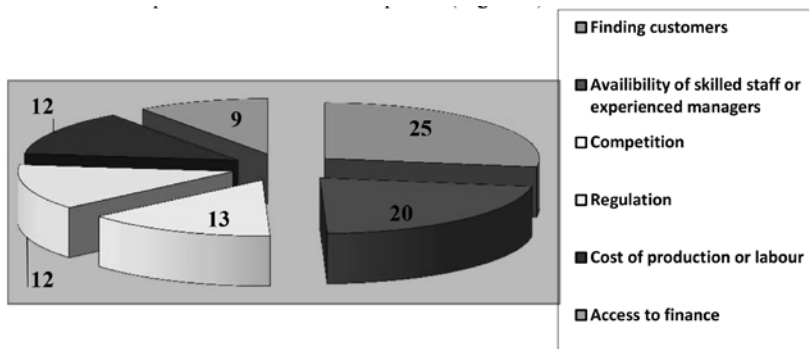
Fig. 4. The main problems for EU SMEs in 2016, %*
Source: compared by author on the basis of [2]

In terms of the main business issues and challenges faced by SMEs in 2016, the issues of "finding customers" and "availability of skilled staff or experienced managers" were highlighted as the most pressing. In addition, regulation, competitiveness, cost of production or labor and access to finance are mentioned among the key issues that create the main part of SMEs' problems. At the same time, the above mentioned issues deeply depend on each other. For instance, to find new customers SMEs need to develop their activities within new markets. This means that they should be able to produce more competitive and innovative products, which is impossible without high skilled stuff involvement. SMEs' abilities to support and educate their stuff and to produce innovative goods and services depend on their access to finance.

As far as "access to finance" is mentioned as one of the most important barriers for SMEs' activities, there is a need to improve the financing environment and develop the potential of different financial sources for small

and medium businesses both in separate European countries and in the whole Europe.

Thus far, the European Commission works to improve the financing environment, creating new possibilities for EU SMEs [8; 9]. The systematic approach is used to concern an action plan to improve access to finance for SMEs [8] as a part of an overarching framework for the EU policy on Small and Medium Enterprises (SMEs) that is summarized in accordance with the Small Business Act (SBA) [8]. The aim of such work is to improve the general approach to SMEs' activities in Europe, simplifying the regulatory and policy environment for SMEs, and removing the remaining barriers to their development. The four strategic priorities for SMEs development are separated within SBA (Fig. 5).
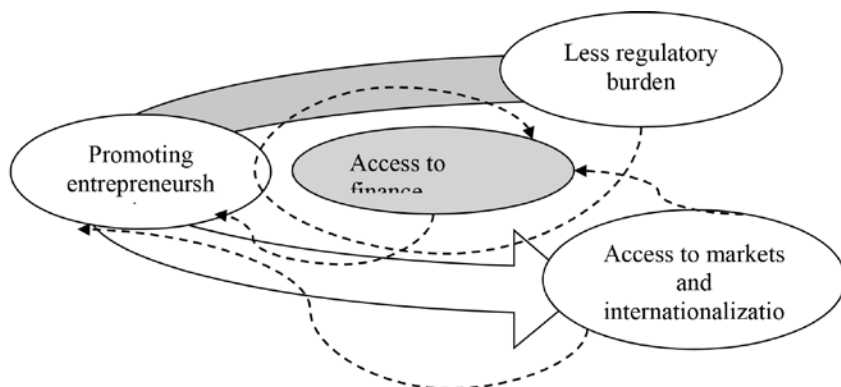
Fig. 5. Strategic priorities for SMEs development in Europe*
* Source: compared by author on the basis of [8]

The first step of the European Commission's strategical SMEs' activities is supporting the Commission's Regulatory Fitness and Performance (REFIT) program that ensures the EU legislative functions within SMEs' activities and removes unnecessary burdens for effective business [10]. The main REFIT issues are defined, including:

– jobs, growth and investments;
– digital single market;
– energy union and climate;
– internal market;

– a deeper and fairer economic and monetary union;
– a balanced and progressive trade policy to harness globalization;
– justice and fundamental rights;
– migration;
– a strong global actor;
– democratic change.

Such kind of activities is able to show results. In particular, within the three years' timeframe more than 130 new initiatives to simplify and reduce regulatory burdens have been proposed to Council and Parliament. Nearly 80 % of all REFIT initiatives include a quantification of regulatory costs and more than 60 % include a quantification of regulatory benefits [11]. As the result, REFIT initiatives help companies to reduce compliance costs for businesses. This supports the entrepreneurship promotion that means encouraging people to build a new business and make it easier to grow such business.

In accordance with the European Commission's researches, there are only 37 % of Europeans, who would like to set up their own business. In compartment to this, there are more than 51 % of such people in the USA and China. In general, the European environment steal does not offer the perfect foundation for an entrepreneurial career, including such main factors as difficult access to financial sources and markets, difficulty in development and transferring businesses, the fear of punitive sanctions in case of failure, and burdensome administrative procedures. Therefore, the principle of "think small first" has to become among the first priorities for European and national policies [12].

Some of the main SMEs' challenges and appropriate actions in EU, proposed by the 2020 Action Plan, are given in Table 1.

Data from Table 1 show us that taking the "Think small first" principle as a reference means mostly a particular approach to regulation will enhances business development, supporting investment growth. On the one hand, boosting small business competeveness and developing is part of development strategy within national economy. On the other hand, SMEs' support means improvement for the whole European Union's worldwide competitiveness among other economic blocks around the world. Therefore, improvement of financing environment for small businesses in Europe plays a significant role within European SMEs' strategy implementation.

Table 1

EU SMEs' challenges and actions*

№	Main SMEs challenges	Areas for immediate intervention	Key actions in Europe
1	*Education* current branch should offer the right foundation for further career in business;	appropriate education and training system to provide high-skilled labour to support further growth and business management; reigniting the European business culture and upbringing the new generation of entrepreneurs;	– investing in primary business education; – support of universities; – investing in particular business foundations activities for an entrepreneurial ideas development; – entrepreneurial learning and entrepreneurship promotion; – a pro-business culture fostering in Europe
2	*Markets and finance* difficulties in accessing finance and markets;	supporting SMEs within their business lifecycle	– micro-credit initiatives; – deploy SME-geared EU financial instruments on a broader scale; – improve SME access to the non-lending financing routes; – enhance the banking capacity and potential of other investors to lend to SMEs
3	*Business development and transferring* difficulty in development and transferring businesses;	removing existing administrative barriers and supporting entrepreneurs in crucial phases of the business lifecycle.	– reduce the volume and improve the quality of EU regulation applicable to SMEs and entrepreneurs; – unleashing additional business opportunities in the digital century; – transfers of businesses; – bankruptcy procedures and second chance for honest businessmen; – regulation burden reduction.
4	*Business sanctions* the fear of "punitive" sanctions in case of failure;		
5	*Administrative procedures* burdensome administrative procedures.		

* Source: compared by author on the basis of [7; 8; 12; 13]

In particular, the European Commission works to improve the availability of financial resources to SMEs by supporting the provision of financial sources, including loans and venture capital through different financial instruments. The European Commission also stimulates particular EU countries to share such SMEs' policy on improving access to finance. The experts of World Economic Forum pay attention to key phases of the entrepreneurial lifecycle and define the first priorities for investing on each phase (Fig. 6).

Scale-up phase
(business growth
and social activity)

Investing factors that enable a business to grow and create an environment for national growth

Start-up phase
(achievement
success)

Investing factors that help an entrepreneur to be successful and to create an environment that helps entrepreneurs to succeed

Stand-up phase
(business start)

Investing individuals to start their own business and to create an environment that motivates individuals to do such activity

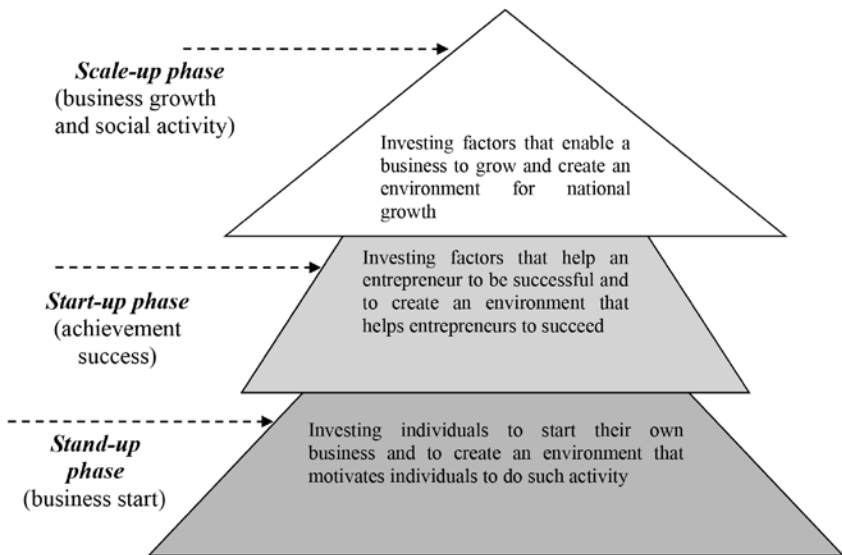**Fig. 6.** The first priorities for investing on each phase
of SME's business cycle*
Source: compared by author on the basis of [14]

On the first phase the most important conditions to start a small business include:
– SMEs' environment improvement;
– a positive attitude towards business;
– highly-developed skills to start an enterprise;
– a cultural, ethical and social framework that encourages self-employed;

– the opportunity to create an innovative idea and actual market offerings;

– financial support for beginners in small and medium business.

However, the basic condition is financial support that is able to encourage future SMEs' representatives to develop their idea and support its implementation within national and European market. In addition, the risks of financing on the stand-up phase are increasing more rapidly than on the farther phases. Mostly, the start-upper already has the progressive innovative idea, but there are a lot of questions about the possibility of its implementation, available demand and managerial skills within the process of SME driving.

EU policy makers should highlight the strategy with main directions, which aim to provide the financial support that helps to estimate all available conditions to start a business and to understand the probability of current start-up success. There is a crucial role of entrepreneur education, which was regarded as the most meaningful form of prior exposure to entrepreneurship by the majority (54 %) of the World Economic Forum respondents. Therefore, on this phase, the primary investment purpose is to develop entrepreneurial thinking, education, culture and the way of thinking. This means the main role of social investments.

Nowadays, social investments are widespread and developed both on the level of national economies and generally in Europe. The main reason for such changes is such as following: people always had their social needs and tried to find new solutions for pressing them. Social investments have spurred its development recently. Such tendencies are connected with the severe employment and social consequences of crises for many of Europe's citizens.

On top of that, the growing of ageing population in Europe, fierce global competition and social changes became burning societal challenges. The sustainability and adequacy of Europe's health and social security systems as well as social policies in general is at stake. This means Europe need to have a fresh look at social, health and employment policies, but also at education, training and high-skills development, small business support, industrial policy and urban development, to ensure socially and environmentally sustainable growth, jobs and quality of life in Europe [15].

The EU social investment strategy means implementation of an integrated policy framework which takes into account the main social, eco-

nomic and budgetary factors and is focused on the following groups of activities:

– investment in SMEs' social protection systems that respond to the main social needs at critical moments throughout business cycle. The main SMEs' needs satisfaction helps to reduce the risk and to avoid further higher social spending, providing an optimal level of their stuff health and education protection;

– development of investment strategies in accordance with targeted social SMEs' policies goals, providing sustainable social protection systems;

– upgrading active inclusion of social investment strategies within SMEs' business strategies, including education, training and job-search assistance, housing support and accessible health care, which are the main areas of policy with a strong social investment dimension.

The second above-mentioned start-up phase means the SMEs' expansion. Therefore, the main business purpose is access to capital. In particular, EU SMEs face the following main issues within the current phase:

– access to follow-on funding, which especially affects the growth of start-ups, including human capital development;

– creating of SMEs' ecosystem and financial support of connection within such system, for instance, sharing business social initiatives with financial sector representatives;

– creating new opportunities, including financial support of market researches and social advertisement activity, which widespread already existing markets, supply chains and simply to gain additional support;

– developing infrastructure, including business support schemes implementation, new work places creation and the important technical and managerial conditions for their productive work creation;

– changing of social and cultural views into SMEs' peculiarities, including of special meetings, conferences and other informational events organization, providing necessary instruments for developing business activity.

Nowadays, the European Commission proposes to focus on the following four main areas of SMEs' financial support, namely:

• removing unnecessary financial regulations and easing tax burdens;
• creating incentives to businesses and/or investors, including social investments stimulation and activation;

• providing particular funding and support programmes, including also social goals;
• promoting and raising the profile of small social-oriented business and the start-up ecosystem [1].

The particular instruments to support SMEs' social investment programs include:

– cluster growth supporting;
– innovative hubs supporting that available to provide particular SMEs' trainings and mentoring;
– investment in creating SMEs' networking opportunities, and facilitating access to financial sources for starters;
– creating connections between business representatives, innovators, mentors, researchers and universities networks;
– boosting further educational SMEs' programs.

Thus, on the second phase, the SMEs are developed and become significant within national economies and international markets. At the same time, on the third phase scale-up SMEs are already stronger than they were before. The small business growth means social activity and influences an existing social services system. On the last phase of SMEs' development, the authority should be interesting in providing particular financial instruments and additional advantages not only to networks and organization that are able to support SMEs' social functions, but also social active SMEs.

The practical directions to support and provide SMEs social investment on the scale-up phase are following:

– the market-based development of alternatives to lending assistance in Europe;
– activation of mid-tier businesses and fast growing SMEs' social activities;
– SMEs' stability and improvement of its lending capacity support;
– secure better possibilities for banks and insurance companies to be involved in implementing alternatives to lending for social-oriented SMEs.

EU SMEs' securing programs are realized with a wide range of instruments, including such instruments and methods as:

– hybrid funding methods (mezzanine finance);
– equity funds and venture capital;

– small-business credit and bank lending programs for SMEs;
– SME bonds;
– SMEs' guaranties;
– regional SMEs' supporting programs.

Thus, the current research to provide favorable conditions for social active SMEs development in Europe is aimed to differentiate three main stages within the SMEs' life cycle, namely the stand-up phase to stimulate entrepreneurship initiatives, the start-up phase and the scale up phase.

The favorable conditions for SMEs creation and development on the first phase mean stimulating of business culture and positive image financing. These create no short-term income, but develop entrepreneurs' potential and access to the right skills. Therefore, the investments in SMEs should be social investment. In general, the main purpose of stand-up phase investment is to concern on the possibilities, which SMEs already have and to develop their potential.

The major factor for start-up phase SME development is access to capital. Therefore, the available legal framework both on the national and regional levels should encourage social business infrastructure and small business eco-system creation. These kinds of activities stimulate to rapid SMEs growth and high skilled development.

Finally, the scale-up SMEs are strong enough to create additional value and social influences for society. The authority is able to remove existing regulation and financial burdens, promoting and stimulating both SMEs and financial institutions to provide social programs.

REFERENCES

1. Muller P. Annual Report on European SMEs 2016/2017. Focus on self-employment SME Performance Review 2016/2017. / P. Muller, J. Julius, D. Herr, L. Koch, V. Peycheva, S. McKiernan. — Brussel: European Commission, 2017. — 189 p.
2. Infographic: Presents the latest data on European SMEs based on the annual report. European Commission official website. — Electronic resource. — The way of access: http://ec.europa.eu/growth/smes/business-friendly-environment/performance-review-2016_en
3. Muller P. Annual Report on European SMEs 2015 / 2016 SME recovery continues SME Performance Review 2015/2016. / P. Muller, S. Devnani, J. Julius, D. Gagliardi, Ch. Marzocchi. — Brussel: European Commission, 2017. — 110 p.
4. Brinkley I. In search of the Gig Economy. The Work Foundation. / I. Brinkley — UK: Lancaster University, 2016. — 19 p. — Electronic resource. — The way of access:

http://www.theworkfoundation.com/wp-content/uploads/2016/11/407_In-search-of-the-gig-economy_June2016.pdf

5.   Prieger J. E. Economic Growth and the Optimal Level of Entrepreneurship. / J. E. Prieger, C. Bampoky, L. R. Blanco, A.Liu. // World Development. — 2016. — Vol. 82. — issue C. — p. 95 -109.

6.   Terjesen, S. Coase on entrepreneurship. / S. Terjesen, N.Wang // Small Business Economics. — 2013. — Vol. 40(2). — pp. 173–184.

7.   A European initiative for the development of micro-credit in support of growth and employment. — Brussels: Commission of the European Communities, 2007. — 31 p.

8.   Think Small First. A "Small Business Act" for Europe. — Brussels: Commission of the European Communities, 2008. — 22 p.

9.   An action plan to improve access to finance for SMEs. — Brussels: Commission of the European Communities, 2011. — 16 p.

10. Regulatory fitness and performance programme — REFIT scoreboard summary. — Brussels: Commission of the European Communities, 2011. — 36 p.

11. REFIT Scoreboard. Official website. — Electronic resource. — The way of access:http://publications.europa.eu/webpub/com/refit-scoreboard/en/index.html

12. Entrepreneurship 2020 action plan. Reigniting the entrepreneurial spirit in Europe. — Brussels: Commission of the European Communities, 2013. — 33 p.

13. Unleashing the growth and job creation potential of SMEs. Strategy paper. — Brussel: Business Europe, 2014. — 10 p.

14. Kearney A. T. Enhancing Europe's Competitiveness — Fostering Innovation-driven Entrepreneurship in Europe. Insight Report. — Switzerland: World Economic Forum. — 2014. — 38 p.

15. Guide to social innovation. Regional and urban policy. — Brussels: European Commission, 2013. — 72 p.

16. Мікловда В. П., Брітченко І. Г., Кубіній Н. Ю., Дідович Ю. О. Ефективність стратегічного управління підприємствами: сучасні проблеми та перспективи їх вирішення. — Полтава: ПУЕТ, 2013. — 240 с.

17. Бритченко И. Г. Маркетинг менеджмент: новые решения / АА Шубин, РК Перепелиця, ГИ Бритченко. — Донецк: ДонНУЕТ им. М. Туган-Барановского, 2007. — 326 с.

UKRAINIAN SMES AS OBJECTS FOR SOCIAL INVESTMENT FROM EUROPEAN UNION: TRENDS IN DEVELOPMENT, CURRENT STATE AND WAYS FOR IMPROVEMENT TO ATTRACT INVESTMENT

I. Kubareva
Phd in Economics,
Associate Professor of Business Strategy Department,
SHEI "Kyiv National Economic University
named after Vadym Hetman"

The challenges of modern world are dictated by the state of the environment, demographic changes, social upheavals, economic transformations. Therefore, the leading European institutional associations in their strategies and programmes are focused on sustainable development. It is important that responsibility for this is on both countries and their associations (that is, in the global context) as well as on individuals and companies (that is, it is individual and business engagement). And it is clear that responsible development is a global and individual liability at the same time.

A socially responsible business is gradually becoming more of a norm than the exception today. Taking into account that it is the small and medium-sized businesses themselves who are the main players in the field of economic growth, these companies need to be the bearers of social changes and transformations in society and economy. Formation and development of a small and medium-sized business strategy for social responsibility is important for all levels of the business environment, as for the internal environment and for external one. At the internal level, competitive advantages of the company are created and its competitiveness is ensured. At the level of the external environment a new socially responsible economy is formed.

The issue of business development inseparably linked with the issue of its financing. In the formation of socially responsible business, the conditions of financing change, the effect and return on investment is already not only purely financial, but also social in nature. Therefore, it is important to

create effective mechanisms for financing projects for the development of social responsibility of small and medium-sized enterprises (SMEs). Social responsible investments act as a tools for financing of SMEs development in their new capacity — socially responsible agents of sustainable development.

Trends in the development of small and medium-sized business in Europe (EU) show that it is the main sector represented by the overwhelming majority of enterprises, as well as the largest number of employees, while generating a significant amount of value added. Similar trends are also taking place in Ukraine, which is a member of the Eastern Partnership, and it seeks to join all economic processes in the EU and meet the goals and principles of the development of the European economy.

Analysis of the characteristics of SMEs in Europe (Fig. 1) showed that almost all enterprises belong to this sector and make 23 489 thousand business entities of the total 23 894 enterprises. These companies provide jobs for more than 93 million people and form an added value of the European economy making 4 030 billion EUR.
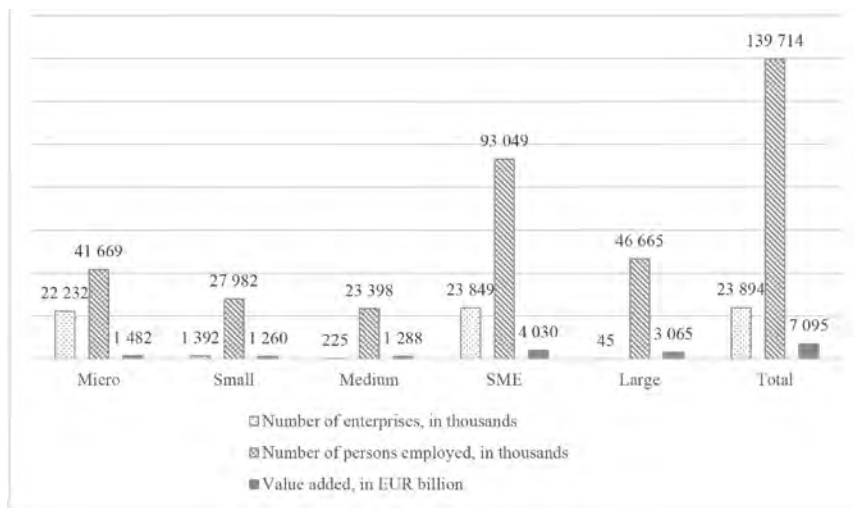

Fig. 1. The SMEs and large enterprises: number of enterprises, number of persons employed and value added in 2016 in the EU-28 non-financial business sector *
* *Source: compared by author on the basis of [1]*

According to the data of Annual Report on European SMEs in 2016-2017 small and medium companies play a significant role in the 'accommodation and food services', 'business services' and 'construction' sectors, in each of which they accounted for more than 80 % of EU-28 employment in 2016. Furthermore, SMEs accounted for 70 % of EU-28 employment in the 'retail and wholesale trade' sector [1]. These Fig.s provide an opportunity to argue that small and medium-sized businesses play an important role in forming demand and supply in the markets for goods and services, provide the population with the necessary benefits and form the basis for economic development. In addition, the role of small and medium enterprises in the development of a socially oriented responsible economy and in achieving the goals of sustainable development is crucial.

It is important to note that the main trends in the development of small and medium-sized businesses in Ukraine, which is a member of the Eastern Partnership, are also in line with the European trends. Data (Fig. 2) shows that in Ukraine there are about 306.5 thousand companies, 306 thousand of which represent small and medium business. Of the 5.8 million employed in the small medium and large businesses, almost 4.2 million are staffed by small and medium-sized enterprises. Ukrainian SMEs generate 32.7 million EUR of value added from almost 60 million EUR commonly made by businesses in the Ukrainian economy. It shows the significant role of Ukrainian business in the functioning of the economy and its social responsibility development.

The structure of the number of enterprises, number of people employed and added value created by business shows that micro-business is the most represented. Microenterprises occupies 93% in Europe and 80.8% in Ukraine and generates 20.9% and 5.4% value added accordingly (Fig.s 3, 4). Hence, microbusiness is more efficient and brings a greater social impact in Europe than the Ukrainian one generates. It is an impetus for Ukraine for finding ways to increase the efficiency of microenterprises and their social contribution to the economy. The staff employed in microenterprises in Europe is 29.8% of the total number employed in business and is three times higher than the same indicator in Ukraine — 11.1%. This also reveals a more active and socially oriented development of microbusiness in Europe compared to Ukraine.

Fig. 2. The SMEs and large enterprises: number of enterprises, number of persons employed and value added in 2016 in Ukraine *
* Source: compared by author on the basis of [2]*
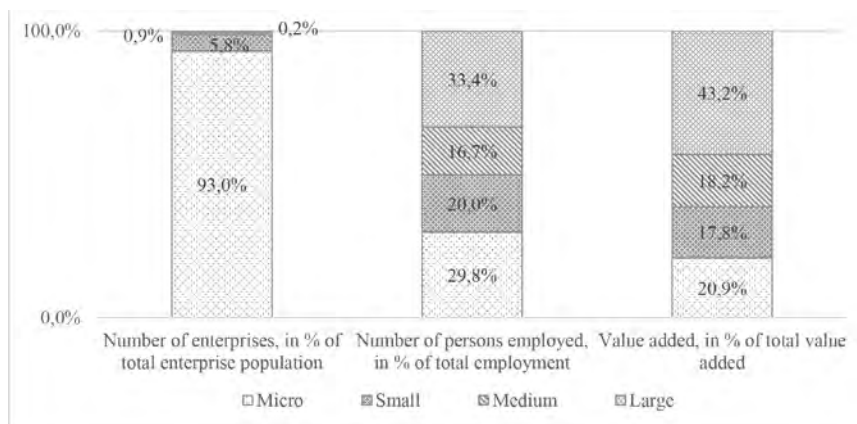
Fig. 3. The structures of SMEs and large enterprises: number of enterprises, employment and value added in 2016 in the EU-28 non-financial business sector *
* Source: compared by author on the basis of [1]*

Small and medium-sized enterprises, on the contrary, predominate in the structure of Ukrainian companies and occupy 14.2% and 4.9% ac-

cordingly, while European companies account for 5.8% and 0.9%. Small and medium-sized enterprises in Ukraine have the largest number of employed — 61.5% while European companies have 36.7% of personnel. The largest value added in the Ukrainian economy is created by medium and large businesses (about 43% and 40% accordingly) while in Europe 43% of value added is for large business and the rest is created by other companies.
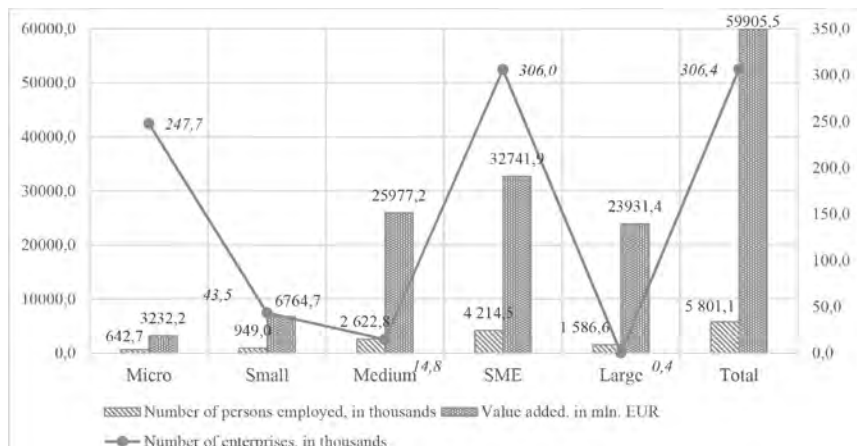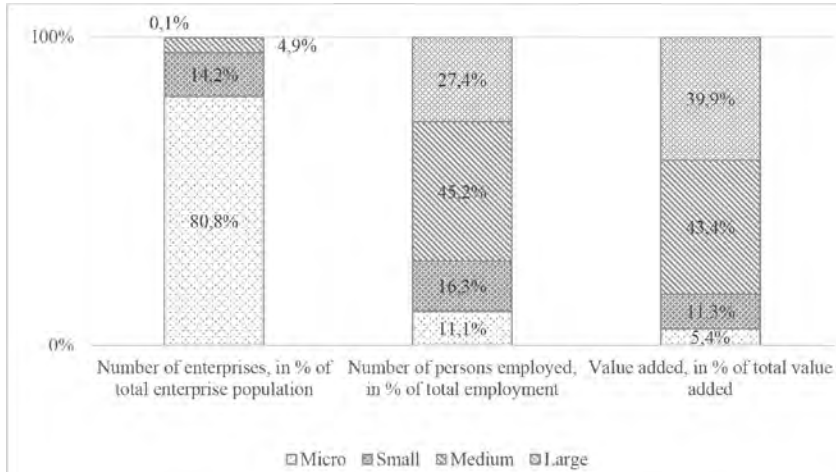

Fig. 4. The structures of SMEs and large enterprises: number
of enterprises, employment and value added in 2016 in Ukraine *
* Source: compared by author on the basis of [2]

The role of Ukrainian companies in creating value added in the economy over the five years from 2012 to 2016 is gradually increasing (Fig. 5), as a whole for all microbusinesses, small and medium-sized businesses, and for each group of enterprises separately. And this is a positive trend, which shows effective changes in the work of SMEs and their social component.

According to the analysis of statistical data, economic efficiency of Ukrainian small and medium business gradually fluctuates during 2012-2016, but at the end increased slightly and SMEs had the most effective indicators of value added in 2016 (Fig. 6).

Ukrainian SMEs provides national economy with good and services and sold 62% of all products in 2016 in Ukraine. At the same time financial

results of small and medium enterprises outlines the low profits and the presence of unprofitable enterprises (Fig.s 7, 8)
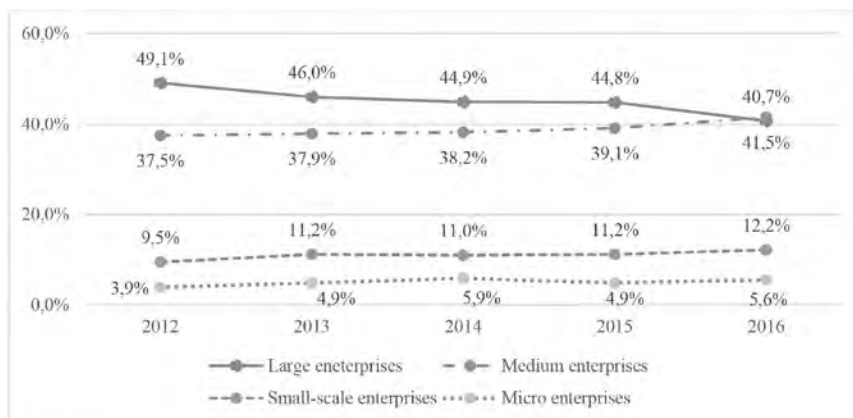
Fig. 5. The value added of SMEs and large enterprises in 2012-2016 in Ukraine *
* Source: compared by author on the basis of [2]
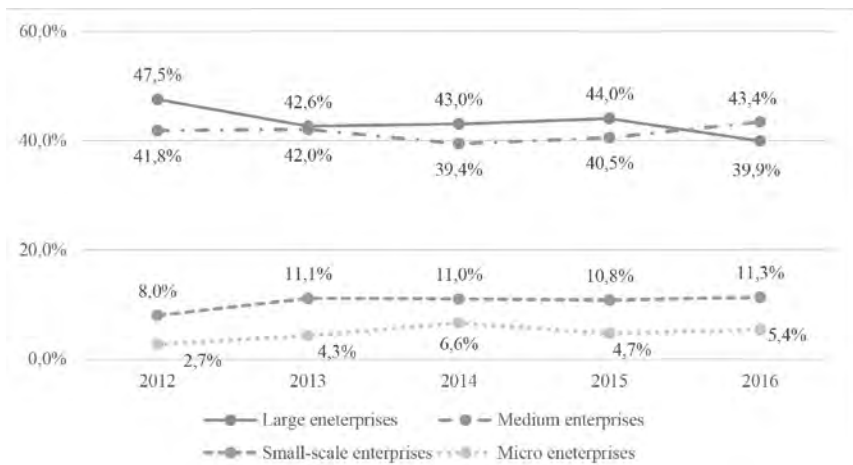
Fig. 6. The value added at factor costs of SMEs and large
enterprises in 2012-2016 in Ukraine *
* Source: compared by author on the basis of [2]
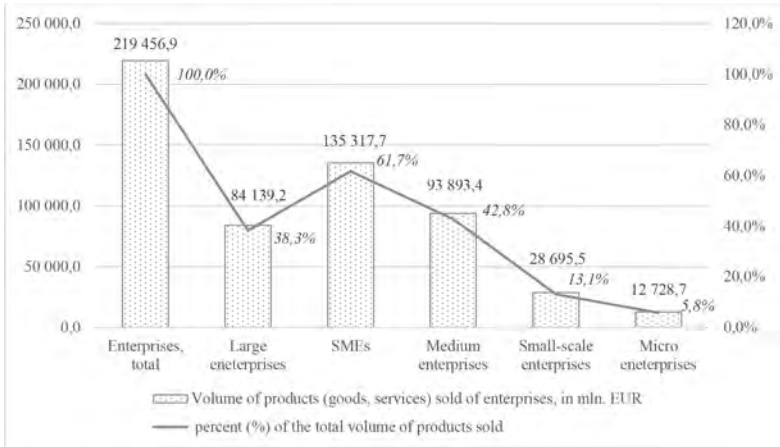
Fig. 7. Volume of products (goods, services) sold of enterprises
of economic activity with separation on large, medium, small
and microenterprises in Ukraine in 2016*
* *Source: compared by author on the basis of [2]*
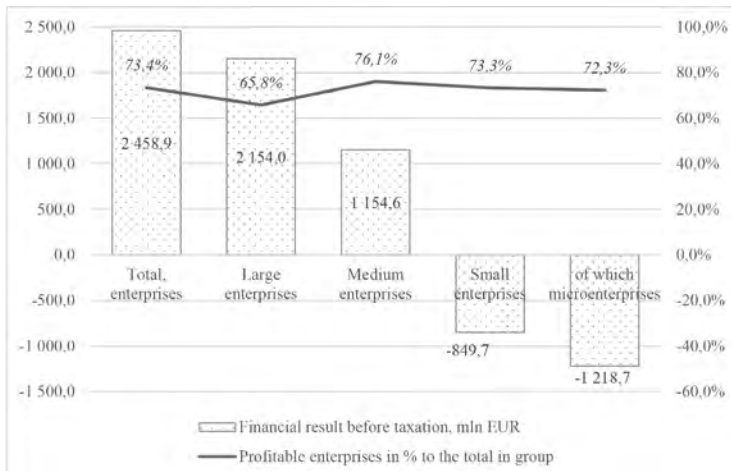
Fig. 8. Financial results before taxation of economic activity with separation
on large, medium, small and microenterprises in Ukraine in 2016*
* *Source: compared by author on the basis of [2]*

Therefore, it can be concluded that Ukrainian business is developing in line with the tendencies of SMEs in Europe. Nevertheless, its current state requires further steps to improve its efficiency and a social component plays an important role in this.

A socially responsible business involves understanding by the owners and employees of the enterprise of the importance of developing corporate social responsibility (CSR) at the strategic level and involving all personnel in these processes.

When companies implement "strategic CSR" they can find there are many benefits, including strengthened corporate and brand reputations and enhanced trust with key stakeholders (customers, employees, regulatory agencies, suppliers, and investors), improved risk management, increased revenues from innovation to identify new business opportunities, and reduced costs from efficiency improvements. [3]. Social responsible business considered as businesses can build and enhance their competitiveness by improving and reporting on their responsible business practices [4]. The directions to develop business practice should include responsible impact on personnel, responsible relationship with stakeholders and clients, responsible attitude to environment, development of the social projects in different areas, responsible consumption.

Corporate Social Responsibility (CSR) in European Commission understanding refers to companies taking responsibility for their impact on society. The European Commission believes that CSR is important for the sustainability, competitiveness, and innovation of the EU enterprises and the EU economy. It brings benefits for risk management, cost savings, access to capital, customer relationships, and human resource management [5].

The importance of CSR for enterprise and EU economy is as follows:

In the interest of enterprises — CSR provides important benefits to companies in risk management, cost savings, access to capital, customer relationships, HR management, and their ability to innovate.

In the interest of the EU economy — CSR makes companies more sustainable and innovative, which contributes to a more sustainable economy.

In the interests of society — CSR offers a set of values on which we can build a more cohesive society and base the transition to a sustainable economic system.

In Europe Sustainable Responsible Investment (SRI) supports development of SCR. SRI Strategies show growing in all their types (Fig. 9).
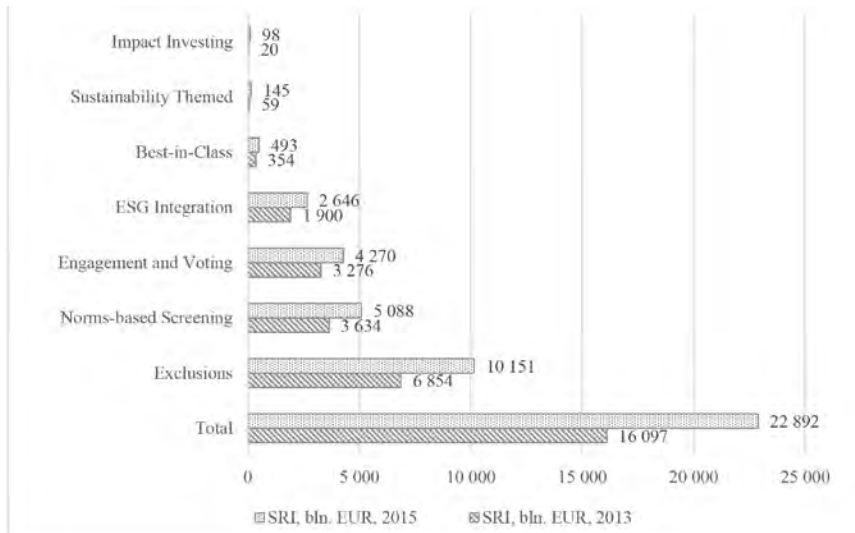
Fig. 9. Overview of SRI Strategies in Europe in 2013-2015*
Source: compared by author on the basis of [6]

The type of strategy defined by ways of social investing and by the couple of appropriate indicators, which are taken in consideration by investors. The initial and important factor for investor is high level of business transparency and accountability.

The results of the survey (Fig. 10) "Business Changing the Country" of the Ukrainian National platform for small and medium businesses shows the most important characteristics for the SMEs in Ukraine. These features of business are transparency, high level of quality, consideration of shareholders' interests, contribution in R&D and science, formation of new social-aims perception of the world, care of the environment and strong independent social values [7].

The problems and negative factors, which prevents the development of CSR in the Ukrainian companies, were investigated in research of the Ukrainian center of development of CSR [8]. One of the main factors is a level of transparency. Transparency index of the 100 companies in Ukraine

(top-companies) in 2015 shows that a disclosure level became better, but had risen slightly (Fig. 11). The bar chard provides information about 100 Ukrainian companies and their level of disclosure. The biggest companies show the highest level of disclosure. Over the period, 2011 to 2015 as whole there was gradual increase in the level of transparency. Nevertheless, during this period there were observed different trends for each group of enterprises. It is valuable to note, that the measures for disclosure of information among the largest companies were the most influential indicator of growth.
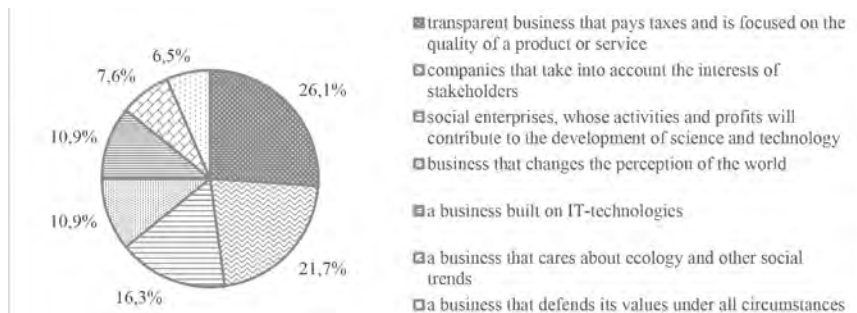
Fig. 10. The main values of Ukrainian SM business in 2016*
* Source: compared by author on the basis of [7]

In comparison with each companies' group, the total disclosure level is not high in Ukraine. Only 17 companies had CSR report. Overall, the level of transparency over the period 2011 to 2015 increased slightly in comparison with the 2011, but had gradual upward trend after 2012. The biggest companies were most successful in the level of disclosure. It is consequently that smaller companies should pay more attention to their CSR and transparency level.

Social responsibility of the business is important for the sustainability. The social development of business contributes to the achievement of the goals of sustainable development proclaimed by the UN [9]. The Sustainable Development Goals (SDGs) call on companies everywhere to advance sustainable development through the investments they make, the solutions they develop, and the business practices they adopt. In doing so, the goals encourage companies to reduce their negative impacts while enhancing their positive contribution to the sustainable development agenda [9]. Thereby,

CSR strategy has the same principal objectives and participants/stakeholders. The research based on the interview with international experts of the most significant objectives and influential groups for sustainability shows that business aimed to add value, manage the risks and obtain competitive advantages (Fig.s 12, 13). It is also important for business to be responsible for customers, investors, personnel and meet regulatory standards. Clients and customers, employees, governance, investors, regulators and civil society are the most important stakeholders of the development of sustainable business.
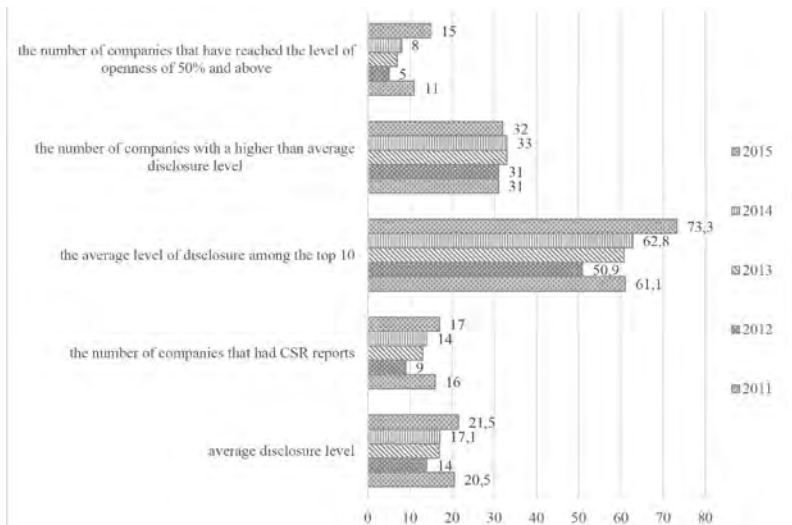
Fig. 11. The transparency level on the top-100 companies
in Ukraine in 2015*
* *Source: compared by author on the basis of [8]*

With regard to Ukrainian enterprises, it is important to develop systematic approaches to the formation of social responsibility, provide the implementation of social development projects, and the attraction of the necessary investments of social orientation. The experience of the EU shows that socially responsible investments today have their own strategies and require the business to have the appropriate characteristics. It is important for Ukraine as a whole and for SMEs in particular to form strategic directions for the development of social responsibility for business, as well

as to build a system for ensuring the investment attractiveness of Ukrainian business for social investment.

Fig. 12. The principal objectives of organization's sustainability strategy*
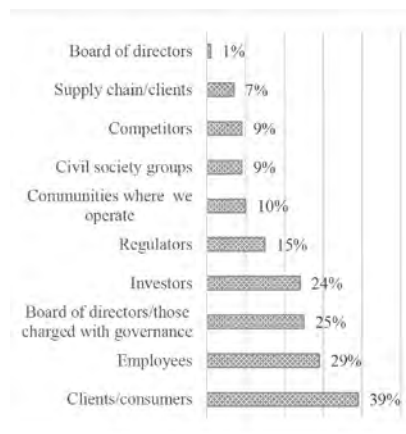
Fig. 13. The groups, which has the most influence on organization's sustainability strategy*

* Source: [10]

Today Ukrainian business has a number of problems and a number of initiatives on the ways of its development. According to the survey, the most frequently requested services for entrepreneurship support are entrepreneurship protection (84%) and financial and credit support (73%), as well as advisory assistance, training and protection of business interests (60%) [11].

Among interviewed experts in the Ukrainian business environment, corruption is the main obstacle for business development (65%) and limited access to financial resources (57%) as well. In this regard, the main areas of support for entrepreneurship are its financial and credit support (78%), infrastructure support (68%), programs for stimulating innovation and export support (65%) [12].

Ukraine attracts investment for business, at the same time for SMEs access to financial resources is more limited and problematic. As a whole, the volume of direct investments from the EU to Ukraine in 2017 amounted to 26.1 million USD (Fig.s 14, 15).
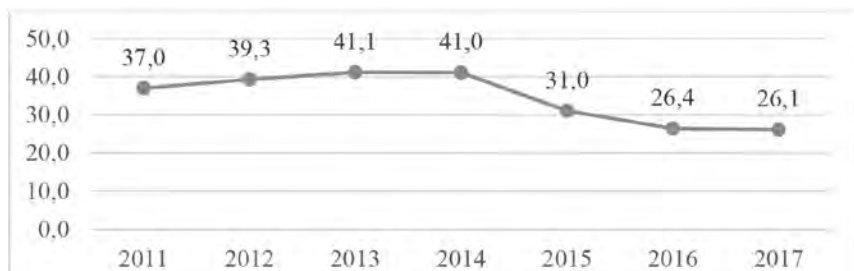
Fig. 14. Level of direct investment to Ukraine from EU
during the period 2011-2017, mln. USD*
Source: Source: compared by author on the basis of [2]
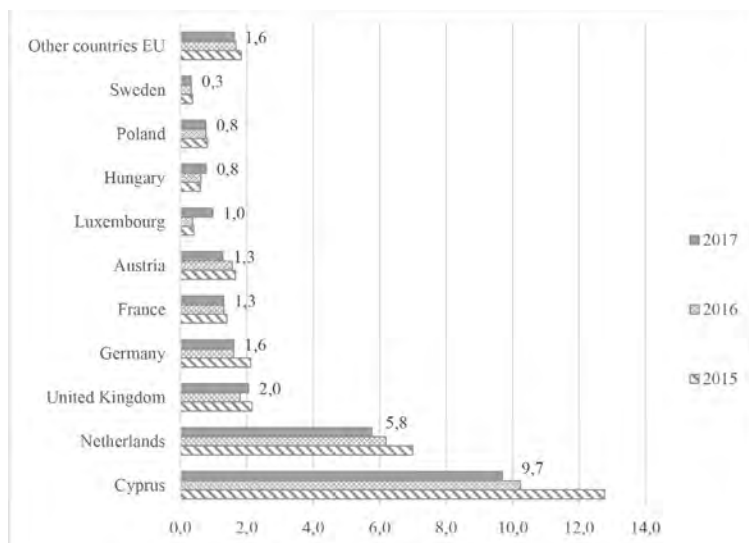
Fig. 15. Level of direct investment to Ukraine from EU countries during the period 2015-
2017, mln. USD*
Source: Source: compared by author on the basis of [2]

During the period from 2011 to 2017, the volume of investments from the EU countries to the Ukrainian economy grew moderately during the period 2011 to 2014 from 37 to 41 million USD. After that, there was a steady trend for a decline in volumes from 2015 to 2017 (by 36%). The larg-

est volumes of investments into Ukraine from the EU over the past three years came from Cyprus, Netherlands, and United Kingdom.

At the same time, Ukraine as member of the Eastern Partnership countries is included in the SMEs Development Program, which provides grants for the development of socially responsible business. Therefore, the EU has cooperation with Ukraine in the framework of the Eastern Partnership. Ukrainian companies have business links with European ones, can take participation in the European programs of business support, and take active part in different conferences and other meetings to make Ukrainian business closer to European economy. The programs of collaboration are focused on human rights and civil society [13]**.**

The ways for improving business in Ukraine to develop integration in EU were declared at International Conference on Support for Ukraine. They include following areas: changing the political, administrative and commercial culture of the country, higher energy prices for consumers, greater competition of businesses, bring energy efficiency in line with the EU average so on. In the frames of bilateral cooperation with Ukraine is planned to grant assistance in the period 2014-2020 to contribute to development of SMEs in Ukrainian economy and aimed to support programs for reforms in energy, transport, environment, migration and other socially significant directions [13, 14].

As part of the EU's €11 billion package supporting Ukraine in April 2015, the European Commission has adopted a €70 million Special Measure for Private Sector Development and Approximation. This measure is a response to the urgent need to support recovery and economic development in Ukraine. It will notably help SMEs across the regions of Ukraine, boosting jobs and growth. It will be complemented by a €40 million loan guarantee facility channeled through the Neighborhood Investment Facility (NIF), which will also ease access to finance for Ukrainian businesses [13].

Taking into account the declining trend in the volume of investments in the Ukrainian economy, as well as taking into account the features of functioning of small and medium enterprises, it is advisable for Ukraine to study the European experience in developing socially responsible investment. To do this, it is necessary to take into account two aspects: internal, which involves active actions of companies for attracting social investments, and external, which involves the expansion and development of investment environment approaches and strategies for the implementation of social investment.

Diagnosis of the strengths and weaknesses of the Ukrainian SMEs as an object of social investment, as well as analysis of opportunities and threats of the environment point out positive tendencies in the development of Ukrainian SMEs, the desire and vision of SMEs representatives on the problems and ways of developing a socially responsible business (Fig. 16).

Strengths	Weakness
– Overwhelming majority of SMEs in the structure of enterprises (99%) – Significant impact on the social efficiency of the economy (60% added value) – Providing most job places (73% employed) – Providing housing and food services – Formation of demand and supply in the markets of goods and services (62% of all sold goods and services), – Formation of a competitive environment – Availability of values and strategic intentions of social orientation among most representatives of Ukrainian business	– Low transparency and accountability level of SMEs – Lack of clear mechanisms of formation of social responsibility strategy in SMEs – Lack of financial resources – Low profits and the presence of unprofitable enterprises
Opportunities	**Threats**
– EU has co-operation with Ukraine in the framework of the Eastern Partnership – Positive trends in Development of Sustainable Responsible Investment In Europe – Programs of EU collaboration focused on human rights and civil society – Grant assistance from EU in the period 2014-2020 aimed to contribute to development of SMEs in Ukraine and focused on socially important directions	– Low level of protection of the rights of entrepreneurs in Ukraine – Weak financial and credit support in Ukraine, lmited access to financial resources – Monopolization of the Ukrainian economy – Lack of Ukrainian business support system – Undeveloped market of investment resources in Ukraine – Low level and negative dynamics of foreign investments (from EU) in the economy of Ukraine (from 37 mln.USD in 2011 to 27 mln.USD in 2017)

Fig. 16. SWOT characteristics of Ukrainian SMEs as objects for social investments from EU*
 * *Source: compared by author on the basis of [1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14]*

Nevertheless, at the same time there are problems with financial resources and active management actions for the formation of system approaches for attracting social investments.

The resulting SWOT-characteristics provide the basis for identifying strategic priorities for the development of SMEs as objects of social investment. The main significant areas and most important strategic measures are as follows:

Strategic area of management:
– formation and development of a strategy of social responsibility at enterprises of SMEs sector, initiation of social projects with development of project management;
– contributing to the achievement of sustainable development goals through their inclusion in strategic business development goals and through the use of special approaches and tools for their implementation.

Human resources area:
– involvement of personnel in processes of formation and development of a strategy of social responsibility;
– formation and development of corporate culture.

Stakeholder's relationship area:
– relationship management and partner interaction with stakeholders;
– creation of partnerships with consulting companies, creation of business centers;
– collaboration with NGOs.

Transparency formation area:
– increasing the level of openness and disclosure, reporting CSR;
– improving company disclosure of social and environmental information;
– being responsible for customers, investors, personnel and meet regulatory standards.

Investment attractiveness area:
– formation of investment attractiveness of SMEs for attracting social investments;
– attracting foreign investments through participation in EU programs.

Innovation and education area:
– support and promotion of innovation;
– enhancing energy efficiency and implementation of green projects;
– integrating CSR into education, training, and research;

– benchmarking the experience of EU in SRI and development of strategies of social responsible investment in Ukraine.

Finally, Ukrainian SM business nowadays is the part of the EU economy and it is a challenge for Ukrainian entrepreneurs to lead their companies to the level of the European trends and requirements in social-economic development. Current state of Ukrainian SMEs gives an opportunity to draw conclusions about the base for further development of economic efficiency and social responsibility for small and medium enterprises in Ukraine. The strategic goals and appropriate measures allows to create effective working mechanism to attract social investment and to enhance the level of social responsibility and sustainability both for individual companies and for the economy as a whole, as well as will promote further integration of Ukraine into the European Economic Area.

REFERENCES

1. Muller P. Annual Report on European SMEs 2016/2017. Focus on self-employment SME Performance Review 2016/2017. / P. Muller, J. Julius, D. Herr, L. Koch, V. Peycheva, S. McKiernan. — Brussels: European Commission, 2017. — 189 p.
2. State Statistic Service of Ukraine. Economic statistics. Basic structural indicators activity of enterprises, by size. — Electronic resource. — The way of access: http://www.ukrstat.gov.ua/
3. Craig Smith N. When It Comes to CSR, Size Matters. / N. Craig Smith, INSEAD Chaired Professor of Ethics and Social Responsibility. // Forbes, 2013. — Electronic resource. — The way of access: https://www.forbes.com/sites/insead/2013/08/14/when-it-comes-to-csr-size-matters/#27992db352a2
4.   Cooney A. Being a socially conscience business doesn't have to be costly — it's for both big and small players. / A. Cooney Social Responsibility Coordinator, ESB // Fora, 2016. . — Electronic resource. — The way of access: https://fora.ie/readme/anne-cooney-esb-social-responsibility-2979703-Sep2016/
5. European Commission. Corporate Social Responsibility (CSR). — Electronic resource. — The way of access: https://ec.europa.eu/growth/industry/corporate-social-responsibility_en
6. European SRI Study 2016. // Eurosif. 2016. — 112 p. — Electronic resource. — The way of access: http://www.eurosif.org/wp-content/uploads/2016/11/SRI-study-2016-HR.pdf
7. Romanska O. Results of survey "Business, which changes the country". // National Platform of Small and Medium Business, 2016. — Electronic resource. — The way of access: http://platforma-msb.org/rezultaty-opytuvannya-biznes-shho-zminyuye-krayinu/
8. Transparency index of 100 largest companies of Ukraine -2015. Survey. // Ukrainian Center of Development of Corporate Social Responsibility. — Electronic resource. — The way of access: www.csr-ukraine.org

9.   SDG Compass. The guide for business action on the SDGs // United Nations, 2015. — 30 p. — Electronic resource. — The way of access: https://sdgcompass.org/wp-content/uploads/2016/05/019104_SDG_Compass_Guide_2015_v29.pdf

10.   Sustainability reporting — the time is now. Report. // EY in association with the Global Reporting Initiative (GRI), EYGM Limited, 2013. — 24 p. — Electronic resource. — The way of access: http://www.ey.com/Publication/vwLUAssets/EY_Sustainability_reporting_-_the_time_is_now/$FILE/EY-Sustainability-reporting-the-time-is-now.pdf

11.   Romanska O. What support do entrepreneurs expect? Survey of the Center for Public Expertise. // National Platform of Small and Medium Business, 2016. — Electronic resource. — The way of access: http://platforma-msb.org/yaku-pidtrymku-ochikuyut-pidpryyemtsi/

12.   Strykun H. The biggest obstacles to business development are corruption, limited financial resources and tax pressures. Survey of the Center for Public Expertise. // National Platform of Small and Medium Business, 2016. — Electronic resource. — The way of access: http://platforma-msb.org/najbilshi-perepony-dlya-rozvytku-biznesu-koruptsiya-obmezheni-finansovi-resursy-ta-podatkovyj-tysk/

13.   Programming of the European Neighborhood Instrument (ENI) Strategic Priorities 2014-2020 and Multi-annual Indicative. Programme 2014-2017. European Neighborhood-wide measures — 2014-2020 — Brussels: European Commission, 2014. — 21 p. — Electronic resource. — The way of access: https://ec.europa.eu/neighbourhood-enlargement/neighbourhood/countries/ukraine_en

14.   Hahn J. Speech at International Conference on Support for Ukraine. / Johannes Hahn, Commissioner for European Neighborhood, Neighborhood Policy and Enlargement Negotiations European Commission. — Brussels: European Commission, 2015. — Electronic resource. — The way of access: http://europa.eu/rapid/press-release_SPEECH-15-4884_en.htm

PROSPECTS OF INNOVATIVE TECHNOLOGIES INTO EDUCATIONAL SYSTEM INTRODUCTION

P. Machashtchik,
Doctor, rector,
State Higher Educational Institution named prof. Stanislaus Tarnowski
I. Britchenko,
Doctor of Economic Sciences, professor,
State Higher Educational Institution named prof. Stanislaus Tarnowski

Educational system innovative development, innovation management and marketing technologies and tools active improvement, learning technologies improvement and multiplication have become an integral attributes of educational technology of the majority countries in the world. Innovations in educational system development is the basis of a state's innovative and technological policy.

The need to improve educational system and introduce innovative technologies is an essential prerequisite able to ensure countries into the world economic community untrammeled integration. In this context it should be noted that modern information and communication technologies application enables to significantly speed up information search and transfer process, transform mental activity nature, and automate human labor.

Erudition and the ability to manage information have long become wealth and power basis in most of economically developed countries. The OECD (Organization for Economic Cooperation and Development) report noted that: «in the knowledge-based economy science and technology are the most important sources of economic growth and welfare».

OECD experts all definitely agreed that: «the basic long-term economic growth rate in OECD countries depends on knowledge base maintaining and expanding ... In many OECD countries value added real growth in the knowledge-based industries has consistently outpaced the overall economic growth for the past two decades. Globalization process has accelerated these trends... Countries comparative advantages are less determined by natural resources richness or cheap labor but increasingly by technological innovations and knowledge competitive application... Economic growth today is as much a process of knowledge accumulation as it is a capital accumulation process»[1].

According to analysts, educational technology is one of the most promising sectors for investment. Despite the fact that educational technology is a market with $5 trillion a year turnover, it is completely shaded by not just fintech but by other investment spheres as well. But according to TechCrunch journalists the situation tables have begun to turn. According to the EdTechXGlobal and IBIS Capital report, investment in education and training will have reached $252 billion by 2020 [2].

Besides the fact that this industry has direct access to schools, institutes and universities, it also is the most reliable object for investments. In contrast to the financial market ups-and-downs, education remains constant and secure from geopolitical storms. According to TechCrunch experts, digital education is the largest and probably the most profitable IT sector [3].

Geoff Mugan, the Chief Executive of Nesta – a British Innovation Institute – has adopted four technological trends in education, which he considers to be the most promising for GovInsider, they are: digital textbooks, blockchain, crowdteaching and adaptive learning [4].

More detailed analysis of modern innovative technologies, which may significantly change educational system configuration in the nearest future, is deemed necessary.

Education, along with a number of other sectors (such as health care and telecommunications) are subject to significant changes due to digital technology increasing distribution. As is usually the case, commercial organizations such as private universities, business schools and corporate universities set trends for digital technologies in educational and research activities implementation. But public universities and institutes are increasingly starting to consider digital transformation [5].

Rapid online learning adaptation, which is expressed in the form of blended learning development and MOOC (Massive on-line open course) active development should be noted among the challenging digital innovations.

The term MOOC was invented in 2008 by David Cormier of the University of Prince Edward Island of Canada and Brian Alexander of the National Institute for Technology in Liberal Education [6].

Massive on-line open course (MOOC) is a training course with a mass interactive participation by means of e-learning technologies and open access via the Internet [7], and is one of distance learning forms. As

additions to traditional curricula, such as videos, reading and homework assignments, massive on-line open course provides an opportunity to use interactive user forums that help to create and maintain students, teachers and assistants' community.

Online learning development dynamics is demonstrated, in particular, by available online courses growth, the number of which is doubled every year in more recent times. At present more than 4,200 courses from over 500 universities are available.
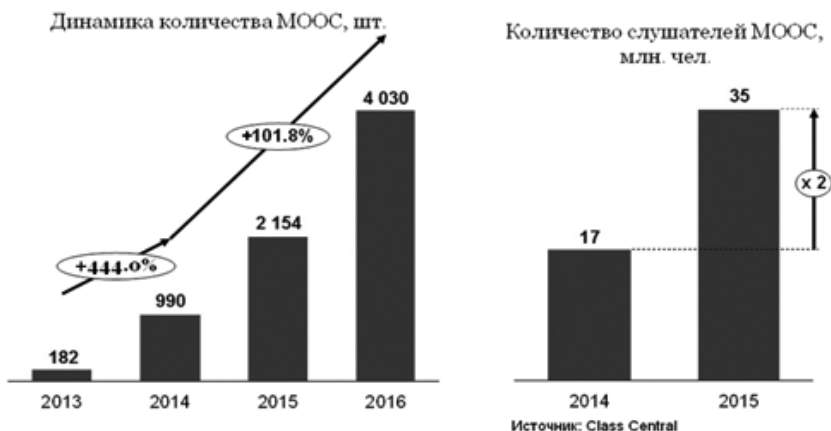
Fig. 1. Online Learning Development Dynamics [5]

Advancing online segment of educational services emergence can completely change this sector landscape: according to some estimates in addition to the number of courses offered and the number of trainees annual doubling MOOC market projected consolidated revenue will grow more than fivefold by 2020.

Development of digital libraries and digital universities' campuses, which have already been implemented by many universities in America and Europe, are additional areas of digital technologies in education application.

Currently three major MOOC platforms are successfully in operation in the USA, they are: edX, founded by Harvard University and Massachusetts Institute of Technology, Udacity, a structure, formed on the basis of Computer Science syllabus at Stanford University, and Coursera.

MOOC is being developed in other parts of the world as well: Iversity in Germany (300 thousand students, more than anywhere else in Europe), Open University in the UK, Crypt4you in Spain, OpenupEd which is a spring of the European Union educational structures, EduKart in India, etc.

Americans were the first to launch, so their MOOC magnitude is beyond competition: 1.6 million audiences (or users) in edX, as many in Udacity, and as many as 6.3 million in Coursera [6].

However, the opinion of A. Chikunov [8] is shared by us and along with undeniable advantages online learning disadvantages shall be critically catalogued.

MOOC is a good example of technological solutions into educational field implementation. In fact, it is a tool that allows to change material delivery method: instead of lectures at universities, interesting video lessons can be viewed, interactive tasks, exercises, etc. can be solved. But it emerged that MOOC proved to be ineffective in traditional learning formats competing due to the fact that the same level of material understanding was impossible to be reached. MOOC offers lectures interpretations, simple tests and surveys — but all this is not enough to memorize the material. A person often needs direct communication with the teacher. In addition, not all training fits into the lecture format — there are also exercises, laboratory classes, as well as design work.

The matters, that colleges and universities are facing now, are limited to the further development strategy choice and direction to focus on selection. It is obvious that digital transformation program for transition to a competitive educational and research model in the future should now be developed.

Artificial intelligence is another innovative technology that is rapidly developing in educational sector.

Artificial intelligence (AI) is a research area associated with methods for modeling individual functions of intelligence by means of software and hardware development [9].

Many AI application areas are available: theorems proving; games; patterns recognition; decisions making; adaptive programming; machine music composition; data processing natural language; knowledge-based networks (neural networks); verbal conceptual learning are among them.

Thus, according to the Laboratory of Knowledge of University College in London and Pearson report [10] many schools and universities already

apply artificial intelligence technologies for educational purposes. Most of them combine AI with Big Data technologies in order to monitor whether the students attend classes and do tasks.

Due to artificial intelligence introduction intellectual training systems that are programs that simulate the teachers' behavior have appeared. They are capable of checking the students' standard of knowledge by analyzing their answers, reporting feedback and even scheduling personalized training programs.

At the moment, the following examples of introduction both applications as chatbots and artificial intelligence in educational sector are known:

1. Automated valid classification. Automated written work, e.g. an essay, assessment is a challenging task faced by many teachers. For instance, both tests and essays are evaluated by artificial intelligence on such online platforms as Coursera, EdX and Udasity. Such training programs as Carnegie Speech and Duolingo use natural language processing technology to identify mispronunciation and correct it.

2. Intermediate interval training. Thus, a Polish inventor Peter Wozniak came up with an educational application based on the interval effect. This application back traces what is studied and when. By means of artificial intelligence the application can track when the information is likely to be forgotten and recommend to revise it. It only takes a few refresher courses to make sure the information is stored in memory for many years.

3. Feedback. Feedback, that is, students' assessment of teachers, has a century-long history. Due to modern technologies, such as AI-driven chat robots, computer-aided learning and natural language processing a lot of interesting opportunities for feedback quality improvement are now available. Chatbot is capable of collecting opinions via a dialog interface with the same benefits as a «real» interview, but with a smaller amount of work required. Conversation can be adapted in accordance with answers and student's personality, the chatbot is even capable of investigating this or that opinion cause.

Besides the fact that it is a good option for conducting surveys, the chatbot provides many other benefits to the teachers who seek to improve teaching effectiveness. By attracting more data sources such as self-assessment, evaluation, peers' feedback, and the latest scientific evidence on how to effectively teach a more aggregate picture of training effectiveness can be

created. Own data with other teachers around the world data comparison should enable the system to offer new and powerful ways to improve teaching methods as well as results in teaching community sharing.

4. Teacher's assistant. At the Georgia Institute of Technology, students enjoyed communicating with the new teacher's assistant, Jill Watson, who quickly and accurately answered their different questions. But the students did not know that Ms. Watson's true identity was actually an IBM-AI-system-equipped computer with the same name. With the help of Ashok Goel, a Professor of Computer Science, the teacher's assistant Watson responded with more than 40,000 posts on the forum.

Having received huge advertising, Jill Watson is now being introduced to universities around the world. One of the last to be added to the list, is BI Norwegian Business School in Oslo, Norway.

5. Chat campus. A bot that helps students who have just gone up to the college «to get accustomed» has been created in AdmitHub: students can apply for scholarships, register for courses, issue a plea for a place in the dormitory by its means. Cornell University uses the CourseQ bot to interview students about various problems associated with the new school year start.

And at the University of Deakin in Victoria (Australia), the chat campus is now being tested in service. As with the teacher's assistant case the intelligence underneath it is IBM Watson supercomputing system. The chat-campus being implemented is capable of answering questions related to everything a student may need to know about the campus life, such as: how to find the next lecture hall, how to apply for the next class of the semester, how to obtain assignments, where to find a parking place or how to contact a consultant. All these issues can be solved by the so-called «djinns» i.e. chatbots [11].

6. Feedback from students. A new approach to student-centered educational models where an individual personality and a student concern are the most crucial factors in curriculum development is being studied.

The content is adapted to the individual pace of training and can consistently offer more complex challenges to accelerate learning process. Thus, both fast and slow students can continue training at their own pace.

Thus, AutoTutor, for example, teaches Computer Literacy, Physics and Critical Thinking by communicating with students in their preferred lan-

guage. And Knewton Software takes into account each student's training specifics and allows to develop a personalized learning plan, taking into account the degree of mastering the material, as well as student's frequent mistakes.

Bill Gates suggested that chatbots can also be used as tutors [12]. Theoretically, these services can teach almost anything.

Thus, Nerdfy Bot helps students do homework, and Ucheba_bot recommends courses, universities and colleges for applicants. Dozens of bots related to education are already available around the world: some help practicing signboards, legal issues, history, etc., others present rare and interesting facts. However, in our opinion, a foreign language study remains the most popular area in the bots' application. This problem is come to grips with by Russian startup Edwin as well. The company's emphasis is made on English language skills training. The service combines artificial intelligence (it personalizes training plans, communicates with the user in the chat, manages different language skills training equipment, supports study, etc.) and tutor's services (e.g., the service is needed for individual lessons on spoken language practicing) [8].

The authors of the Laboratory of Knowledge of University College in London and Pearson report note that artificial intelligence is already actively being introduced into the group learning process. It is used to appoint groups of students with the same level of knowledge, analyze the discussion between people and mark the moments when the conversation participants get off the topic.

The report states that artificial intelligence technologies are capable of tracking each student progress. Such a monitoring may become mandatory in the future to ensure schools, districts and a country as a whole performance evaluation, as well as effectiveness of various training programs testing.

Researchers believe that the future will offer «educational partners» that will teach a person throughout his life-time. «Being in the cloud, they will be available on each device as well as in offline mode. Instead of teaching all subjects, these partners will be able to contact an expert in a certain field on requirement and then inform the user about his point of view «[10].

Artificial intelligence technologies, which are already called «new electricity», are rapidly entering new verticals, and EdTech is not an excep-

tion. It is obvious that AI in education application will significantly change learning process in the future [13].

Many important problems can be solved by means of blockchain technology into education introduction. Thus, currently the distributed blockchain database is increasingly being integrated into document storage and control systems. This technology advantage is lack of practical capabilities to manipulate the data recorded in the system due to the fact that the information in the database can only be added, but not recirculated. Conversely, document authenticity can be easily traced, as everyone can trace whom it was recorded into the blockchain by. Along with identification papers and banking sector "Kryptorevolution" has not ignored educational system as well.

Crypto-currencies, including Bitcoin, operate on its basis. The main blockchain feature is its immutability. Posted into the database transaction data can neither be deleted nor edited, since huge computing resources are required for the smallest revision [14].

Blockchain is a technology enabling to store information in a distributed form. If a user has a key to this database, he will have access to the materials posted, which will provide some openness and transparency to many areas of life. However, like any new technology, the «blockchain» system to date causes a lot of questions and disputes that require solutions from the experts.

It should be noted that currently situation in digital economy market in the education development sphere is in the initial development stage.

The University of Nicosia has become the first to officially use blockchain to store their diplomas and certificates. Importantly, it also became the first university to accept Bitcoin as a payment. Massive On-Line Open Courses (MOOC) of the University of Nicosia are available in 83 countries. It is also a member of European Universities Association (EUA) and European Association of Higher Education (EURASHE). It means that its diplomas and certificates are recognized worldwide.

Such organizations as Open University (UK), Sony, Massachusetts Institute of Technology and others have become inheritors [15].

Sony Corporation and Sony Global Education (SGE) have created a system with blockchain technology in educational field application. The system enables centralized data within several educational institutions management. It enables making links, recording information, and perform-

ing digital manuscripts. The system eliminates data falsification possibility, as well as controls the access to the records that allows transferring data to authorized third parties in the proper form. The program will operate on the basis of Hyperledger project, in which blockchain technology is actively being implemented.

It is noteworthy that the current system will enable operators to link previously collected data to training systems and students data systems, even though such data is collected from different sources. Further, the users can see the overall academic performance picture, perform digital decoding and send it to an appropriate authority.

In addition, the presented system allows to analyze data and records by means of artificial intelligence and subsequently suggest ways to improve curriculum as well as educational institutions management mechanism [16].

The Company representatives stated: «This technology holds the potential to develop an innovative infrastructure system for the data on the network various secure distribution, providing incredible opportunities for dealing with academic records and their evaluation».

Sony Global Education innovation will help to facilitate open and secure data management that will further result in new services in educational field emergence. Moreover, the new system will attract attention of numerous educational institutions representatives to the network, which will increase the level of confidence in testing procedure.

The company representatives added: «Sony Global Education is planning to launch the new system development as early as in 2017 by implementing applications based on blockchain technology in the services provided commencing with Global Math Challenge.»

Global Math Challenge is an international online competition, which participants are assessed on mathematical knowledge and logical abilities level. More than 150 thousand enthusiasts from more than 80 countries have taken part in the competition. It is noteworthy that the results are determined not only based on correct and incorrect answers calculation. In addition, overall performance, including time spent on the proposed tasks solution, is also assessed. The final assessment is a participant's abilities confirmation which meets international standards requirements [17].

As for academic progress data with blockchain recording, the San Francisco Engineering School of Holberton outstripped the Japanese giant

by signing an agreement with Bitproof to transfer its own diplomas to the blockchain.

Educhain is a blockchain startup in educational technology field, which has become a Dubai Future Accelerators (DFA) program "graduate". The company is planning to launch its pilot project in the selected institutions in Dubai, which will affect all system levels. The launch is scheduled for early 2018.

This project enables academic institutions to issue their official diplomas in digital form and automate their verification. Control over making entries in such a document is at the Registrar's directly, and a student himself can see who exactly looks through his records. This approach reduces administrative costs and at the same time saves institutions time on processing information. Ultimately, Educhain platform can completely change documentation storage, management and processing by eliminating unnecessary middlemen and creating benefits for institutions, students and employers.

At the end of 2017 the DFA invited Educhain for cooperation with KHDA (Committee on Science and Human Development), the regulatory body of Dubai, providing the quality of education. The goal of creating self-regulating school institutions, ready for challenges of the future and able to become a world's best by 2025 was set. Educhain and KHDA has investigated startup blockchain solutions potential to ensure certification practices and certification system to digital rails transfer. This is required by the Dubai Blockchain Strategy-2020 [18].

In January 2016, the Ministry of Education of France announced plans to create a new digital platform, which allows diplomas confirmation.

Blockchain technology is of great interest to French universities these days due to great potential for innovation in educational sector especially when it comes to degrees and diplomas authentication. All current procedures could be shortcut quite simply, while at the same time providing all safety measures and confidentiality. Due to this, future headhunters can go online and check out information from an applicant's CV in a matter of minutes [19].

The European Commission has published a report [20], which presents the results of their research on Blockchain technology in education application. Among other things, the Commission has analyzed such areas as feasibility, possible problems, benefits, and risks as well as the technology

application in universities and schools. 8 possible blockchain technology in education applications are mentioned in the report. The most relevant issues that can be solved by the blockchain is documents accreditation and transfer, digital certification, multi-level accreditation and students' fees payment.

In conclusion, the Commission has recognized the fact that blockchain in this field application is still in its infancy. It also stated that only a «completely open» process of the technology implementation can produce real results and give Blockchain Technology an opportunity to support educational sector [21].

All the above allows to assert that getting education, being anywhere on the planet, is possible in the modern world. And although traditional forms of getting education do not lose their ground, the given advantages of innovative technologies in education are undeniable.

Today we are witnessing a new educational system, focused on integration into global information and educational space emergence. This process is accompanied by significant changes in learning process organization, which should correspond to modern technical possibilities. Modern information technologies in education penetration can qualitatively change educational methods and organizational forms, having made it much more convenient and accessible.

REFERENCES:

1. Сертакова И.Н. Новые технологии в сфере образования и образовательных услуг/ И.Н. Сертакова // Аналитика культурологии. — 2010. — Вып. 17 — С.296-301.
2. Emily Spaven. Report: EdTech spend will reach $252bn by 2020. Режим доступа: https://www.uktech.news/news/report-edtech-spend-will-reach-252bn-2020-20160526
3. David Bainbridge. Edtech is the next fintech. Режим доступа: https://techcrunch.com/2016/08/13/edtech-is-the-next-fintech/?ncid=rss
4. Мухамедзянова Д. 4 технологических тренда в высшем образовании / Д. Мухамедзянова // — Режим доступа: https://hightech.fm/2016/11/21/education
5. Сидоров Г. Цифровой университет: применение цифровых технологий в современных образовательных учреждениях / Г. Сидоров // — Режим доступа: https://www.itweek.ru/idea/article/detail.php?ID=192831
6. Голубицкий С. MOOC как будущее образовательного процесса: за и против / С. Голубицкий // — Режим доступа: http://www.computerra.ru/92998/mooc-kak-budushhee-obrazovatelnogo-protsessa-za-i-protiv/
7. Массовый открытый онлайн-курс. Материал из Википедии. — Режим доступа: https://ru.wikipedia.org/wiki

8. Чикунов А. Машина-учитель: как AI-технологии дадут новый импульс онлайн-образованию / А. Чикунов // — Режим доступа: http://www.forbes.ru/ tehnologii/342091-mashina-uchitel-kak-ai-tehnologii-dadut-novyy-impuls-onlayn- obrazovaniyu

9. Шайдуров А.А. Использование технологий искусственного интеллекта в образовании / А.А. Шайдуров // — Режим доступа: http://elar.rsvpu.ru/ bitstream/123456789/16728/1/avme_2014_216.pdf

10. Luckin, R., Holmes, W., Griffiths, M. & Forcier, L. B. (2016). Intelligence Unleashed. An argument for AI in Education. Режим доступа: https://www.pearson.com/content/ dam/corporate/global/pearson-dot-com/files/innovation/Intelligence-Unleashed- Publication.pdf

11. Искусственный интеллект в образовании сегодня и завтра. Режим доступа: https://pedsovet.org/beta/article/iskusstvennyj-intellekt-v-obrazovanii-segodna-i- zavtra

12. Франич А. Билл Гейтс: чат-боты помогут людям учиться так, как учусь я сам / А. Франич // — Режим доступа: https://rb.ru/story/gates-on-bots/

13. An Artificial Intelligence Expert Explains Why 'AI Is the New Electricity'. Режим доступа: https://www.inc.com/andrew-ng/why-artificial-intelligence-is-the-new- electricity.html

14. АСИ: блокчейн перспективен для внедрения в системе образования и труда. Режим доступа: http://tass.ru/ekonomika/4403151

15. Блокчейн в сфере образования. Режим доступа: https://habrahabr.ru/post/344764/

16. Sony собирается использовать технологию блокчейн в сфере образования. Режим доступа: https://cryptos.tv/sony-ispolzuet-texnologiyu-blokchejn-v-sfere-obrazovaniya/

17. Sony улучшает качество образовательной системы при помощи блоковой цепи. Режим доступа: https://www.coinessa.com/news/sony-uluchshaet-kachestvo- obrazovatelnoj-sistemy-pri-pomoshhi-blokovoj-tsepi/

18. Инновации в образовательной системе Дубаи с помощью blockchain-стартапа Educhain. Режим доступа: http://postomania.net/post427988117/

19. Технология блокчейн в сфере образования. Режим доступа: http://bitalk.org/ threads/4053/

20. Grech, A. and Camilleri, A. F. (2017) Blockchain in Education. Inamorato dos Santos, A. (ed.) EUR 28778 EN; doi:10.2760/60649 Режим доступа: http://publications. jrc.ec.europa.eu/repository/bitstream/JRC108255/jrc108255_blockchain_in_ education(1).pdf

21. ЕС исследует возможности блокчейна в сфере образования. Режим доступа: https://ttrcoin.com/es-issleduet-vozmojnosti-blokcheyna-v-sfere-obrazovaniya.1633/

CHAPTER 5.

ENHANCING OF INNOVATIVE ENTREPRENEURSHIP IN CONDITIONS OF GLOBAL SOCIAL AND TECHNOLOGICAL CHALLENGES

ENTREPRENEURIAL POTENTIAL OF SMES IN UKRAINE IN THE CONTEXT OF EUROINTEGRATION REFORMS

V. Lavrenenko
Phd in Economics,
Associate Professor of Business Economics Department, SHEI "Kyiv National Economic University named after Vadym Hetman"
N. Harashchenko
Phd in Economics,
Associate Professor of Business Strategy Department, SHEI "Kyiv National Economic University named after Vadym Hetman"
V. Vostriakova,
Phd in Economics,
Associate Professor of Business Economics Department,
SHEI "Kyiv National Economic University
named after Vadym Hetman"

Entrepreneurship in the modern economy is the environment for the generation of innovations which are an important factor in competitiveness and economic growth. Awareness of this fact in developed countries in the 1980s. changed the attitude of government and society to small business and ways to support it. Small businesses that were previously associated only with high risk, resource constraints and administrative pressures from the state and major competitors, were viewed as a major source of economic growth. The stimulation of entrepreneurship has become one of the main priorities of economic policy. In this context, the problem of SME's

entrepreneurial potential requires a profound study on the background of eurointegration processes.

The Association Agreement between the EU and Ukraine and its part — a Deep and Comprehensive Free Trade Area (DCFTA) will fundamentally change the rules of business and the regulatory environment in the country. These changes will affect not only exporters to EU countries, but all business entities, as the national business environment must also be brought into line with EU standards. These changes can become serious challenges for SMEs, requiring the development of skills and large financial resources to adapt to them. To solve the problems that prevent SMEs from realizing their potential to use the new market opportunities of the DCFTA, to ensure their growth and development, an effective SME support policy should be developed that broadly covers the range of issues of the European integration context.

At the same time, it should be noted that analytical documents concerning the impact of the DCFTA Agreement on the development of SMEs in Ukraine, especially those which have been developed after its implementation, are few [1,2,3]. As a rule, they are devoted only to specific issues, and there is none that would be prepared to determine the necessary tasks of the government to support SMEs in connection with the implementation of the DCFTA. There are reports on the study of the impact of DCFTA on Ukraine, Georgia and Moldova (in December 2015 on the challenges and opportunities for SMEs, and in December 2016 — on the impact in general) prepared by the European Business Association [4] and the Vienna Institute for International Economic Affairs Studies (wiiw) and Bertelsmann Stiftung [5]. There is also a document prepared on the basis of a study conducted in early 2016 before the referendum in the Netherlands in April to ratify the Association Agreement on the initiative of the Netherlands Transnational Institute — an analytical review "Expected Impact of the Association Agreement between the EU and Ukraine" [6]. In the last one opportunities and challenges for the SME sector of Ukraine in connection with the the Association Agreement are described and argued.

The following objectives are set within the framework of this paragraph as the part of actual business theory in terms of support and development of SMEs:

first, to analyze the current level of SME development and its characteristics;

secondly, to research the leverage of government support for SMEs to promote business compliance with European standards and new conditions.

International benchmarking studies use the comparative assessments of entrepreneurial intentions of the population and the realized contribution of SMEs to various sectors of the economy to analyze the entrepreneurial potential and imbalances existing in a certain region or country. The significance of these indicators in Ukraine demonstrates the existence of a significant gap between the entrepreneurial potential and the level of its using. Research conducted by the Institute of Sociology of the National Academy of Sciences of Ukraine [7, p. 16], indicates that 30.5% of respondents would like to start their own business. According to the Amway Entrepreneurial Spirit Index (AESI), in Ukraine, the proportion of people who would like to start a business in 2015 was 42% [8]. Such values for the country as a whole are quite high and on the whole correlate with the world level. At the same time, on the effectiveness of SME participation in economic processes, there is a significant lag. In particular, the share of SMEs in employment in the market sectors of the economy (excluding banks, farms, public sector) does not exceed 30%, and the share of SMEs in employment in processing industry, which is an indicator of cluster development, amounts to 12%. For comparison, we note that in South Korea, these Fig.s are 85% and 77% respectively. These low results can to a large extent be explained by the unfavorable business climate for SMEs.

The development of SMEs in the context of DCFTA requires government support both to promote business compliance with European standards and new conditions, and for a positive perception of change and awareness of the prospects. The background for government strategic measures requires development of a plan for their implementation, since it is a question of a significant expenses and a serious restructuring of a large number of processes, taking into account both the capacity of the DCFTA and the counteraction to the challenges. The lack of results can affect the deterioration of economic results in the country, which in turn can lead to new political challenges.

In our opinion, a serious problem for today is the lack of a proper research and analytical consideration for the reforms on the way to the implementation of the DCFTA, which should be based on knowledge of national specifics and processes. According to a study by the Center for Public

Expertise, at the request of the Center for International Private Enterprise (CIPE), in the framework of the «Confident Business — Rich Community» project, held at the end of 2014 [9], the expert environment with current challenges and key problems of SME development recognizes corruption in different forms and manifestations; excessive regulation of business activities and lack of effective deregulation; lack of access to financial resources by SMEs. At the same time, representatives of business associations consider the existence of corrupt practices in the interaction of entrepreneurs with public authorities of different levels and the unequal relations between SMEs and public authorities the most acute of the above-mentioned problems of SME development. According to the Global Competition Index (2014), corruption is the most significant problem for business development in Ukraine. This problem closely correlates with the problems of limited and non-transparent access to state and municipal resources and the ineffectiveness of mechanisms for protecting rights and legitimate interests. Business associations consider another problem particularly critical — the presence of excessive tax pressure.

In another document, «Towards a modern public policy in the sphere of small and medium business in Ukraine», published on the basis of the BEBerlinEconomicsGmbH research (with the support of the Friedrich Naumann Foundation for Freedom) [10], the following main obstacles to the development of SMEs focused on growth, such as macroeconomic instability with limited access to financing and an unfavorable regulatory environment, in particular high administrative pressure. In addition, it is necessary to add specific characteristics of SMEs that have developed historically as a result of insufficiently effective economic policy on the part of the state — low competitiveness, a significant portion of SMEs that produce products with low added value, a high level of shadowing of entrepreneurial activity. When analyzing the level of competitiveness of SMEs, it is necessary to take into account that there are sectoral (in terms of scope) features that affect the fact that SMEs become competitive only if they reach a certain size. Only understanding these features, it is possible to formulate public policy, and it should be sectoral in nature. The theory of competition proves that competition take place only in the product-sectoral consumer field, therefore, influence must be aimed at the priorities of the industrial (industrial) policy of the state.

The problem of a large part of SMEs that produce products with low added value is closely linked to competitiveness. Only competition start on the innovation field, where the innovators of the SME sector will challenge the large companies, forcing them to also be involved in this innovative competition, will be able to solve this problem. Accordingly, top priorities of the public policy in the sphere of SME support development should be focused in solving these problems, which are identified by experts as deregulation and overcome the corruption. But business associations except deregulation and overcome the corruption as such priorities pointed tax reform, the problem of concessional lending, the creation of SME development support system from the government.

Corruption issues in the SME sector can be viewed through the prism of not only what is brought to the agenda by business (coercion of SME sector corruption subjects to avoid (decrease) the administrative (or other) pressure that threatens them), but also from the point of view of the dishonesty of the subjects themselves SMEs to gain advantages over competitors as a result of corrupt officials. This generates fictitious self-employment for money laundering for bribes. And this affects the opportunities for growth of bona fide companies and entrepreneurs. State policy should provide for measures to overcome such phenomena.

Thus, there are sufficient presuppositions to consider the entrepreneurial potential in Ukraine unrealized due to institutional and other problems. In our opinion, the main institutional factors hampering the formation and effective development of the business environment are the asymmetry of information, the absence of clear legal norms that structure the activities of enterprises, the orientation of institutions responsible for creating the basic basis of entrepreneurship for pseudo-market rules of behavior, a contradictory combination of institutions and their insufficient development, inconsistency of formal and informal institutions, blurring of property rights, excessive reglamentation of business activities.

In addition, the situation is complicated by the fact that there are a number of problems of public institutions in Ukraine that require solutions, which are the reason for the rather poor quality of conceptual and strategic documents, the lack of clear planning for their implementation, the violation of the process of harmonizing public decisions with key stakeholders and the formal attitude to principles good governance. At the same time,

civil society has not yet developed sufficient levers of influence on the governance processes in the country in order to demand proper implementation.

Important issues include social aspects and tax regulation, tools for developing relations between SMEs and large businesses, ways to «encourage» the business to engage in unprofitable or «uninteresting», but important for the economic, environmental, and social spheres in the country. In addition, the post-industrial economy requires more modern approaches to managing economic activity and using the latest management tools. That is why we should speak about the creation of such mechanisms to promote the development of SMEs, which would be based on simplifying access to information resources and expertise, the use of knowledge management methodologies, social technologies and new project management methods, e-commerce tools and distance learning and counseling technologies.

Overcoming the low level of education in business and the low level of tax culture should, in our view, become priorities for government SME policy, since their growth will directly affect the state of democratization of society. After all, those who avoid paying taxes do not have the «moral right» to demand from the state the rational use of tax revenues and accountability for the money spent.

Small business in Ukraine should be the main tool of the overall strategy of economic growth and structural reconstruction of the national economy. According to Ya.A. Zhalilo, SME should perform the functions of the structure-forming element of Ukraine's modern market economic system, a means of overcoming its structural disproportions. Entrepreneurship in modern economic conditions should become a system of built-in regulators that will be able to respond adequately to market signals, form effective private economic strategies, and for which it becomes possible to apply traditional regulators of economic stabilization.

The problem of known public approaches to stimulating small business development lies in the fact that their main focus is on stimulating the creating of a new small business, while little attention is paid to the issue of strengthening and developing small businesses that are already existing.

It is necessary to actively promote the developing of both the sphere of supply of SME services and the sphere of demand for such services, that is, the creation of the institution of entrepreneurship directly. It should be borne in mind that the process of the entrepreneurship development in

Ukraine was caused by political methods, rather than by the historical conditioning of factors and events that are inherently developing in society. The principles and essence of the new market institution did not immediately penetrate the consciousness of the overwhelming majority of the population, since it did not originate in an evolutionary way, but as a result of changes in the way of life, value orientations, traditions. Proceeding from such preconditions, the reform of socio-economic life depended on the competence of the country's political leadership, the correlation of political forces. Another peculiarity was that the development of SME took place through the efforts of business entities, that is, on initiative from below, and one of the mechanisms for the emergence of large business is the exchange of power over property. In Ukraine, the SME sector has not developed sufficiently, since privatization processes and the transformation of the property institution themselves did not occur in accordance with the interests of the development of the domestic economic system, but in accordance with the interests of corporate structures.

To realize the potential of SMEs, appropriate government policies should be developed with the involvement of experts with extensive experience in processing and analyzing the problems of the SME sector, and who also have certain applied achievements to stimulate the development of SMEs. This can also include the mechanisms for discussing a policy with representatives of SME interests through public-private dialogue and development of a road map for the implementation of such a strategic process, which will significantly improve the quality of the final documents.

Over the past decades, world markets have been intensively developing against the backdrop of the active processes of globalization. Before Ukraine, as before, it is necessary to solve the problem of creating national market institutions, restructuring the domestic economy, increasing competitiveness and integrating it into the world economy, primarily on the basis of innovations as a universal way of gaining competitive advantages. As studies of world analytical structures show, ahead of the economic development of the leading countries is largely based on the ability of their national innovation systems to use the progress made to create added value. It is national innovation systems that can explain why some countries achieved high results in creating innovations [11].

Despite the significant backlog in terms of both production and export of high-tech products, it should be noted that Ukraine still retains intellectual potential, capable of generating world-class scientific ideas, has strong scientific schools in mathematics, physics, chemistry, medicine, radio electronics, the development of new materials, information technology, communications and telecommunications. Ukraine is one of the eight countries in the world that are capable of providing a full cycle of design and production of aerospace equipment, to the top five countries of the world with a full cycle of tank production and the ten largest shipbuilding countries in the world. The country has developed high-tech industries, in particular the production of heavy engineering, power equipment, instrumentation. Nevertheless, international comparisons (Table 1) show that there is still a significant gap between the leaders. As to the share of R&D expenditures from GDP, Ukraine lags far behind even the marginally acceptable level of 2%. The indicators of business expenses for R&D are insufficient.

Table 1

Benchmarking comparison of innovative development of Ukraine [11-16]

Indicators	The value of Ukraine's indicator	Best value	Lead country
Number of applications filed under the Patent Cooperation Treaty (PCT) per million population, 2017	3,6	332,4	Japan
Patent families filed in three offices per million population, 2017		11 000	Japan, Tokyo
High-tech industries,% of GDP, 2015	15	36	USA
Export of high-tech products,% of GDP, 2013	0,56	5,19	Germany
Tertiary graduates in science, engineering, manufacturing, and construction (% of total tertiary graduates), 2014	25,5	48,7	Oman
Researchers, full-time equivalence (FTE) (per million population)	1006	8255	Israel
Gross expenditure on R&D (% of GDP), 2015	0,6	4,3	Israel

Indicators	The value of Ukraine's indicator	Best value	Lead country
GERD: Financed by business enterprise (% of total GERD)	40,3	77,9	Japan
The country's share in world spending on R&D, 2014, %	N.d.	31,1	USA
Domestic market scale as measured by GDP, billion PPP $ (GII 2017 Report), 2016	350	21 269	China
GDP (nominal) per capita, USD $ (International Monetary Fund), 2016	2 194	103 199	Luxembourg
GDP (PPP) per capita, USD $ (International Monetary Fund), 2016	8 305	127 660	Qatar

Serious problems of the innovation system of Ukraine, as well as most post-Soviet countries [11], is low innovation activity and weak innovation potential of enterprises, which can be explained by two key factors: the structure of the national economy and low incentives and insufficient resources for such activity in its main sectors. In particular, the features of the Ukrainian economy are that it prevails in the sectors that a priori have a lower innovative activity: agriculture, metallurgy. In these industries, product innovation is not a key factor for business success. In current conditions, it is easier for Ukrainian enterprises to buy ready-made technologies and equipment from leading manufacturers. The share of innovation-intensive sectors of the Ukrainian economy, such as information technology, biopharmaceuticals, the production of new materials, aerospace production, is extremely low, as evidenced by the data in Table1. The definition of high-tech branches of the OECD takes into account three components: the share of R&D expenditures in the expenditures of enterprises in the industry, the share of high-tech equipment in the composition of products and the share of R&D personnel in the composition of enterprises. Among such branches are microelectronics, information technology, computational technology, programming, robotics, nanotechnology, nuclear energy, aerospace technology, biotechnology, pharmaceuticals, genetic engineering, artificial intelligence.

Another problem is the absence of an effective system of economic incentives in Ukraine for the creation and commercialization of industrial property rights in Ukraine. Along with this, a significant part of the po-

tentially significant inventions (pharmacology, IT technologies) are filed directly to the patent offices of foreign countries (Russia, the USA, South Korea) without an application to the Patent Office of Ukraine [7].

Innovative abilities at the micro level consist of three factors: first, the technological level; second, the ability of the enterprise to borrow and adapt technologies and know-how from the outside for use in their innovation processes; and thirdly, the ability to create new knowledge within an enterprise. If we consider the ability to borrow and adapt knowledge and technologies of domestic enterprises, as well as their technological level of production, these skills are extremely low compared to companies from other countries, as reflected in Table 2.

Table 2

Benchmarking comparison of technological development of Ukraine [11-16]

Indicators	The value of Ukraine's indicator	Best value	Lead country
ISO 9001 Quality management systems—Requirements: Number of certificates issued (per billion PPP\$ GDP) (GII 2017 Report)	3,09	61,08	Italy
Firm-level technology absorption (1=not at all; 7=to a great extent) (The Global Competitiveness Report 2017–2018)	4,3	6	Sweden
Availability of latest technologies (1=not at all; 7=to a great extent) (The Global Competitiveness Report 2017–2018)	4,1	6,6	Finland

Technical standards and certification significantly affect the innovation activity. Developed mandatory standards can create economic incentives for enterprises to apply more advanced new technologies and refuse from old ones [11]. Ukraine is lagging behind the number of ISO 9001 certificates, which is a sign of separation from global value chains, as well as an indicator of enormous opportunities for improved management of productive capacities [7]. Certification of ISO 9001 can be a useful means of taking managerial best practices, regardless of the level of technological development of the enterprise. With the proliferation of new business models based on contract

manufacturing and fragmented sales chains, quality standards are "entrance tickets" to global production networks. In addition, the distribution of the international certification system facilitates technological exchange and improvement, reduces the overall level of spending in the economy, accelerates the diffusion of technological advances and the development of new products. Although Ukraine is given a more positive assessment in comparison with the Russian Federation and Belarus [7], however, the enterprises of the country lag behind the level of complexity of technological processes from the EU countries, exporters operate more in the extraction and primary processing of resources than in the non-productive stages of the value chain.

One of the generalizing quantitative criteria for assessing the capacity of the innovation potential of any national economy is the R&D expenditures [13]. In developed countries, they range from 2.5% to 3% of GDP. An important trend in recent years for almost all countries of the world is the faster growth of R&D expenditures than GDP growth. One of the main objectives of the EU over the past decade is to increase the competitiveness of the EU by increasing investment in the scientific and research field. Lisbon strategy [14] set a goal: 3% of GDP should be spent on research and development. Although by 2010 this goal was not achieved, it remained one of the five key tasks under the Europe 2020 strategy adopted in 2010.

In 2013, domestic R&D spending in the EU grew by 0.7% compared to 2012. The share of R&D expenditure in GDP in 2013 reached 2.1%, and remains considerably lower than in Japan (3.38% in 2011) and the United States (2.81% in 2012). In 2013, among the EU member states, the highest science intensive output of GDP was in Finland (3,31%), Sweden (3,3%) and Denmark (23,06%); It should be noted that in Slovenia and Estonia the level of science intensive output was higher than the average in the EU (respectively, 2.59% and 1.91%).

In contrast to the pan-European and world trends, Ukraine has suffered a reduction in R&D spending over the last ten years, which is largely due to general macroeconomic instability. The size of R&D financing in 2006-2016 is less than 1% of the GDP, which is substantially below the 2% permissible level. Also, a distinct tendency from the world-wide is the slow growth rate of R&D financing on the growth rate of GDP.

One of the important factors that influence the management of innovative development of the company is the protection of intellectual prop-

erty rights, including R&D results. The efficiency of the innovation activity of enterprises is directly related to the protection of intellectual property rights both in the external and in the domestic markets. If intellectual property rights are poorly protected, enterprises make a choice to attract successful innovations, so the level of protection of intellectual property actually determines the direction of the development of technologies and the product line of manufacturers.

It should be added that the different level of protection of intellectual property rights creates a difference in the amount of foreign investment in the country as a whole [15]. Studies show that the strengthening of intellectual property rights has a positive impact on the level of innovation activity and technological progress, although it is not uniform and can be offset in the long run. Also, according to studies [15], it has been discovered that when a country implements and attracts innovations, and carries out its own development, the lower the level of protection of intellectual property rights, the greater the preference is given to attracting innovation than developing its own. It also confirmed the positive effect of the strong protection of intellectual property rights on the level of foreign direct investment, although this does not guarantee the flow of investment flows into the science-intensive industry.

Successful realization of the entrepreneurial potential of SME's in Ukraine is possible under the condition of significant improvement of innovation activity. The economic reforms that began in the country after the revolution in 2014, and Association Agreement with the EU create prerequisites for the transition of the economy to sustainable growth.

REFERENCES

1. Benefits and Costs of DCFTA: Evaluation of the Impact on Georgia, Moldova and Ukraine. Joint Working Paper No. 2016-12, December 2016 in cooperation with BertelsmannStiftung. — Electronic resource. — The way of access: https://wiiw.ac.at/benefits-and-costs-of-dcfta-evaluation-of-the-impact-on-georgia-moldova-and-ukraine-p-4111.html
2. The expected impact of the EU-Ukraine Association Agreement, The Transnational Institute (TNI), 2016. — Electronic resource. — The way of access: https://www.tni.org/en/publication/the-expected-impact-of-the-eu-ukraine-association-agreement
3. Імплементація Угоди про асоціацію між Україною та ЄС: економічні виклики та нові можливості : наукова доповідь / за ред. акад. НАН України В. М. Гейця та чл.-кор. НААН України Т. О. Осташко ; НАН України, ДУ "Ін-т екон. та прогнозув. НАН України". — К., 2016. — 184 с. — Electronic resource. — The way of access: http://ief.org.ua/docs/sr/293.pdf

4. DCFTAs: Challenges and Opportunities for SMEs/ Georgia, Moldova and Ukraine/ General Report by Yuliya Vengerovych (EBA Ukraine), Zviad Eliziani (IBDIPC Georgia), Sergiu Mihailov (ProCoRe Moldova). — Electronic resource. — The way of access:: http://archive.eap-csf.eu/assets/General%20report_DCFTAs-Challenges%20 and%20Opportunities%20for%20SMEs_GE_MD_UA.pdf December 2015

5. Benefits and Costs of DCFTA: Evaluation of the Impact on Georgia, Moldova and Ukraine Amat Adarov and Peter Havlik. — Electronic resource. — The way of access: https://wiiw.ac.at/benefits-and-costs-of-dcfta-evaluation-of-the-impact-on-georgia-moldova-and-ukraine-dlp-4111.pdf

6. The expected impact of the EU-Ukraine Association Agreement, The Transnational Institute (TNI), 2016. — Electronic resource. — The way of access: https://www.tni.org/en/publication/the-expected-impact-of-the-eu-ukraine-association-agreement

7. Обзор инновационного развития Украины / Европейская экономическая комиссия ООН. — Женева: Издание ООН. — 2013. — 142с.

8. Глобальне дослідження Amway про підприємництво 2015. — Electronic resource. — The way of access: http://news.amway.ua/files/2016/06/AGER-2015_ UKRAINE_presentation_UA.pdf

9. Розвиток малого і середнього підприємництва в україні:проблеми, потреби, перспективи. — Electronic resource. — The way of access: http://regert.net/uploads// attach-395-8119369554.pdf

10. На шляху до сучасної державної політики у сфері малого та середнього бізнесу в Україні. — Electronic resource. — The way of access: http://fnst.org/sites/default/files/ uploads/2016/08/09/smeinukraineukrfinal.pdf

11. Праздничных А. Н. Построение инновационной экономики для будущого / А. Н. Праздничных // Российский журнал менеджмента. — 2013. — Том 11. — № 2. — С. 107–150. — Electronic resource. — The way of access: http://ecsocman.hse. ru/data/2013/07/17/1251235665/rjm_2_13_Prazdnichnykh.pdf.

12. Рекомендації слухань у Комітеті Верховної Ради України з питань науки та освіти: «Законодавче забезпечення розвитку Національної інноваційної системи: стан та шляхи вирішення» (15 червня 2016 року). — 18с.

13. Аналітична довідка «Стан розвитку науки і техніки, результати наукової, науково– технічної, інноваційної діяльності, трансферу технологій за 2013 рік» [Електронний ресурс] / Державне агентство з питань науки, інновацій та інформатизації України. — Київ, 2014. — Режим доступу: http://old.dknii.gov.ua/?q=system/ files/sites/default/files/images/_%D0%B7%D0%B0_2013_%D1%81%D0%BE%D0%B A%D1%80_%D0%BE%D0%BA%2B.pdf.

14. Україна у рейтингу глобальної конкурентоспроможності 2015 [Електронний ресурс] — Режим доступу: http://reforms.in.ua/ua/news/ukrayina-u-reytyngu-globalnoyi-konkurentospromozhnosti-2015.

15. Офіційний сайт дослідження Global Innovation Index [Електронний ресурс] — Режим доступу: http://www.globalinnovationindex.org/content/page/GII-Home#pdfopener

16. Доповідь «Інноваційна діяльність промислових підприємств України» 2015 рік [Електронний ресурс] /Держ. служба статистики України. — Режим доступу: https://ukrstat.org/uk/druk/publicat/kat_u/publnauka_u.htm–

TRAJECTORY OF DEVELOPMENT OF INNOVATIVE ENTREPRENEURSHIP IN UKRAINE IN CONDITIONS OF SOCIAL AND TECHNOLOGICAL CHANGES

I. Riepina
Doctor of Economic Sciences,
Professor of Business Economy Department, SHEI "Kyiv National Economic University named after Vadym Hetman"
K. Riepin
student of the master's degree program
"Management of entrepreneurial activity"
SHEI "Kyiv National Economic University named
after Vadym Hetman"

The XXI century is fairly called the era of rapid changes in the geopolitical and socio-economic life of society. A man in an effort to adapt to his needs the external environment, to defeat time and distance, has accumulated a sufficient mass of innovations in various spheres of his activity. This has led to the transformation of traditional commodity markets and their integration into a single global space, which is characterized by a higher intensity of competition. In addition, world society has undergone a significant depolarization of the centers of poverty, which led to social isolation of the population of the countries. This upgraded the need to create a road map for social inclusion for people who fell below the poverty line. Among the key tools of such a roadmap, the innovation entrepreneurship is considered as an opportunity to earn money for poor and socially vulnerable groups of the population who do not have the means to implement large-scale and capital-intensive projects, but are able to realize creative business ideas using unique intellectual resources and personal abilities.

The need to ensure social inclusion through innovative entrepreneurship in Ukraine is due to a number of current circumstances. A country that did not manage to recover from the global financial crisis was in a protracted turmoil of events caused by confrontation of the military conflict, annexation of territories, economic and political instability. Of course, all this has affected the welfare of the population, resulting in a significant increase in the number of poor people. According to recent years, 23.8 per-

cent of the population was at the expense of relative poverty. The deterioration of the labor market, especially in regions with a large population of displaced persons, was one of the main factors of the aggravation of poverty problems. If in 2011 the unemployment rate in Ukraine reached 7.9% of the economically active population and gradually decreased over the next two years (by 7.5% in 2012, by 7.2% in 2013), due to the loss of employment by forced migrants the unemployment rate increased to 9.3% in 2014 and remains at 9.1% (2015) and 9.6% (2016) [1]. In addition, one out of every five unemployed is in a state of unemployment for more than 12 months.

The results of the Social Development Index 2017 indicate that countries achieve significantly different social progress, even at the same level of GDP per capita [2]. According to published data, if last year Ukraine, with a score of 66.43 points (at a maximum of 100 points), led a group of countries with a development below the average, then its new score of 68.35 points allowed it to move to a higher category. At the same time, a number of other countries over the past year have made even more progress. As a result, if a year ago Ukraine in the ranking was 63 of the 133 countries, then in this — 64th among 128.

Research by many scientists proves that poverty significantly impedes human development, generates social conflicts, and threatens the unity of society. An effective instrument for combating it should be the implementation of innovation entrepreneurship in the national economic system.

There is now a claim that entrepreneurship contributes to economic growth through innovation and job creation [3]. In addition, entrepreneurship has a long history of leadership in matters of social inclusion. Let's recall, for example, the philanthropic activity of such innovators as Andrew Carnegie and John Rockefeller. However, in recent years, we are witnessing growing dissatisfaction with the public by the "elite", when the so-called "one percent" is considered prosperous at the expense of other "99 percent". Especially with the onset of the global financial crisis, many corporate executives are accused of taking unnecessary risks, unethical behavior and the fact that they do not share the fruits of entrepreneurship. The general result was the fall of public confidence in big business. So the credibility of large US companies over the decade does not rise above the lowest mark of 18 percent [4]. Trust in banks has fallen from 49 percent ten years ago to 27 percent today. A recent survey by Deloitte has shown that more than half of

the generation born at the end of the 20th century refuses to work in a particular organization if they have doubts about their behavior [5]. However, the ability of entrepreneurial activity to create (and maintain) employment is valuable in a period when so many people were unemployed.

In order to determine the state of development of entrepreneurship in the country, the data of DOING BUSINESS rating of World Bank Group [6] are recently used. It is based on the analysis of legal and regulatory conditions applicable to enterprises throughout the country throughout their life cycle, including the establishment and conduct of business, foreign trade activities, taxation, and liquidation.

In Table 1 and Fig. 1 shows data on the dynamics of changing the position of Ukraine in terms of Doing Business rating indicators during 2010-2017 and assessment of the identified trend.

Table 1

Dynamics of changing the position of Ukraine in terms of indicators of the Doing Business rating for 2010–2017 *

Indicator of the rating	2010	2011	2012	2013	2014	2015	2016	2017	Trend*
1 — «Starting a Business»	136	118	116	50	69	70	30	20	positive
2 — «Dealing with Construction Permits»	181	179	182	183	68	139	140	140	stable
3 — «Getting Electricity»	–	–	170	166	182	138	137	130	positive
4 — «Registering Property»	160	164	168	149	88	64	61	63	negative
5 — «Getting Credit»	30	32	23	23	14	17	19	20	negative
6 — «Protecting Minority Investors»	108	109	114	117	107	87	88	70	positive
7 — «Paying Taxes»	181	181	183	165	157	106	107	84	negative
8 — «Trading across Borders»	139	139	144	145	153	109	109	115	negative
9 — «Enforcing Contracts»	43	43	44	42	44	98	98	81	positive
10 — «Resolving Insolvency»	145	150	158	157	141	141	141	150	negative
Overall	**147**	**145**	**152**	**137**	**112**	**96**	**83**	**80**	positive

* systematized by the author according to the data [7]
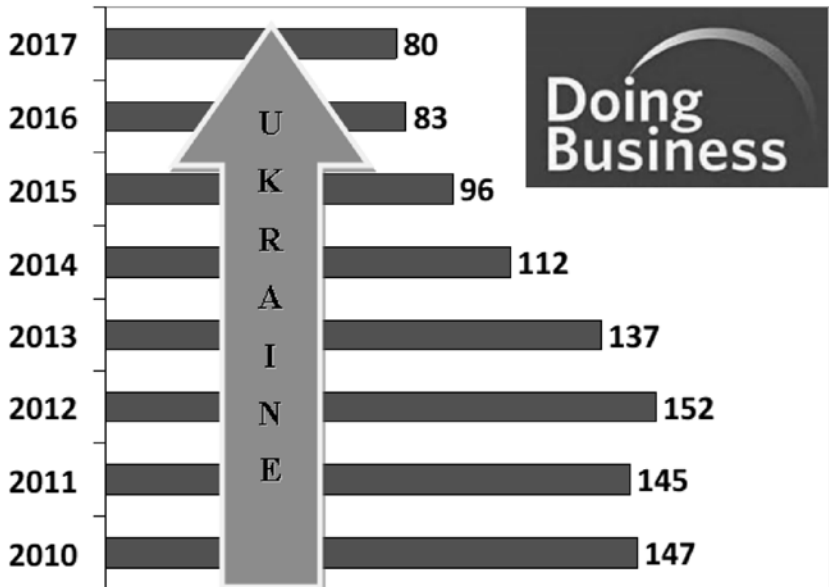
Fig. 1. Changes in the position of Ukraine in the rating Doing Business

An analysis of Ukraine's position in the Doing Business rating showed that the country needs to introduce further systemic administrative reforms that should lead to improvement of the business climate and, consequently, increase the position in the rating in the near future to 75-77 places. Expectations are mainly related to indicators: business and property registration, protection of minority investors, enforcement of contracts. If by 2020 this positive tendency to improve the position of Ukraine in the Doing Business rating will be maintained, this will be able to create an additional 50-70 thousand jobs and attract about 30 billion UAH of investments into the Ukrainian economy.

Improving the business environment creates preconditions for the formation of an inclusive business model in Ukraine.

The concept of an inclusive business model was first presented on July 1, 2008 in a UN report entitled "Benefits for All: A Strategy for Doing Business with the Poor" (Creating Value for all: Strategies for Doing Business with the Poor). It contained over 50 real business practices from around the

world, identified and systematized experiences that underpinned the definition of an inclusive business model. The report was prepared by the United Nations Development Program: "Inclusive Market Growth Initiative" with the participation of the Advisory Board, which included the International Business Leaders Forum, the International Finance Corporation, the main international donors of the United Nations (United States Agency for International Development and AFD), the World Business Council for Sustainable Development, the University of Michigan and the Harvard Business School.

In this case, the benefits of inclusive business models are not only in direct receipt of cash. The benefit for business is also in attracting new customers, expanding employment and strengthening the supply channels for raw materials and products. The benefits to low-income people include the satisfaction of basic needs, steady income and higher productivity.

Given the content and objectives of innovative entrepreneurship, several models of social inclusion can be identified.

1. Consulting Multiplication Model. This model implies the dissemination of successful experience of innovative entrepreneurship among inclusive audiences by practitioners themselves. They advise on the opening of their own businesses, which then sell their innovative products or services to the open market.

2. Venture model. Under such a model, large innovative enterprises or entrepreneurs innovators can participate in co-financing or lending their own creative work to poor people.

3. Model of employment. According to this model, companies provide employment and professional training to people who cannot compete on the traditional labor market (people with disabilities, homeless, socially vulnerable young people, former convicts). Such a model is widely used by civic organizations of various directions, as well as companies for urban improvement, coffee shops, courier companies, etc.

4. Philanthropic model. Entrepreneurs sell goods and provide services, and their revenue is almost entirely used to finance social programs. However, the existence of such a model has been repeatedly criticized by a large part of entrepreneurs due to contradictions with the competition law.

5. Communication model. The model is often used for the commercialization of social services or for the benefit of intangible assets, such as

trade relations, and the income of innovative entrepreneurs is spent on financing services to customers who are not able to pay for them.

It should be noted that the issue of using innovative entrepreneurship as a tool for providing social inclusion has both its supporters and opponents. Some studies indicate that technological innovations targeted by innovation entrepreneurship can exacerbate social inequality (work reduces people's wages or even employs jobs) [8]. These fears are not new, as evidenced by the rebellion of Lyon weavers in France in the XIX century and the resistance of the industrial revolution from the movement of Luddites in the UK. Such anxiety needs to be taken seriously, for example, by investing in advanced training and social security systems. At the same time, we also need to appreciate the positive aspects of technological innovation. Putting them into service can help to ensure social inclusion, creating opportunities for people to participate more in the economy and gain a greater share of benefits.

According to J. Schumpeter, "... the task of entrepreneurs is to reform and revolutionize the way of production by introducing inventions, and in a more general sense, through the use of new technologies for the production of new goods or former goods, but by a new method through the discovery of a new source of raw materials or a new market finished products — up to the reorganization of the former and the creation of a new industry ... "[9]. Thus, J. Schumpeter believes that innovation and novelty are an integral feature of entrepreneurship.

Indeed, the search for new ideas and their implementation — this is one of the most important, but at the same time and difficult tasks of the entrepreneur, because in this case, the entrepreneur needs not only the ability to think creatively and find new solutions, but also think perspective, anticipating future needs that are formed in society. Consequently, the task of the entrepreneur-innovator is to reform the way of production by introducing inventions, and in a more general sense, through the use of new technological opportunities for the production of fundamentally new products or the production of old goods by new methods through the discovery of a new source of raw materials or the new market of finished products — up to the creation a new branch of the economy.

Creation of innovative products and services is strategically a priority direction of ensuring competitiveness and, under current conditions of

management, is considered as the most important factor of growth. As the study proves, there is a correlation between the concept of "innovation" and "competitiveness": the higher the degree of innovation, the higher the competitiveness of the economy. The Global Innovation Index for Ukraine has remained relatively stable for three years — 56-64 [10], while Ukraine's position in the Competitiveness Index (The Global Competitiveness Index) ranged from 73 to 85 places [11]. Innovation considers such a position of Ukraine through the prism of disintegrators and stimulators of innovation development. Among the most significant disintegrators: the low level of financing of fundamental and applied scientific developments (0.62% of GDP including 0.21% at the expense of the state budget); insufficient part of intangible assets in the cost price of Ukrainian products which does not exceed 0.5-2% and 20 and more times lower than in economically developed countries; a low share of Ukraine's presence in the innovation market (0.1% vs. 39% of the US, 30% in Japan, 16% in Germany [12], pp. 37-39), etc. However, the presence of world-renowned academic schools and the positioning of Ukraine in the priority directions of world scientific and technological development creates the prerequisites for integration into the world market of innovations and acts as a significant stimulator for the development of innovative entrepreneurship. According to the data of the State Statistics Committee [13], in recent years scientific and scientific-technical work in Ukraine was carried out by 978 organizations, 44.3% of which belonged to the state sector of the economy, 40.3% to entrepreneurship, and 15.4% to higher education. Of the total number of works, 9.9% is aimed at creating new types of products, 41.9% of which are new types of equipment; 7.5% — to create new technologies, 45.4% of which are resource-saving; 2.2% — for the creation of new types of materials; 5.8% — new varieties of plants, animal breeds, as well as 16.5% — for the creation of new methods and theories, more than half of which were used in future work. The share of executives of scientific research and development (researchers, technicians and auxiliaries) in the total number of employed population was 0.50%, including researchers — 0.33%. More than 50 innovative business incubators have been created, of which 12 are in Kyiv and Kyiv oblast, 9 in Odessa oblast; 18 out of 27 regions of the country have 1 to 2 business incubators, out of 255 existing innovative funds, 175 operate in Kyiv, and today there are 10 innovation centers, with higher educational

institutions — intellectual property units, Ukrainian Institute of Scientific and Technical Information regional offices.

Improving technologies is essential for international competitiveness, business success, as well as for creating high-value jobs and solving large-scale social and environmental problems. Therefore, for the sake of prosperity and success in the next decades, the economy of the country should rely on high-performance science and an effective state innovation system.

The main feature of the current worldwide expansion of forces is the significant disconnection of the leaders of the countries that create the "innovative enclave," from less powerful countries, which are forced to fully depend on the position of active players. The countries that lead in technological development, determine the directions and nature of global shifts, adapt to these changes from time to time. In countries-outsiders who do not keep up with the pace of world NTP, there is a deformation of the production system caused by the moral aging of the technological base. As a result, the positions of such countries on the world markets deteriorate, they start to import technologies, resulting in dependence (technological, and then economic) from the leaders of the countries.

Among the priority areas for innovation development for the UK, Germany, the United States, Finland and a number of other developed countries is space exploration, energy sector development, healthcare, biotechnology, information and computer technology; for India — information technology and software development, biotechnology development and space, for China — machine building, instrumentation and automation, chemical and petrochemical industry, biotechnology, microbiology, etc.

Consequently, industrially developed countries concentrate their efforts on the accelerated development of those sectors of the economy, which, on the one hand, provide a decisive contribution to the increase of labor productivity, and on the other hand, allow to maintain technological advantages over competitors.

According to experts from the Organization for Economic Cooperation and Development (OECD), in the USA in the 80's and 90's of the last century, at the expense of high-tech sectors, almost 50% of the total productivity growth was achieved, in the UK, Canada, Japan — more than 30, France and Italy — 25% [14]. At the same time, the industry structure of the "innovation countries" of the latest technologies was identical to the mid-90s of the last

century — aerospace, automotive, electrical engineering, — each of which accounted for 10 to 15% of all R & D expenditures in the US, Japan and EU But in the mid 90's. The situation has changed qualitatively. In the USA, the service sector was the leader, represented by information technologies (20% of all R & D expenditures), which pushed the aerospace industry (12%) and automotive (11%). In the EU, electronics (15%), automotive (13%) and services (14%) became the leading ones. In Japan, priority areas are electronics (18%), electrical engineering (11%) and automotive (10%) [15, p. 44].

Technological developments taking place on a global scale concern a wide spectrum of technologies and cover all the main directions of modern scientific and technological progress. The basis of the formation of the global production system lies in the process of internationalization, which results in a trans boundary spread of technologies. Activating rivalry forces national producers to increase their competitive edge, including through the introduction of new technologies. Without sufficient funding to develop their own innovations, Ukrainian companies are constantly waiting for new global technological challenges. Among other things, it stimulates the international transfer of technology, as manufacturers seek to obtain cutting-edge technologies from abroad. In this way, domestic enterprises in 2016 acquired: energy transportation technologies, resource-saving technologies, new technologies for the production of materials, their processing and connection, technology for updating and developing the agro-industrial complex, modern information and communication technologies. In addition, intensive diffusion of knowledge is stimulated by the emergence of global information networks with open innovation.

In modern conditions there is a large number of technological innovations that affect the business. PwC's experts have analyzed more than 150 modern technologies that are most relevant for business. As a result of this analysis, eight technologies were selected that will have the most significant impact on business in the near future: artificial intelligence, complemented reality, Blockchain technology, drones usage, Internet things, robotics, virtual reality, 3D printers [16]. Let's consider them in more detail.

Technology No. 1 "Artificial Intelligence". This technology is reduced to providing computer properties to knowledge comparable to those of the human brain. Most experts in this area agree that there are three varieties of artificial intelligence:

– Artificial Narrow Intelligence (ARI) is the first level of artificial consciousness that specializes in decision making in just one area of activity;

– Artificial General Intelligence (AGI) is the artificial intelligence of the second level that achieves and exceeds the level of ordinary human consciousness: can solve mathematical and logical problems, think abstractly, compare and master complex ideas, learn quickly, have their own experience ;

– Artificial Super Intelligence (ASI) is the third level of development of artificial intelligence technologies, where it is smarter than all humanity combined, at first a little, and then as a result of self-learning — in trillions of times.

First level artificial intelligence (ANI) is already used in automotive, energy, finance, telecommunications and more. In particular, ANI technology is at the heart of Google's search engine, the basis of the Facebook news feed.

Technology No. 2 "Enhanced Reality" (AR in English — augmented reality) allows you to put virtual images (holograms) into the real world. AR is a technology that can free up a human brain, free up part of cognitive efforts and help to optimize their use. This technology is already widely used today in the broadcast of sports competitions. The viewer can, when viewing the pictures on the TV screen, compare the achievements of the athlete in real time with the achievements of records in the past. However, the most famous case of penetration of AR everyday was the game Pokemon Go, which last year unexpectedly seized and tucked into smartphones and tablets millions of people around the world. According to virtual pokemon sites, both children and adults were hunted in real areas.

Technology No. 3 "Blockchain". This is a fundamentally new reliable storage technology that can dramatically change the approach to building and storing databases. This reliable and open technology will soon change our lives. For example, when issuing bank loans will be locked into a blockchain, nobody will ever face a credit fraud. Yes, and "holes" in bank balances will also be clearly visible, therefore, large bankruptcies will be avoided. Frauds with mortgage apartments and lending cars will simply be impossible — and many people will avoid problems and cash losses. Even public services related to the execution of documents, issue and confirmation of

rights and certificates, can be implemented as a convenient and open registry based on blockchain.

Technology number 4 "Using drones". Consumer demand for drone recently grew very fast. Droni are small flying machines with multiple screws that operate on remote control and can stay in the air for quite some time. Recently, Google and Facebook have officially announced strategic investment in projects that specialize in the production of solar powered drones and will be able to work continuously in the air for a month. In addition, Amazon.com intends to widely use drone in postal logistics. There are plenty of ideas about how to use drone in agriculture, police, healthcare institutions, television and other areas of human life. Therefore, there are all prerequisites for the further development of the droni industry.

Technology No. 5 "Internet of Things" (IoT — Internet of things). This is a technology for connecting devices over the Internet, allowing them to communicate with us, applications and with each other. Thus, all devices in buildings, in cars, on the user perform the processing of information, its analysis and exchange between themselves, depending on the results, make decisions, and perform certain actions. Internet of things is one of the most promising technologies of recent years, which actually creates hundreds of new products (fitness bracelets, smart-watches, "smart glasses", smart-houses, etc.) and leads to the emergence of new companies in the market that dictate their conditions for IT giants.

Technology number 6 "Robotics". This technology focuses on the creation of robots and robotic systems designed to automate complex technological processes and operations, including those performed in non-deterministic conditions, to replace a person during heavy, tedious and dangerous work. Japan and Germany are now leading the world market for robotics — these countries produce more than half of all robotic products in the world. Talking about some serious achievements of Ukraine in this field is too early, but we do something about it: there are both industrial producers and Start-up. So at the CES 2017 exhibition, the Ukrainian company RnD64 introduced the Hello Egg device (a robot-egg that works as an assistant in the kitchen). According to KNN Systems, the most commonly used works in Ukraine are automotive, chemical and electronic industries, for cutting and welding processes, packaging, packaging, palletisation. The most famous companies that use robotic systems are Procter & Gamble,

Henkel, AvtoZAZ. About the level of robotics says the ratio of robots to the number of staff serving this area. The average world Fig. is 60 robots per 10,000 people, while in South Korea it reaches 400 robots, in Japan 340 robots, and in Germany, 280 robots. In Ukraine, this Fig. is still at 1:20 000. In 2016, about 15 old and 5 new robots were purchased in our country.

Technology number 7 "Virtual reality". The new technology of contactless information interaction, which implements with the help of complex multimedia operating environments, the illusion of the direct occurrence and presence in real time in the stereoscopically presented "screen world". The main difference between the virtual reality of everything that existed before — its maximum impact on all human feelings — sight, hearing, sense of smell, touch, and so on. In virtual reality, there may be other objects or other people, and people can interact with them. Thanks to operations on virtual patients, doctors are studying new techniques and surgical techniques. Virtual simulators help pilots of aircraft or drivers to work out situations that are virtually impossible in today's world, even for a person with a great deal of experience. Virtual excursions are now offered by most museums in the world. With the help of special equipment, the virtual world becomes accessible to everyone.

Technology number 8 "3D printers" is the construction of a real object for the computer model created by the 3D model. 3D technologies allow you to completely exclude manual work and the need to draw drawings and calculations on paper — because the program allows you to see the model from all angles already on the screen, and eliminate the defects found not in the process of creation, as it happens in manual manufacturing, but directly in the development and create model for a few hours. 3D printing has opened up great opportunities for experiments in such areas as architecture, construction, medicine, education, clothing modeling, small-scale production, jewelry business, and even in the food industry.

Due to the constant monitoring of technological innovations and the direction of entrepreneurial ideas in the direction of their use and distribution, domestic companies are able to achieve the desired level of competitiveness in the target markets and provide for a stable development.

The results of the research have shown that the development of innovative entrepreneurship depends on the demand from consumers for innovation, the availability of the developed scientific and technical potential of

the national economy, the functioning of venture companies and investors that finance risky innovation activities.

As suggestions for systematic stimulation of innovation activity, one can propose the following:

– granting of tax privileges (reduction of rates and tax holidays) for the enterprises in the high-tech areas and oriented on creation of innovations;

– creation of business incubators, techno parks, etc .;

– creation of special educational programs and educational institutions focused on the formation of an intellectual resource for the development of innovations at enterprises of various spheres;

– use of tools to encourage the use of innovations (grants, bonuses, ratings, etc.);

– formation of tools for available financing of innovations for enterprises (loans, subsidies);

– creation of conditions for the application and stimulation of demand for innovations (both internal and external) through, above all, fiscal measures;

– creation of scientific schools based on universities and commercial educational institutions.

International experience demonstrates the possibility of reducing poverty and social exclusion of the population through the development of innovative entrepreneurship through the use of social and economic policies through expanding access to education services, health care and other social services, improving the state of the environment and the use of natural resources, especially in the countryside. Under the conditions of the implementation of the Strategy for Overcoming Poverty, in the next three years, our country can prove that the following is approved by the Cabinet of Ministers of Ukraine from March 16, 2016, No. 161-p [17]:

– the poverty rate by absolute criterion% (according to the World Bank methodology) in 2018 to 0,8%, and already in 2020 to 0,5%;

– poverty rate by relative criterion% (60% of median level) in 2018 to 6.6%, and in 2020 to 6.5%;

– the poverty level by the absolute criterion% (costs below the actual subsistence minimum) in 2018 to 23%, and in 2020 to 15%;

– the unemployment rate of the population aged 15-70 (% of economically active population of the corresponding age) in 2018 to 9.2%, and in 2020 to 9%.

The prerequisite for achieving such indicators should be the maximum use of domestic internal reserves of business entities, the transition to innovative technologies and projects focus on foreign economic activity and strengthen cooperation with larger enterprises to stabilize the financial situation and expansion of markets.

The aforementioned research is presented in the context of logic and dialectics of knowledge of innovative entrepreneurship, disclosure of economic essence and ensuring social inclusion as the only system-forming mechanism for solving socio-economic problems of Ukraine. Each direction of this study has a list of tasks that need to be considered and further studied.

REFERENCES

1. Riven bezrobittia v Ukraini: dynamika i demohrafiia za ostanni piat rokiv. Rezhym dostupu: https://news.finance.ua/ua/news/-/413236/riven-bezrobittya-v-ukrayini-dynamika-i-demografiya-za-ostanni-pyat-rokiv

2. Indeks sotsialnoho rozvytku 2017 Rezhym dostupu: file:///C:/Users/inna/Downloads/2017-SPI_Executive-Summary-Report.pdf

3. Pidpryiemnytstvo: orhanizatsiia, efektyvnist, biznes-kultura : navch. posib. / Kolot V. M., Riepina I. M., Shcherbina O. V. — 2-he vyd., pererob. i dop. — K. : KNEU, 2009. — 444 p.

4. Americans Confidence in Institutions Stays Low. [Elektronnyi resurs]. — Rezhym dostupu: http://www.gallup.com/poll/192581/americans-confidence-institutions-stays-low.aspx http://www.kmu.gov.ua/control/ru/cardnpd?docid=248898080

5. The Deloitte Millennial Survey 2017 Apprehensive millennials: seeking stability and opportunities in an uncertain world. [Elektronnyi resurs]. — Rezhym dostupu: https://www2.deloitte.com/global/en/pages/about-deloitte/articles/millennialsurvey.html

6. Riepina I. M., L. A. Sherhina, K. S. Riepin Rozvytok pidpryiemnytstva v Ukraini za indykatoramy reitynhu svitovoho banku "Doing Business" / I. M. Riepina, L. A. Sherhina, K. S. Riepin // Problemy i perspektyvy rozvytku pidpryiemnytstva: Zbirnyk naukovykh prats Kharkivskoho natsionalnoho avtomobilno-dorozhnoho universytetu.-№ 2 (9) — 2015.-Kharkiv: KhNFDU, 2015.-P.106-113.

7. Reitynh «DOING BUSINESS 2015: Bilshe, nizh efektyvnist» [Elektronnyi resurs] Rezhym dostupu: http://www.doingbusiness.org/data/exploreeconomies/ukraine

8. Kuratko F. Donald Entrepreneurship: a contemporary approach. — 3th ed. / Kuratko F. Donald, Hodgetts M. Richard. — The Dryden Press, 1995. — P. 735.

9. Shumpeter Y. Kapytalyzm, sotsyalyzm y demokratyia / Y. Shumpeter; pod red. V. S. Avtonomova. — M. : Эkonomyka, 1996. — 540 p.

10. Hlobalnyi indeks innovatsii (Global Innovation Index). Rezhym dostupu: https://www.globalinnovationindex.org/

11. Indeks hlobalnoi konkurentospromozhnosti (The Global Competitiveness Index). Rezhym dostupu: http://reports.weforum.org/global-competitiveness-report-2015-2016/

12. Kryvous V. B. Intehratsiia u svitovyi rynok innovatsii v konteksti transnatsionalnykh korporatsii (TNK) / V. B. Kryvous // Intehratsiia Ukrainy u svitovyi ekonomichnyi prostir: mizhnar. nauk.-prakt. konf., 24-25 sich. 2008 r. : tezy dop. — Ternopil.– 2008. — P.37-39.

13. Naukova ta innovatsiina diialnist Ukrainy 2016 rik: statystychnyi zbirnyk. Rezhym dostupu: http://www.ukrstat.gov.ua/

14. Raskhody na ynnovatsyy v promыshlenno razvytыkh stranakh // Biulleten ynostrannoi kommercheskoi ynformatsyy (BYKY). — 1999. — № 143. [Эlektronnыi resurs]. — Rezhym dostupa do dokumenta: http://www.pressarchive.ru/biki/1999/01/30/318515.html

15. Yvanova N. Ynnovatsyonnaia sfera / N. Yvanova // Myrovaia эkonomyka y mezhdunarodnыe otnoshenyia. — 1999. — № 8. — P. 43-48.

16. Tech breakthroughs megatrend. [Эlektronnыi resurs]. — Rezhym dostupa do dokumenta: http://www.pwc.com/gx/en/issues/technology/tech-breakthroughs-megatrend.html

17. Rozporiadzhennia Kabinetu Ministriv Ukrainy «Stratehiia podolannia bidnosti» vid 16 bereznia 2016 r. № 161-r [Elektronnyi resurs]. — Rezhym dostupu: http://www.kmu.gov.ua/control/ru/cardnpd?docid=248898080

CREATING ENTREPRENEURIAL UNIVERSITIES AS DRIVERS OF INNOVATIVE DEVELOPMENT OF ECONOMY

L. Petrenko
Phd in Economics,
Associate Professor of Business Economics Department,
SHEI "Kyiv National Economic University
named after Vadym Hetman"
A. Pavlenko
Assistant of Department of Economic Cybernetics and Marketing
SHEI "Kyiv National University of Technology and Design"

One of the prerequisites for the development of entrepreneurship in a particular country is the existence of an entrepreneurial culture. During the Soviet period in Ukraine, entrepreneurial culture was oppressed. As a result, we have a distorted view of entrepreneurship, which in Ukrainian society is identified with trade, not with innovation. However, according to the definition given by Josef Schumpeter [1] back in 1934, entrepreneurship is precisely the process of creating innovations [2]. Based on the Schumpeterian definition, one of the most influential projects in the world Global Entrepreneurship Monitor (GEM), connects entrepreneurship with the notion of "innovation", the ability to create new products and technologies. We state that in Ukraine there is an underdevelopment of the entrepreneurial culture and especially on the innovation vector.

According to the current world trends, the function of forming an entrepreneurial culture in a society must be fulfilled, first and foremost, by universities. For this, the very essence of universities is changing, which become entrepreneurial. The focus on the transformation of existing universities into entrepreneurial ones, for example the USA, was chosen back in the 1940s, but this process became especially active after the adoption of the Beich-Dole Act of 1980: within a few years universities created more than 2 thousand companies (260 thousand jobs), which dealt with the commercialization of innovations. Prior to the adoption of the act, all US universities registered less than 250 patents per year. In 1982, there were 1500 of them, and in 2010 — 4,500. If in 1989 — 1990, universities received

$ 82 million in licensed revenue, and in 2009 — more than $ 1.5 billion. J. R. Cole (2010) believes that "a significant part of the leading industries in the US, perhaps more than 80%, came from discoveries made in the US universities "[3].

In Europe, the process of creating entrepreneurial universities is motivated by the need to increase the competitiveness of the European economy and in particular, the universities of Europe (primarily compared with the US higher education system). Since the early 2000s in Europe, the main role in the creation of a knowledge society has been assigned to universities, since they are at the intersection of research, education and innovation [4]. The concept of creating excellence networks is based on the idea of integrating the scientific environment of universities at the global level into network structures that use the strengths of their participants [5]. At the European meeting in Hampton Court (2005), universities, along with R & D, were named the basis of European competitiveness [6]. Thus, Cambridge University has transformed the County of Cambridgeshire into an innovative cluster; of it, along with others, came out ten companies with a billion-dollar capitalization.

For Ukraine, the establishment of entrepreneurial universities is an acute, socially and economically significant problem, as universities must take an active part in modernizing society and transforming the economy. According to the Strategy of Innovative Development of Ukraine for the period up to 2020, the priority in education is the orientation "on the development of the research and development sector in universities, the deepening of cooperation between universities and leading companies in the real sector of the economy and scientific organizations ..." [7]. At the same time, this Strategy states the fact that "universities independently try to establish cooperation with industrial enterprises, but university inventions often do not reach their potential consumers, because the situation in the Ukrainian economy does not stimulate demand for innovative technologies." The National Report "Innovative Ukraine 2020" states: "It is necessary to follow the world's best practices and create all the normative conditions for stimulating innovative creativity in Ukrainian universities so that they become powerful entrepreneurial academic centers producing inventions and scientific and educational products that quickly reach the market. … It is also necessary to create special legislative support for forming a "cooperative"

model of the innovation cycle in Ukraine, to develop and adopt laws that promote the processes of self-organization on the territory of innovative cooperation between scientific institutions and universities, on the one hand, and business and government structures on the other." [8]

In 2017, Ukraine, according to the Global Innovation Index ranking GII joins the top 50 this year at the 50th position, moving up by six [9]. At the same time, Ukraine lags far behind the global leaders in innovative development. On the global map of startups (startupblink.com) in December 2017, only 1739 startups were registered in Ukraine, and in the USA — 31,748.

Meanwhile, the level of the innovative index of Ukraine shows its potential for the development of entrepreneurial universities. GII is calculated as the average value of the input and output indicators (subindexes) of innovations. The first characterizes the opportunities that are available for innovation, the second — its economic results. Among the opportunities or resources of innovative development are the characteristics of the education system [9].

One of the main reasons for Ukraine's innovative lag, is the outdated model of higher education, universities need to be reformed. Moreover, they can become the key source of competitive advantages of Ukraine in the international market in the era of knowledge. It is necessary to increase the economic component of the activities of universities, to develop cooperation with the external environment — the business community. It is important to modernize the university structure to ensure its dynamic development and financial sustainability. It is necessary to strengthen, on an equal basis with the educational and research, the third — the innovative and entrepreneurial function of universities. It is extremely important to increase the efficiency of using the potential of universities as sources of knowledge, a unique combination of highly qualified specialists and intellectual capital. However, the absence of a systematic state program does not allow Ukrainian universities to deal with these transformations effectively.

The concept of an entrepreneurial university is a consequence of the evolution of previous concepts. According to the established point of view, the history of the University includes three generations, differing in their missions. Thus, the mission of the first-generation universities (U 1.0), emerged in the European Middle Ages, was the training of a narrow circle of people. From the beginning of XIX century, the formation of the second

generation of universities (U 2.0) began: in addition to the educational one, they acquired a second mission — the production of scientific knowledge through research. Theorists and practitioners of higher education interpret U 3.0, the third mission and its components in different ways [10]. The informational metaphor "University 3.0" in its digital designation should not be misleading, it means the number of university missions: University 1.0 — only an educational institution, university 2.0 is aimed at teaching and research; at university 3.0, the commercialization of knowledge is added to the two previous missions. The emergence of the higher education system 3.0 is associated with the development of multi-campus universities in the US [11].

Most of the proposed interpretations are based on the concept of entrepreneurial university, put forward by B. Clark almost twenty years ago [12]. Modern researchers give the recent definition of the entrepreneurial university: "An entrepreneurial university is a higher educational institution that systematically makes efforts to overcome limitations in three areas — generating knowledge, teaching and transforming knowledge into practice — by initiating new activities, transforming the internal environment and modifying the interaction with the external environment "[13].

Modern universities 3.0 are becoming scientific and educational centers, open to the outside community and responsive to its requests for the implementation of the ideas of an innovative economy. In this context, the university's interaction with key public actors — business and the state — is built on the basis of the "Triple helix" theoretical model, grounded by G. Itskovich and L. Leidesdorff. It describes the process of the phased creation of an innovative product through the interaction of three social institutions: the university as a scientific center, the state and business, which in the innovation economy is essentially non-linear and resembles the cohesion of spiral DNA structures [14].

De facto, now, in the 21st century, higher education in Ukraine continues to live in the industrial culture of the mid-20th century. A significant part of universities operates only as educational institutions that supply personnel (model U 1.0); in other research and development in varying degrees, more often in insignificant, are integrated into the learning process (model 2.0). Universities that have a full-fledged sector of commercialization of knowledge (model 3.0), in Ukrainian higher education are absent.

This is the absence of legal prerequisites for the activities of universities on the model 3.0 in Ukraine. First of all, the issue of financial autonomy of state universities, their ability to act as founders of companies for the commercialization of their own inventions and new technologies, has not been regulated at the legislative level. However, not only the absence of law hinders the formation of entrepreneurial universities: in the academic community, misunderstandings of the functions of universities are common, often the entrepreneurial university is misunderstood — just an entrepreneurial business structure. This false understanding demotivates and postpones the beginning of the necessary reforms in the system of higher education in Ukraine.

Therefore, further, we set forth the arguments as to what functions, from the standpoint of innovative development, a modern university should fulfill and what are the domestic limitations on the performance of these functions in Ukraine. We take for granted educational and research functions as functions of a classical or research university and focus on the consideration of the functions of an entrepreneurial university.

Generally, **the main function of an entrepreneurial institution is the function of creating an innovative entrepreneurial environment in society**. The creation of the environment, in the opinion of the authors of this study, includes three areas, in which we will dwell in detail below:

– First, the development of entrepreneurial culture,

– Secondly, the improvement of entrepreneurial education,

– Thirdly, the transformation of the university into a key element of the innovation infrastructure of the economy.

First, the function of developing entrepreneurial culture. The authors of this article support the position of B. Clark who proved that one of the key elements in the development of an entrepreneurial university is the creation of a strong entrepreneurial culture [12]. In practice, this is often understood narrowly — as the formation of entrepreneurial culture of university employees and students, etc. It is important that this narrow understanding was only at the initial stage of development of the entrepreneurial university, and then expanded. In a broad sense, the development of entrepreneurial culture as a function of the university in Ukraine should include:

– Popularization of the values of the economy of knowledge and innovations by the university as the basis of modern *entrepreneurship, insti-*

tutionalized in the mission and strategy of the university. Then follows the implementation of the above mission through the teaching, research, educational, professional, innovative functions of the university in society. This includes the organization of conferences, the creation of scientific laboratories, research and publications on the topic of innovative entrepreneurship, etc.

– *Concentration and use of actual knowledge about innovations and entrepreneurship on the basis of active international interaction, internationalization of activities* in terms of education and research. The aspect of academic mobility is important — the exchange of experience with business universities in the world. We need contacts with representatives of the best world experience, partnership with leaders, and participation in joint activities. It is predicted that the development of universities through the internationalization of their activities increasingly become part of the international policy of developed countries. At the same time, international student mobility ceases to be an independent trend and becomes part of the process of international movement of labor, managed by national politicians fighting for talent as a key factor in the competitiveness of countries. These and other macroeconomic trends are changing the microeconomics of the market for educational and other services of universities, their motivations and business strategies of activity. [15]

– Activation of *interaction with all persons, groups of persons and organizations interested in the activities of the university (stakeholders).* One of the key tasks of the entrepreneurial university is the development of entrepreneurial competencies of all participants in the innovation process. Historically, in Ukrainian universities, students are poorly involved in research. Therefore, it is important to introduce a policy of maximally involving students in research, and then, along the chain, to involve students in the commercialization of research results, including the popularization of start-up movement. Development of links between the education system and business, where participants establish close ties with entrepreneurs for the development of entrepreneurial and business culture at the university level. Thus, the system of university management should be oriented not only to internal, but also to external processes: establishing mutually beneficial relations with the business community and attracting additional funding. Therefore, the vision and values transmitted through the management and leadership system can break down barriers to understanding

and accepting the entrepreneurial culture and mission of the university. Thus, the activation of interaction with stakeholders, naturally, contributes to the following two functions of the entrepreneurial university: improving the quality of entrepreneurial education and turning the university into an element of the country's innovative infrastructure.

Secondly, the improvement of entrepreneurial education. The aim is to train professional innovators. Universities need to restructure educational programs and plan their activities with the use of foresight, focusing on the profession of the future, including on interdisciplinary professions, training specialists in partnership with organizations, enterprises (companies).

In Ukraine, the improvement of entrepreneurial education can be carried out as follows:

– *Establishment innovative entrepreneurship education as part of the educational program and, possibly, as an obligatory subject*. The goal is to compensate for the lack of business competencies among students, especially those representing "non-economic" faculties and specialties, which are a priori sources of new knowledge and technologies. The society today needs those market actors who are able to master the opportunities of the innovative economy in a timely manner and benefit.

– *Widespread use of innovative teaching methods — informatization of the tuition process.* Technology is becoming a central part of the tuition process in higher education, which can provide more access to entrepreneurial education in Ukraine. Massive open online courses (MOOC) have become one of the most important aspects of the use of technology in education in recent years. Ukrainian universities have joined the process of creating their own MOOC, which are presented on their websites and open resources, for example https://prometheus.org.ua.

– Motivation and development of leadership and entrepreneurial qualities of future specialists through *involving students in entrepreneurial and innovative activities during the period of study at the university.* The relevance of this is determined by the fact that modern students, representatives of the so-called Generation Y and Generation Z, are inclined to search for innovative solutions, knowledge of their abilities, entrepreneurial behavior [16]. Students and university graduates have a huge innovative and entrepreneurial potential, which the university should develop through providing access to entrepreneurial business education and creating an en-

vironment conducive to the formation of entrepreneurial culture and the implementation of business ideas through the launch of start-ups.

– *To establish "open courses" at the university, for example, in the format of start-up schools for entrepreneurship education*. The target audience can be several groups at the same time. First, students and graduates with technical skills and knowledge who have a business idea, but no team and sufficient business competencies. Secondly, researchers who want to build a business based on inventions. Thirdly, students and graduates with economic and business education who have the necessary knowledge of business and the desire to join the startup team. It is the interaction between these groups that fosters the formation of interdisciplinary teams and the maximum development of the participants' potential. Such a startup school allows the "students" to develop competencies to recognize and use market opportunities, attract resources to solve interdisciplinary tasks, build and manage multifunctional teams, launch innovative projects, and to initiate cooperation between the university and the business sector.

– At the same time, it is impossible to manage only internal resources; *universities should find opportunities to attract prominent professionals, business representatives, investors for teaching at the university*. It is necessary to systematically train research teams, grow and attract leaders (and "stars" in this professional field). The aim is to create an entrepreneurial ecosystem at the university that is favorable for growing, at the first stage, future entrepreneurs, and at the second stage — teams and even companies (new subjects of the market). One of the tools for forming an entrepreneurial ecosystem is the start-up schools — these are platforms where active students, undergraduates, young scientists with entrepreneurial initiative and vision, talent, leadership can get support from business representatives. As a rule, successful entrepreneurs who have experience in starting a business conduct all classes in start-up schools. They are ready to immerse participants in the business environment, share business experience. The activity of start-up schools implies holding both one-time meetings (meetups) with well-known entrepreneurs, and full-fledged training courses.

– *The top of the development of entrepreneurial education should be the preparation by universities of not individual specialists, but ready-made teams and even companies* (new subjects of the market). The growing demands on the participants of the modern market are that that they must do

much more than just transformation of an idea into a technical solution, the creation of a prototype and its mass production, more, than the transfer of technology (which allows profit from the commercialization of some technologies). It is necessary to create an innovative infrastructure that will be receptive to mass innovation solutions.

– *To increase the degree of correspondence of knowledge of graduates to the needs of employers.* A large and growing share of university graduates in Ukraine is suffering from unemployment. So far, none of the Ukrainian universities is not included in the top 150 leaders of employability (The Global University Employability Ranking 2017). [17] The way to solve the problem of employability is to involve employers in the process of creating and filling educational programs in universities.

Improvement of entrepreneurial education in Ukrainian universities can be considered as the first stage of improving the innovation infrastructure of the Ukrainian economy.

Third, the transformation of the university into a key element of the innovation infrastructure of the economy.

Analysis of infrastructure opportunities for an innovative economy in modern conditions allows us to conclude that the most important infrastructure component is the university, which has huge (and so far unrealized) opportunities. Experts conclude that in Ukraine (and in many other countries) there is no other platform that can create and promote innovation (throughout the innovation cycle), except for universities.

In Ukraine, universities can and should become agents of change, agents of the development of regions and industries. As an entrepreneurial university is a public institution that provides the basis for regional and national growth and development through more intensive interaction with the external environment.

The transformation of the university into a key element of the innovation infrastructure of the economy in Ukraine should include:

Firstly, the management's understanding of the universities' appointment and the role of the university in the country and region of the deployment, in accordance with this, the formulation of goals and objectives (clearly indicated mission in the university strategy) integration with business. The fact is that entrepreneurial activity accelerates the participation of the university in the development of its region through the creation of a ramified inno-

vative research, educational, and production infrastructure with a view to realizing the competitive potential of the territory. As a result, regional universities are becoming one of the key drivers of socio-economic development in their region.

Secondly, the establishment of the interaction of an entrepreneurial university with a regional infrastructure within the framework of the undertaken mission requires activation of contacts in the triangle "regional authorities — business — university" (regional "triple helix"). The regional university is well aware of the needs of regional business. As a result, the university develops business innovations that are necessary for business. At the regional level, the implementation and commercialization of innovations by university scientists is taking place, they are carrying out orders for R & D from regional companies. It is possible to search for new forms of integration by universities — entry into R & D structures of regional companies, creation of joint research organizations with business, use of the potential of international partnership. That is, one of the most important missions of the university (the leading and authoritative in the region) is the development of entrepreneurial activity. In other words, regional universities-leaders are able to become "locomotives" in revealing the innovative potential of regions, human potential, and development of SME. At the same time, the university has an opportunity to use intellectual, material, infrastructure and other resources of its region to solve its own problems. This is extremely important in the context of limited state support for higher education in Ukraine and the need to attract non-government funding sources for universities.

Thirdly, getting state and public support. Ukrainian universities have no experience of performing entrepreneurial functions. In addition, Ukrainian society is not accustomed to perceive the university as an accelerator of entrepreneurship. Consequently, the university needs to gain credibility and fulfill the role of a key element in the regional innovation cluster. In a society, the attitude towards universities should be changed in accordance with the world practice. Undoubtedly, the corresponding governmental program can promote the role of universities as the center of innovation infrastructure. In the end, the state should endeavor and lead the reform processes that the universities have already begun. Entrepreneurial universities are needed by the state of Ukraine, since they are able to assume a

part of government functions in support of innovative development of the country. Thus, state support could be placed first in the list of necessary actions. Moreover, this support should be not so financial, as regulatory, legislative. Universities need financial autonomy to create their own SMEs and commercialize innovations. Universities need the authority to become centers of regional innovation clusters and to take on some of the government's functions to stimulate the country's innovative development.

The transformation of the Ukrainian university into a key element of the innovation infrastructure of the economy requires, respectively, **the restructuring of the internal structure of the university and the creation of new units for Ukrainian universities that enable the realization of the entrepreneurial function**.

Universities should create supervisory boards consisting of entrepreneurs and strategic experts. The availability of laboratories, places for coworking, business incubators, and technology parks allows bringing together talented students, mentors, researchers, modern technologies, both external and internal financial resources, to increase the level of entrepreneurial business education by bridging the gap between theoretical knowledge and practical activities. With a certain success of such activities in the long term, universities should consider more advanced tools for the development of entrepreneurship, potentially bringing great and financial and image benefits: accelerators, incubators, and technology parks, educational and innovative clusters. Thus, by creating its own infrastructure, universities become full participants of the country's innovative infrastructure system.

Now the universities of Ukraine, even without the necessary financial autonomy and state support, have begun to apply in practice certain parts of the concept of an entrepreneurial university. Reform "from below" has already begun, as universities seek to maintain their own competitiveness. Undoubtedly, one institution is more active, others are less active in interacting with business and educating students in innovative entrepreneurship. However, this process is progressing. In Table 1, we give examples of the successful implementation in Ukraine's universities of certain features of the triple-helix concept and the creation of entrepreneurial universities. Studying the same degree, level of development of a university in Ukraine on an entrepreneurial path requires additional research.

Table 1

Functions of the entrepreneurial university and their implementation by some universities of Ukraine

№	Function	Examples of successful implementation by universities of Ukraine	A source
		1. **The development of entrepreneurial culture**	
1.1.	Popularization of the values of the economy of knowledge and innovations by the university as the basis of entrepreneurship, institutionalized in the mission and strategy of the university	«NaUKMA is a leader in innovations and actively influences the future of Ukrainian society and the state. NaUKMA organically combines scientific activity, educational process and acquisition of practical skills of high quality.»	*University of "Kyiv-Mohyla Academy"/* Vision from the strategy of the university: http://www.ukma.edu.ua/index.php/about-us/sogodennya/pry-znachennia-ta-misiia
1.2.	Concentration and use of actual knowledge about innovations and entrepreneurship on the basis of active international interaction, internationalization of activities in terms of education and research	Strategy of internationalization for 2016 — 2020: «The goal of internationalization of KNEU is the formation of an effective polystructural system of international academic mobility ... Mutual interuniversity transfer of creative competencies of students, post-graduate students, doctoral students and teachers ...»	*Kyiv National Economic University named after Vadym Hetman.* https://kneu.edu.ua/userfiles/center_international_relation-ships/Internationalization_strategy_and_Certificate.pdf
1.3.	Activation of interaction with all persons and organizations interested in the activities of the university (stakeholders)	«Development of cooperation with the business community, public authorities, enterprises, organizations, institutions, as well as other potential participants in cooperation in the scientific and technical sphere and the sphere of technology transfer»	Regulations on the Center for Technology Transfer of the *Zaporizhzhia National University:* http://web.znu.edu.ua/ctt//docs/polozhennya-pro-tsentr.pdf

№	Function	Examples of successful implementation by universities of Ukraine	A source
		2. The improvement of entrepreneurial education	
2.1.	Establishment innovative entrepreneurship education as part of the educational program and, possibly, as an obligatory subject	The course «Innovative development of the enterprise» is taught to students of master's programs of all forms of training, starting from 2015.	*Kyiv National Economic University named after Vadym Hetman* http://feu.kneu.edu.ua/ua/depts4/k_ekonomiky_pidpry-jemstv/disciplines_of_masters_degree_level_ekp/
2.2.	Widespread use of innovative teaching methods, informatization of the tuition process	«Informatization of the educational activities of the University is directed on ... the introduction of computer teaching methods ... individualization of training, the organization of systematic knowledge control, the ability to take into account the psychophysiological characteristics of each person, etc.»	*Kyiv National Economic University named after Vadym Hetman* The concept of informatization of university activities: http://kneu.edu.ua/userfiles/norm_doc/concept_it2013.pdf
2.3.	Motivation and development of leadership and entrepreneurial qualities through involving students in entrepreneurial and innovative activities during the period of study at the university	«Inside Out is a project that creates a platform (an incubator of grassroots initiatives) to implement the best ideas of students. The project not only provides mentoring support, but also guarantees the full implementation of the winners' projects.»	*Project of National Technical University of Ukraine Kiev Polytechnic Institute:* https://www.inside-out.pro

№	Function	Examples of successful implementation by universities of Ukraine	A source
2.4.	To establish «open courses» at the university, for example, in the format of start-up schools for entrepreneurship education	«For the first time in the history of Ukrainian education, leading educational institutions have joined their efforts in order to make the best education available to everyone ... the courses "Economics for All" and "Entrepreneurship. Own business in Ukraine" by the teacher of the Kiev-Mohyla Academy Alexei Gerashchenko.»	KNU named after Taras Shevchenko, NU of "Kyiv-Mohyla Academy", Ukrainian Catholic University and LITS became partners of the platform of mass free online courses "Prometheus". https://courses.prometheus. org.ua/courses/Prometheus/ ENTREPR101/2016_T1/about
2.5.	At the same time, it is impossible to manage only internal resources; universities should find opportunities to attract prominent professionals, business representatives, investors for teaching at the university	«Priority directions of the university development: Ensuring the quality of education in accordance with international standards ... the maximum focus of teaching the academic disciplines on the applied application of knowledge received by students; attracting well-known practitioners to the courses.»	Regulations on the quality of educational activities and the quality of higher education at the National University "Ostroh Academy". http://www.oa.edu.ua/publik_ information/polozhenya_zabez-pechenya_yakosti_vyshchoy_ osvitu.pdf
2.6.	The top of the development of entrepreneurial education should be the preparation by universities of not individual specialists, but ready-made teams and even companies (new subjects of the market)	«The Center of Entrepreneurship is a platform for the training and development of Tech-projects, social entrepreneurship and creative industries, that provides the necessary knowledge, mentoring support and advice from entrepreneurs of practitioners to implement a successful business project.»	Ukrainian Catholic University https://bigggidea.com/ project/tsentr-pidpriemnit-stva-ukranskogo-katolitsko-go-universitetu/#

214

№	Function	Examples of successful implementation by universities of Ukraine	A source
3. The transformation of the university into a key element of the innovation infrastructure of the economy			
3.1.	The management's understanding of the universities' appointment and the role of the university in the country and region of the deployment, in accordance with this, the formulation of goals and objectives (clearly indicated mission in the university strategy) integration with business	«The aim of the creation and functioning of NSSMD SSU is the practical realization of the scientific, professional and intellectual potential of teachers, employees and students of Sumy State University, other higher educational institutions, scientific institutions and organizations for developing and strengthening the market positions of enterprises and institutions of the Sumy region ...»	Regulations on the Research and Training Center for Marketing Research SSU (*Sumy State University*): http://sumdu.edu.ua/ukr/general/normative-base.html?task=getfile&tmpl=-component&id=bae8a-0ca-10b8-e011-9adc-001a4be-6d04a8&kind=1
3.2.	The establishment of the interaction of an entrepreneurial university with a regional infrastructure within the framework of the undertaken mission requires activation of contacts in the triangle «regional authorities — business — university» (regional «triple helix»)	«The mission of the Innovative Office of the Odessa National University is to serve as a regional center for integrating the innovation activities of research institutes, government agencies and business companies in Southern Ukraine, to provide world-class services in the research, development and commercialization of innovative products at local, national and international markets.»	*Odessa National University* http://innocentre.onu.edu.ua/wp-content/uploads/2013/02/SMO-of-ONUInnocentre_ukr.pdf

Before reforming, it is important to realize that Ukrainian universities have high potential, which is confirmed by international ratings. In 2017, Ukraine improved its position in The Human Capital Index (WEF) by 2 points and ranked 24th among 130 countries. This index provides a holistic assessment of the human capital of the country. As the WEF report points out, human capital is people with the knowledge and skills that make it possible to create value in the global economic system. Therefore, Ukraine on the quality of staff — between Britain and Lithuania, Ukraine has outrun all its neighbors, except Russia. Ukraine's performance is particularly high relative to its GDP per capita levels. Within the lower-middle income group (countries with a GNI per capita between US$1,006 and US$3,955), one out of 35 countries covered by the Index—Ukraine—scores above 70%. [18]. It is important, in the process of reforming Ukrainian universities and turning them into entrepreneurial ones, not to destroy universities, but to increase their potential.

Before starting reforming and creating entrepreneurial universities, **it is important to get away from extremes, to avoid misunderstanding of the entrepreneurial function**.

The false "excessive" understanding of the entrepreneurial function is to turn the university into a business structure that is at least self-financing (thereby removing from the government its obligations to finance the higher education system), and even better — profitable, earning money and paying corporate tax in the state budget.

In practice, the entrepreneurial function should support, and not contradict, the task of developing the scientific and technological structure of universities.

Entrepreneurial universities should not rigidly focus on the prospect of developing selected key areas (branches of knowledge), as this will reduce flexibility and adaptability to the challenges of the future.

When reforming, it is important to avoid an absolute predominance of a pragmatic approach. It is unacceptable that university management is aimed solely at maximum commercialization of scientific / educational products, the search for sources of providing the university with financial, material, human resources, and the development of the business mission.

It is also dangerous to reject fundamental research and concentrate exclusively on applied ones, which are easy to commercialize. This approach can completely emasculate the research function of universities.

The university, being involved in economic-centric trends, is transformed from a classical social institution into an economic entity engaged in the production of scientific and educational services. The renewed university must respond quickly and effectively to society's requests for university products in which this society is interested. Such a transformation is unusual and painful for the classical university of Ukraine, which traditionally estimated the effectiveness of its activities in the categories of public good, selfless service to society.

Ukrainian universities, which for centuries, until the 90s of the last century, were created, functioned and developed as totally State-funded institutions, the prospect of becoming entrepreneurial is perceived as a challenge that threatens their existence.

Finally, to avoid excesses and extremes, the authors of this study recommend that the process of reforming must be gradual by developing a state program for this purpose with a duration at least 10 years. Proposals for the development of such a program are the direction of future studies of the authors of this publication.

REFERENCES

1. Шумпетер Й. Теория экономического развития. Капитализм, социализм и демократия. / Йозеф Шумпетер. — М: Эксмо, 2007. — 864 с.
2. Петренко Л. А. Інноваційне підприємництво як наукова категорія. / І. А. Павленко, Л. А. Петренко // Інвестиції: практика та досвід, 2014. — № 16. — С. 12-15.
3. Cole J. R. (2010). The great American university: Its rise to preeminence, its indispensable nation role, why it must be protected. N. Y.: Public Affairs.
4. CEC (2003). The role of the universities in the Europe of knowledge. Brussels: Commission of the European Communities.
5. EUA (2003). Response to the communication from the Commission uThe role of the universities in the Europe of knowledge". Brussels: European University Association. EUA (2007). Creativity in higher education: Report on the EUA Creative Project 2006—2007. Brussels: European University Association.
6. CEC (2006). Delivering on the modernisation agenda for universities: Education, research and innovation. Brussels: Commission of the European Communities.
7. Стратегія інноваційного розвитку України на 2010–2020 роки в умовах глобалізаційних викликів /Авт. упоряд.: Г. О. Андрощук, І. Б. Жиляєв, Б. Г. Чижевський, М. М. Шевченко.— К: Парламентське вид-во, 2009. — 632 с
8. Інноваційна Україна 2020 : національна доповідь / за заг. ред.В. М. Гейця та ін. ; НАН України. — К., 2015. — 336 с. [Electronic source]. — Access mode : http://ief.org.ua/wp-content/uploads/2015/07/Інноваційна-Україна-2020++.pdf

9. Cornell University, INSEAD, and WIPO (2017): The Global Innovation Index 2017: Innovation Feeding the World, Ithaca, Fontainebleau, and Geneva. https://www.globalinnovationindex.org

10. Балмасова Т. А. «Третья миссия университета» — новый вектор развития? // Высшее образование в России. — 2016.-№ 8-9. — С. 48-55.

11. Lane J. E. (2013). Higher education system 3.0: Adding value to states and institutions. In: J. E. Lane, D. B. Johnstone (eds.). Higher education system 3.0: Harnessing systemness, delivering performance. Albany, NY: SUNY Press, pp. 3—26.

12. Clark B. Creating Entrepreneurial Universities: Organization Pathways of Transformation. — Guildford, UK: Pergamon, 1998. — 163 p.

13. Константинов Г. Н., Филонович С. Р. Что такое предпринимательский университет // Вопросы образования. — 2007. — № 1. — С. 49-62.

14. Etzkowitz H., Leydesdor L. The Triple Helix University-Industry-Govemment Relations: a Laboratory for Knowledge-Based Economic Development // EASST Review. — 1995. — Vol. 14. -№ l.-P. 14-19.

15. Павленко О. В. Розвиток ринку освітніх послуг ВНЗ: актуальні тренди та прогнози / О. В. Павленко // Стратегія економічного розвитку України: Зб.наук. праць. — 2017. — № 41. — С. 89-98. [Електронний ресурс] — Режим доступу : http://www.sedu.com.ua/archive/41/sedu_41_2017.pdf

16. Quinn, S. Generational challenges in the workplace. / S. Quinn. — Ventus Publishing Aps., 2010. — 38 p.

17. The Global University Employability Ranking 2017. [Electronic source]. — Access mode : https://www.timeshighereducation.com/features/which-countries-and-universities-produce-most-employable-graduates

18. Ukraine in Global Rankings. Easy access to relevant data on the position of Ukraine in key international indices. [Electronic source]. — Access mode : http://www.pravda.com.ua/cdn/graphics/ratings/eng.html

19. Audretsch, D. From the entrepreneurial university to the university for the entrepreneurial society / D. Audretsch // The Journal of Technology Transfer. — 2014. — Vol. 39, iss. 3. — P. 113–121.

DEVELOPMENT OF UKRAINIAN IT ENTERPRISES IN THE CONTEXT OF MODERN TRENDS OF THE WORLD MARKET OF INFORMATION SERVICES

I.Pavlenko
Doctor of Science (Econ.),
Professor of Management Department
SHEI "Kyiv National University of Technology and Design"
Ch.Chyzhov
Phd Seeker of Business Economics Department,
SHEI "Kyiv National Economic University
named after Vadym Hetman"

Today, a priori is the assertion that the economic growth of enterprises of all types of economic activity is to a large extent determined by the use of information technology. This quite naturally creates the preconditions for the development of IT enterprises in the whole world as well as in Ukraine.

The most dynamic segment of the global IT market in recent years is the software market (software), the annual growth of which exceeded 6%. More than half of the total volume of the segment is formed by different categories of applications, the rest falls on the system software and development tools. The highest rates of development are demonstrated by the category of applications for organizing collaboration, in particular, solutions for intercompany social networks and file sharing, the volume of which increases annually by more than 20%. Also, the category of decisions to manage databases and analytics with an annual growth of more than 8% is developing dynamically. Invariably, high demand persists for managing enterprise resources and customer relationships, as well as security solutions. According to forecasts of analysts, the aggregate network of network equipment, servers and external data storage systems (DSS) will show an average annual growth rate of 19.6% over the next five years.

According to Gartner, in 2016, IT spending globally was $ 3.375 trillion, 0.6% less than a year earlier, while data for 2017 show an increase of 2.7% (to $ 3.464 trillion) According to the predicted findings of Gartner specialists, in 2017, global IT sales will grow by 2.9% compared to 2016 and

will reach $ 3.5 trillion. The growth of the market will occur, first of all, at the expense of software and IT services [1].

Geographic concentration of the market allows noting that the USA share accounts for more than half of the supply of information technology in the world, the headquarters of leading IT companies are located in this country (Table 1). At the same time, companies from India and China are starting to play an increasingly important role in the global market. For example, the Indian company Tata Consultancy Services, an IT service provider, exceeds market capitalization by Dell and EMC. And Chinese Internet giants — Baidu, Tencent Holdings and NetEase.com — are among the leaders in the IT industry at a rate of growth in income and profitability.

Table 1

Ten largest public IT companies in the world in 2016, $ billion

Company	Country	Volume of sales	Profit	Active assets	Market-value
Microsoft	USA	85.3	16.8	224.6	507.5
Oracle	США	37.4	8.9	125.4	182.2
SAP	Germany	24.4	4	46.7	119.7
VMware	USA	7.1	1.2	16.6	37.8
Adobe Systems	USA	6.1	1.3	13	64.4
Symantec	USA	3.8	2	16.8	19.1
Salesforce.com	USA	8.4	0.18	17.6	59.7
HCL Technologies	India	6.3	1.1 B	6.4	18.7
Fiserv	USA	5.5	0.930	9.7	24.9
Intuit	USA	4.9	0.793	4.4	30.3

Source: [2]

The United States is not only the main supplier of information technology to the world market, but also their largest consumer, accounting for about a third of the total turnover of the entire market. In Western Europe, against the background of the economic recession, the slowdown in IT spending growth is expected to reach 1.7% per year (in the region as a whole). In recent years, the technology sector is among the world leaders in

terms of the number of initial placements on the stock exchange. The reasons for entering an IPO company range from diversification to acquisition of assets and attraction of funds for development to increase the company's flexibility and its level of recognition and attractiveness.

The growth of IT enterprises and the increasing scale of their activities have complicated their operation by their own forces, which provoked the development of the practice of transferring part of the functions of maintaining its own information infrastructure to external contractors — outsourcing. According to analyst data from International Data Corporation (IDC), three of the leaders of IT outsourcing service providers are IBM, CGI and Cognizant.

It is also worth noting that the IT sector is characterized by a high level of average wages. In the United States last year, the average wage of a software developer with a work experience of 3 to 5 years reached a record high and approached $ 100 thousand a year. However, after paying taxes, housing and food costs, the «net» annual programmer's income of this level is about $ 70,000. Analyzing the incomes of programmers in the USA, it should be noted that to date, they rank first in the salary level of IT specialists [3]. In the EU, despite the significant development of information technology, the income level of IT professionals is about $ 55 thousand, although in recent years, wage growth in the IT sector has become more dynamic than in the United States. Over the past year, salaries of software developers have increased by almost 10% [3]. According to the portal kv.by the first place among the countries of Europe is Germany, with an average annual salary of 65 thousand dollars, the second place is Switzerland — 53 thousand dollars, the third — Lithuania, with an annual salary of 44 thousand dollars.

A significant proportion of world production, including in the field of information technology, is concentrated in China, but the salary of programmers in this country is very much lagging behind developed countries and is on average up to $ 18 thousand a year. Another country that has become the outsourcing center (according to IDC experts, almost every fourth (23%) of the largest outsourcing of IT related functions was attributed to an Indian company) — India. About 40% of vacancies are located in this country. The reason for this is the low cost of services for programmers with an annual income of about $ 12,000. In Japan, despite the status of a highly developed

country, and above all in the IT field, the average salary of a programmer is just under $ 40,000, which is one of the reasons for the migration of Japanese programmers to other countries, in particular, in the USA.

Objective prerequisites for growth are also characteristic for Ukrainian IT companies. The main development of the industry in Ukraine began in the 2000s (Pic. 1). It should be noted that in 2003, the seven Ukrainian market leaders — ELEKS, Miratech, Softline, SoftServe, Telesens, Tessart and UkrSoft, as well as the vast majority of other IT companies, belonged to Ukrainians. With only $ 100 million in IT exports, Ukraine did not play a significant role in the world market, which at that time amounted to about $ 500 billion. During this period only six IT companies had over 100 employees, and only about 8000-10000 IT specialists were employed throughout the market. However, at that time, the list of major Ukrainian companies was highly reputable: Boeing, Citibank, DaimlerChrysler Aerospace, Delta Airlines, DHL, Disney, Ford, General Electrics, ING Bank, Intel, Microsoft, Motorola, NASA, New York Stock Exchange, Paramount Pictures, Scala and others. The European Union was represented by Alcatel, Deloitte & Touche, Deutsche Telekom, Fiat Avia, France Telecom, Nokia, Philips, Siemens and others.

The above representative sample of clients from Ukrainian IT companies has allowed individual experts to assert that the Ukrainian IT industry has begun to generate credibility. To strengthen this trust and increase its attractiveness, many Ukrainian companies have started to shape their business processes in accordance with ISO and industry standards, such as Software CMMI. With the growth of the industry and increased competition, another indicator of the reliability of the domestic IT service provider was a financial audit with the involvement of a reputable international auditor.

The period of large-scale attraction of foreign investments to Ukraine provoked a rapid growth of domestic IT-business. A typical scheme was the purchase by a well-known international software developer of one or several small or medium-sized Ukrainian companies, which subsequently created major development centers in Ukraine. The interest of foreign investors in Ukrainian programmers is due to the high level of their qualification, which is supported by the following indicators. Thus, the World Economic Forum Global Competitiveness Report estimated the coverage of higher education in Ukraine by 79.4% (7th among 183 countries). The

practice of hiring and dismissal was estimated at 4.8 points, which made Ukraine the 17th place in the world and demonstrated the potential for the recruitment of skilled specialists. With 2007 investment, the volume of Ukrainian exports of ICT services grew to $ 504 million according to the World Bank [4].
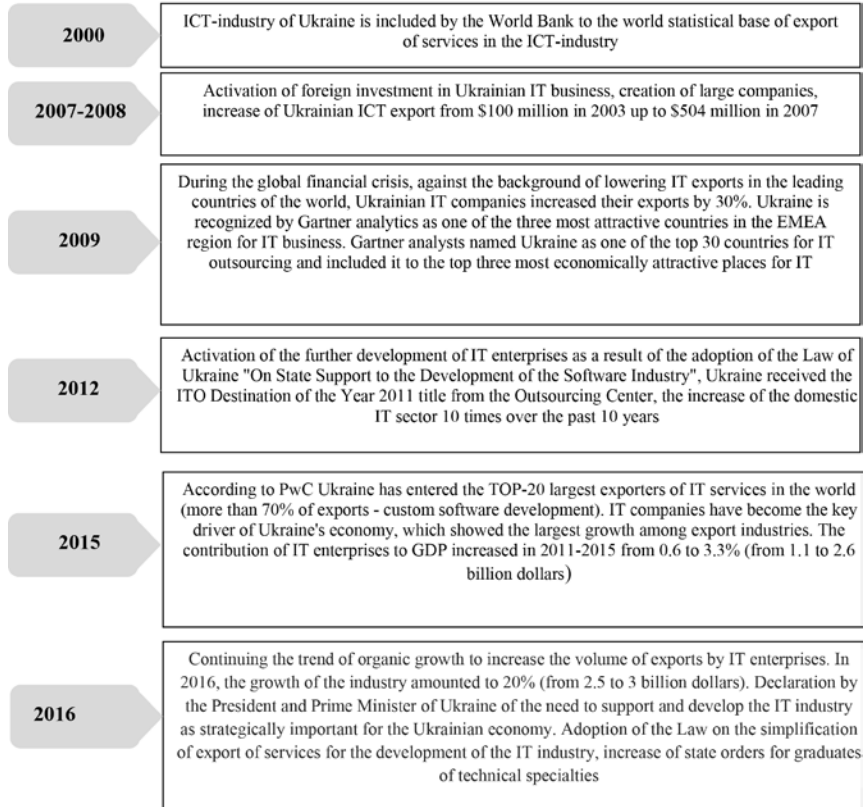
2000	ICT-industry of Ukraine is included by the World Bank to the world statistical base of export of services in the ICT-industry
2007-2008	Activation of foreign investment in Ukrainian IT business, creation of large companies, increase of Ukrainian ICT export from $100 million in 2003 up to $504 million in 2007
2009	During the global financial crisis, against the background of lowering IT exports in the leading countries of the world, Ukrainian IT companies increased their exports by 30%. Ukraine is recognized by Gartner analytics as one of the three most attractive countries in the EMEA region for IT business. Gartner analysts named Ukraine as one of the top 30 countries for IT outsourcing and included it to the top three most economically attractive places for IT
2012	Activation of the further development of IT enterprises as a result of the adoption of the Law of Ukraine "On State Support to the Development of the Software Industry", Ukraine received the ITO Destination of the Year 2011 title from the Outsourcing Center, the increase of the domestic IT sector 10 times over the past 10 years
2015	According to PwC Ukraine has entered the TOP-20 largest exporters of IT services in the world (more than 70% of exports - custom software development). IT companies have become the key driver of Ukraine's economy, which showed the largest growth among export industries. The contribution of IT enterprises to GDP increased in 2011-2015 from 0.6 to 3.3% (from 1.1 to 2.6 billion dollars)
2016	Continuing the trend of organic growth to increase the volume of exports by IT enterprises. In 2016, the growth of the industry amounted to 20% (from 2.5 to 3 billion dollars). Declaration by the President and Prime Minister of Ukraine of the need to support and develop the IT industry as strategically important for the Ukrainian economy. Adoption of the Law on the simplification of export of services for the development of the IT industry, increase of state orders for graduates of technical specialties

Fig. 1. Chronology of development of Ukrainian IT-enterprises
* Source: formed by the author *

In 2008 — 2009, during the global financial crisis, the Ukrainian IT market once again attracted the attention of international researchers. Gartner analysts called Ukraine one of the top 30 countries for IT outsourc-

ing and included in the top three most economically attractive places for IT [4]. Against the backdrop of falling exports of IT services in the leading countries of the world (by 16% in Italy, by 11% in the UK, by 7% in India, by 5% in Japan and Germany), Ukraine has demonstrated by the end of 2009 30% growth in ICT exports. After 12 months of ICT research in different countries, Gartner experts called it one of the three most economically attractive countries in the EMEA region [5,6].

In 2011, Ukraine had another significant recovery in the industry, one of the reasons for which was the successful lobbying by the IT Association of Ukraine of a bill to support IT companies adopted as the law of Ukraine «On State Support to the Development of the Software Industry» in 2012. In the same year, Ukraine received the ITO Destination of the Year 2011 title from the Outsourcing Center [5].

As of now, the IT sector of Ukraine demonstrates a steady growth of 25%. Over the past 10 years it has grown 10 times. According to official statistics of the State Statistics Committee in 2014, exports of computer, information and telecommunication services amounted to $ 1.6 billion, and imports — only $ 0.5 billion. In 2015, according to experts, the share of exports is $ 2.5 billion a year. IT ranks third after the agro-sector and metallurgy, and competes with the export of chemical materials (Fig. 2). In 2016, the volume of IT service exports reached a maximum of $ 3.2 billion.

A specific feature of IT business in Ukraine is that most IT companies are outsourcing companies. The attractiveness of Ukraine for the work of outsourcing companies is also confirmed by statistics, one indicator of which is a steady growth, an average of 15%, the number of employees in the top five largest companies. The trend is also confirmed by international research. So, according to the Global Services Location Index, which ranked countries by the attractiveness of outsourcing business, Ukraine rose immediately to 17 positions and ranked 24th. The International Association of Outsourcing Professionals IAOP has published a rating of the best outsourcing companies, The 2015 Global Outsourcing 100, which brings together 75 market leaders and 25 «upcoming stars.» The list included 7 companies operating in Ukraine, of which 4 companies were among the top five. TEAM International Services, Intetics, Miratech and Softeng ranked 2, 3, 4 and 5 respectively in the category of «upcoming stars». Luxoft, SoftServe and EPAM (18, 26 and 51 palces) [7] were noted in the category Leader.
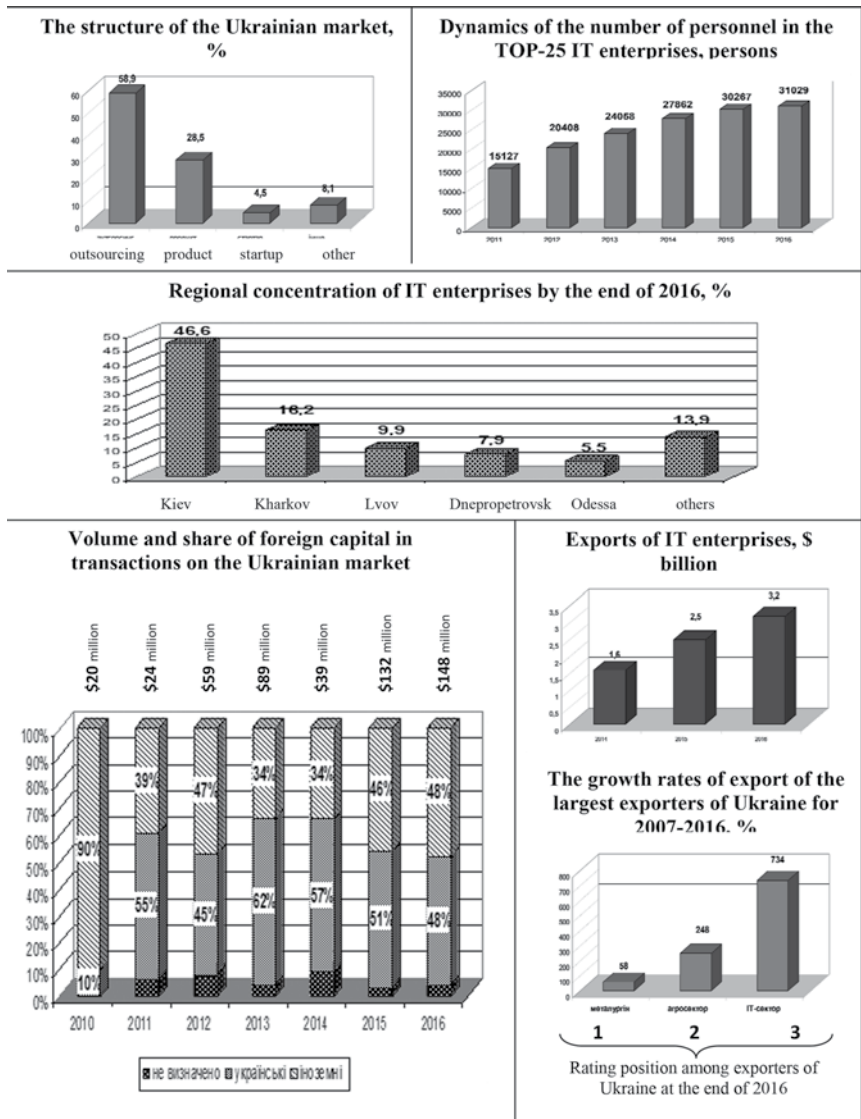
Fig. 2. Indicators that characterize Ukrainian activities of IT enterprises
* Source: formed by the author

According to the results of 2014 only EPAM Systems fell out of top hundred, but in 2015 experts interviewed by IAOP returned the company back to the rating. EPAM is the leader of the outsourcing market in Ukraine. According to a recent study by the web portal Dou.ua, the company employs 4400 people, more than 800 of whom have become EPAM employees for the last year. This is the most dynamic player in Ukrainian market. During 2015 the Company's stock value has almost doubled. According to Forbes EPAM is the only IT company in Ukraine that included to the list of the largest companies in the country. Large software foreign companies like Luxoft and Ciklum also have development centers in Ukraine. The first one has some offices in three cities in the country and more than 3,700 employees. The second one has about 2300 employees in six Ukrainian cities.

After a short-term decline in 2014, Ukrainian IT sector showed record growth in 2015. The market exceeded the activity indicators of trading activity for the previous years. The investment market of the country has reached 132 million USD in 2015, which 240% growth is compared with the previous year, when the decline of the market was 55% comparing with 2013 (according to open agreements). Taking into account undisclosed deals, the market is estimated $ 172 million. Also, despite pessimistic forecasts, foreign investors have not lost interest in the Ukrainian hi-tech sector, whose share of investments in 2015 was 40% [7, 8].

2016 is characterized by the continued trend of organic growth for increase the volume of exports by IT enterprises. In 2016 the growth of the industry amounted to 20% (from 2.5 to 3 billion dollars). The President and Prime Minister of Ukraine has declared the necessity support and develop IT industry as strategically important for the Ukrainian economy. Adoption of the Law on simplifying the export of services for the development of the IT industry, increasing the state order for graduates of technical specialties.

The vast majority of IT companies in Ukraine operate under standard offshore schemes where the customer is a direct counterparty of a foreign offshore company, while a Ukrainian contractor is an executor of works commissioned by an offshore company. A typical IT development company, that provides services for foreign customers, represents the following structure: a Company is registered in a country where the Management team is located and all taxes are paid in the country of registration. Foreign customers

make payments to the company's account, and all taxes are paid from these funds. Local workers are being recruited to work for this company.

However, Ukrainian IT companies prefer a scheme for company profits optimization, according to which an offshore company is registered, which will become a mediator between buyers and a local resident company. Foreign customers make payments to an offshore company account. An agreement on the execution of IT services is concluded between offshore and resident companies. The Offshore transfers to the account of the local company exactly as much money as it would be enough for its expenses, and all other profits remain in the account of the offshore. As a consequence, for the Ukrainian IT company tax optimization is underway. And, besides that, settlements with clients are simplified, as offshore activities do not come under currency control. It is enough for an overseas client to provide an invoice for payment, it is not necessary to sign a separate agreement and acts of performed work, as required by Ukrainian legislation when conducting foreign trade activities by Ukrainian resident companies.

However, not all investors are ready to work or invest in a classic offshore company. In particular, Google does not pay offshore accounts with either GooglePlay or GoogleAdSense, and, according to their policies, a bank account must be opened in the country of registration of the company. Apple and Microsoft are loyal to this matter. A better option for long-term and business-focused companies is to open a company in a respectable, simplified tax system where the company operates in reliable and stable jurisdictions. There is the protection of assets and property. Investors and banks are willing to work with such companies. These jurisdictions include partner companies in England and Scotland (LLP), Asian countries such as Hong Kong and Singapore, the United States, the State of Delever. From minuses — in order to avoid taxation, you cannot operate in the territory of the country of registration; high cost for company registration, compared to ordinary offshore; open owners register; reporting.

By various estimates, the industry employs up to 100,000 IT professionals, of which 25% of all programmers work in TOP 25 companies. Ukrainian IT business is concentrated in five cities: Kyiv, Kharkiv, Lviv, Dnipropetrovsk, and Odessa. At the same time, almost half of the IT market is concentrated in the capital. In the occupied territories of the Donbas and the Crimea, the information technology market was relatively weak, so

their losses were largely unaffected by the IT industry as a whole. In addition, most of the companies left the occupied territory.

Experts and analysts predict a slow growth of the Ukrainian IT market in the coming years. To date, market players have adapted to a difficult period and began to create, in addition to the regular budget, a crisis IT budget. Of the positive trends, it is worth highlighting the expected transition of government agencies to electronic document circulation and electronic services, the development of the concept of «Internet of Things» (when devices, sensors, industrial and household equipment connect to the Internet), the introduction of cryptography, reorientation of companies to commercial datacenters (data centers, centers data processing). The category of secure data storage and cyber security will be steadily used all in all.

In addition, the signing of the Association Agreement with the EU is an important global factor affecting the development of IT in Ukraine. Within the framework of this agreement it is necessary to ensure implementation of a number of steps concerning the IT sphere, in particular: implementation of the Convention on cybercrime; recognition of European digital signatures; definition of computer services based on UNSCR84; drafting of a bill aimed at adaptation to the European law in the field of IP (Internet Protocol); improvement of labor legislation; involvement of Ukraine in the program COSME (Competitiveness of enterprises and SMEs); introduction of e-government and individual elements (e-court, e-procurement, etc.); legislative stimulation of research centers and new IT companies; reduction of the number of regulatory and control bodies, elimination of duplication of their functions; development of cooperation in the field of innovation activity between the state, business entities, educational institutions and research institutes; Definition at the legislative level of the concepts of "business center", "business incubator", " clustering", "subconstration"; encouragement of business entities to social responsibility of business; reforming tax policy, etc.

Among the reasons that slow down the development of companies in the short term, employers focus mainly on political instability. The armed conflict in the Donbass has created additional factors of the risk of IT companies operating in the Ukrainian market. The war has become a major factor in hindering, first and foremost, the development of IT outsourcing. For outsourcing clients, the continuity of the development process is import-

ant. The result of investors' fears of a conflict outside the Donbass caused a significant slowdown in industry growth during the first two years of the conflict — from 20-25% to 10-15% annually. In order to diversify the risks of economic and geographical location, companies began actively to relocate offices. The main areas were Poland, Romania and the Czech Republic.

Additional risks of IT company activity result in lack of effective support from the state and effective legislative framework, which is expressed in the level of stability of the country's economic and legal environment. The adoption by the Verkhovna Rada of Ukraine on January 22, 2012, of the Law on support of the IT industry, according to experts, marked the beginning of a stage of positive change. It is worth noting that during the last time some steps have been taken, at least declarative, which defined the framework for interaction between the state and the IT business in Ukraine. In particular, according to a new government project, which envisages creation of 100 thousand of working places in this area, by 2020, Ukraine intends to become leaders in the field of IT outsourcing. The said project stipulates that for domestic IT-specialists, suitable working conditions will be created to prevent the outflow of highly skilled personnel. In addition, the bill provides for a revision of the tax legislative framework to ensure Ukraine's competitiveness on the international market. The project was sponsored by authors, whose expert group includes both government representatives and the heads of leading IT companies operating in Ukraine, entrusted the export of IT services and the development of an e-government model.

According to experts, the IT outsourcing market is quite rigid and competitive. It is also characterized by high professionalism in the provision of services and dynamic development. According to the authors of the project, Ukraine, which is now one of the leaders in IT in the Central and Eastern Europe, may in the years to come, be one of the leading IT service providers in the global IT market, in real competition. China and India, which according to various estimates totally control about 90% of the global outsourcing market.

Serious threats to domestic IT companies lead to illegal actions by law enforcement agencies and legal risks. Illegal actions lead to companies being stopped by illegally removing servers and other equipment, rather than copying information in order to obtain a bribe [9]. In addition, certain legal

tyranny, which may be encountered by foreign investors in Ukraine in personal order, may negatively affect the overall relationship of counterparties.

The insecurity of copyright and property rights also causes the risks of product sales (for the grocery company). Objects of copyright and related rights have recently been broadly disseminated through the Internet. The legislation of Ukraine on the protection of such objects does not contain the necessary legal instruments for their protection in the network. Draft amendments to the various laws proposed today focus mainly on regulation of the sphere, and not on solving the problem. According to data published in early February 2015 in the special annual report of the International Intellectual Property Alliance (IIPA), also known as the «301 list», Ukraine ranked first in the ranking of infringing states of intellectual property rights. The situation with the protection of intellectual property rights holds back the growth of the Ukrainian economy in general and the IT market in particular. At this level, Ukraine ranked last in the world rankings.

Currently there is a significant staffing crisis in the IT industry. The high level of labor market mobility in the IT sector stimulates the drain of the best personnel. Political and economic instability in the country contributes to the desire of specialists to go abroad. According to the latest survey among IT specialists, almost 70% of them are willing to leave the country. Despite the effort of IT companies in educational initiatives, the overall level of qualification in IT fields is decreasing. On the IT labor market there is an imbalance of demand and supply of specialists. The main problem for Ukrainian IT companies today is the deficit of middle/senior engineers. This imbalance in the IT market is due to negative trends in the Ukrainian educational sector (at all levels), which threaten the development of the IT industry. At the same time, availability of qualified specialists is an essential competitive advantage of Ukrainian IT companies in the global market. By deterioration the quality of basic and technical education in Ukraine, this advantage may be lost.

Impact analysis of global IT trends on the development of the Ukrainian IT sector, the main conditions for the functioning of the national IT market, and investigation of the main threats to the IT companies, have allowed to develop framework which contributes to the algorithm of the questionnaire. Based on the materials of our surveys conducted by senior and middle managers of 12 IT companies in Kyiv, conducted during

2015-2017, we outlined and summarized the main parameters of the risks we have allocated for IT companies in Ukraine: «personnel», «processes», «structure «, «client» and «growth «.

For the group «personnel» it was developed number of parameters, which insure sustainable development of the IT companies as well as continuous improvement. Those parameters are: the level of dependence on particular employee, the availability of adequate personnel pool in the labor market; difficulties in recruiting new personnel; "hunting" of personnel by a client / competitor; the level of maturity of corporate culture; loyalty of staff; staff turnover. Among the main risks of the «client» group are defined: the risk of loss of the client; difficulty finding clients; client satisfaction with product/service quality; client geography; the risk of a crisis in the client's industry; client dissatisfaction with staff turnover. The group of risks «structure» includes: the level of diversification of risks of economic and geographical location; the level of stability of the economic and legal environment of the country-location; conflict among shareholders/owners; risks associated with the product launch (for the product IT companies). The group «growth» includes: the ratio of growth rates of revenue and the growth rate of the market; the ratio of profitability of company comparing to the average market profitability; the ratio of growth rates of fundamental and market capitalization.

With a company size of 1 to 10 employees, the "personnel" score is critical, because for a small number of staff, there is a significant dependence on individual employees who perform the core functions of the organization (one men dependency). Potential problems can be related to the loss of key expertise, the deterioration of relationship with the client, a significant increase of load for other team members. Potential solutions to this problem may be the systematic work of maintaining knowledge within the company, through regular exchange of information with colleagues, recording video/audio lectures, webinars, high-quality documentation of architectural decisions and processes. As a means of preventing the problem, the formation of a positive climate in the organization, the regular conduct of team-building events and trainings may be a good solution.

With a company size of 11 to 50 employees, the impact of staff related risks are still high. Companies have the same problems as the smaller ones, but the distribution of bargaining powers is more optimal. The solution

proposed to the managers of the company is similar to the previous option, but with a lower level of mood monitoring for key employees and without their involvement in the distribution of profits. For companies with the number of employees from 11 to 300 people, the level of risk of the group "personnel" is defined as not critical.

The "structure" indicator has a critical level of vulnerability in case of one office location, and an average in the two office locations. The presence in only one region, causes the company's significant dependence on changes in national legislation. For example, changes in the legislation regulating the activities of private entrepreneurs (currently 90% of Ukrainian IT specialists are registered in this form of ownership) will increase the tax burden and, as a result, reduce the margin of business. Consider opening an additional office or looking for a partner company is a potential solution. It will help minimize the location risks associated in one region dependency, providing additional opportunities for relocation of personnel in the event of any force majeure. At the beginning, the easiest way of location diversification is to go to regions with the most similar mentality and labor market conditions. For IT product companies, it is most logical to be closer to the market for which the product is created, or close to investors.

Woth the two offices, the level of risk is reduced, but in the case where both location offices are in one country the risk are similar to the previous option. In this case, the recommendations remain the same as for a company with one office. When an office is located in only one region, the company may face imbalances in demand and supply in the labor market. One of the solutions to a problem associated with a shortage of key employees may be the opening of an office in a location where such resources are available. For outsourcing and outstaffing businesses, clients are more likely to work not only with locations that have a good cost/quality ratio, but also with those located in nearshore time zones, and have a similar mentality. Clients from North America are actively outsourcing to Latin America, clients from Asia — to India or China, clients from Europe — to Central and Eastern Europe.

In case of shortage of IT specialists, companies should try to create ready-made solutions to gradually shift from the model of sales working hours (time and materials business model) to the solution business model (sales of completed business solutions which aimed to solve client's needs). It will significantly increase the profitability of the business and accelerate

growth. Companies dominated by senior staff are faced with a significant shortage of staff, as well as competition for these staff with other companies. This leads to a slowdown in growth, an increase in overhead costs and an increased risk of loss of key people. To make the business more stable and predictable companies should invest in personnel development. It is worthwhile conducting a large number of trainings in order to intensively raise seniority level of staff.

When team structure is dominated by junior specialists, there is a significant risk that the product/service will not meet high standards of quality which could cause damadge to the relationship with the client. Unskilled personnel inevitably leads to increased overhead for management, delays in implementation timelines and, as a result, additional costs.

Ukraine is ranked 7th through the level of country risks systematically assessed by the Organization for Economic Cooperation and Development. It is characterized by high corruption, inefficient judicial system, high cost of financial resources, low level of citizens' security, etc. This situation leads to the outflow of skilled personnel and the low attractiveness of location by foreign clients. It is necessary to work on the business deversification, the opening of new locations, the search for new international partners and the conduct of business in the most secure locations. It is also necessary to conduct systematic work with clients aimed at increasing loyalty to the Ukrainian location and providing high-quality information on potential problems and a plan of action to minimize its consequences.

Working with offshore jurisdictions often has a negative reputational effect and creates certain instability risks, as developed economies systematically work on their legislation to reduce the risk of «gray operations» and minimize taxes. Large international clients see risks in dealing with offshore jurisdictions. Tax optimization should not be the main factor of marginality. Sometimes it's worth decrease marginality in order to attract clients who are not ready to work with offshore jurisdictions.

In the case of several shareholders, there is always the risk of a conflict over strategic issues. These issues may include strategic positioning, business model definition, localization strategy, etcConflicts between shareholders may also emerge around financial issues, in particular regarding the distribution of profits. . It is desirable to write down in detail all the nuances in partnership contact and dicuss all possible scenarios in advance.

Summarizing the above, we can conclude that in the medium term, the global IT market will continue to grow. The IT market is global in the full sense of the concept. The high degree of mobility is inherent both for capital and technology, and for the workforce. In addition, the level of technology development is an indicator of the level of development of national economies. Such trends will require countries to increase investment, both internal and external, in the sector, harmonization of regulatory legislation in this area, support and development of productive capacity. Ukrainian IT companies that have accumulated significant intellectual potential and experience in this segment have all the prerequisites for further growth, strengthening their positions in the market and increasing the level of their attractiveness for both existing and potential clients. However, it is necessary to focus attention on the fact that the further development of domestic IT companies is to a large extent limited by factors of the environment (political instability, imperfection of the legislative basis, unlawful actions of power bodies, etc.). Minimization of both external and internal factors of influence on the functioning of IT companies highlights the need to focus the attention of top management to four key projections: personnel, clients, growth, structure.

REFERENCES

1. Gartner: в 2017 году мировой рынок ИТ вырастет до 3,5 трлн долл. [Електронний ресурс]. — Режим доступу: http://www.computerworld.ru/news /Gartner-v-2017-godu-mirovoy-rynok-IT-vyrastet-do-35-trln-doll
2. Big Success With Big Data Executive Summary [Електронний ресурс]. — Режим доступу: www.accenture.com/us-en/_acnmedia/ Accenture/ Conversion-Assets/ DotCom/Documents/ Global/PDF/ Industries_14/ Accenture -Big-Data-POV.pdf
3. Чижов В. А. Актуальність досліджень глобальних тенденцій розвитку ринку в роботі кризис-менеджера ІТ-компанії / В. А. Чижов // Проблеми і перспективи економіки та управлінню — 2016. — № 3 (7). — С. 110-116.
4. Columbus L. Roundup Of Analytics, Big Data & Business Intelligence Forecasts And Market Estimates [Електронний ресурс]. — Режим доступу: http://www.forbes.com/sites/ louiscolumbus/2015/05/25/roundup-of-analytics-big-data-business-intelligence-forecasts-and-market-estimates-2015/#1f4317514869
5. Gartner Says Worldwide IT Spending Forecast to Grow 2.7 Percent in 2017 [Електронний ресурс]. — Режим доступу: http://www.gartner.com /newsroom/id/3568917
6. Інвестиції в ІТ: головні події року, що минає [Електронний ресурс]. — Режим доступу: http://news.finance.ua/ua/news/-/366435/investytsiyi-v-it-golovni-podiyi-roku-shho-mynaye

7.   Eisenberg A. Конференція IT Weekend 2014. Наслідки кризи в Україні для ринку IT. [Електронний ресурс]. — Режим доступу: http://ignitejobs.com.ua/weekend–ukrainska–kriza–naslidki–dlya–galuzi/

8.   Ворона Т. 15 IT-компаний, которые сменили бизнес-модель и теперь стоят миллиарды долларов [Електронний ресурс]. — Режим доступу: https://ain.ua/2014/11/16/15-it-kompanij-kotorye-smenili-biznes-model-i-teper-stoyat-milliardy-dollarov

9.   Збитки українських IT-компаній від обшуків силовиків в 2015 році склали $10-20 [Електронний ресурс]. — Режим доступу: http://watcher.com.ua /2016/03/09/zbytky-ukrayinskyh-it-kompaniy-vid-obshukiv-sylovykiv-v-2015-rotsi-sklaly-10-20-mln/

THE NEW CONCEPTUAL APPROACH TO THE EVALUATION OF INNOVATIVE BUSINESS DEVELOPMENT (APPLIED TO UKRAINIAN PHARMACEUTICAL ENTERPRISE "FARMAK")

G. Shvydanenko
Phd in Economics,
Professor of Business Economics Department,
SHEI "Kyiv National Economic University
named after Vadym Hetman"

O. Borodkov
Master of Business Economics Department,
SHEI "Kyiv National Economic University
named after Vadym Hetman"

O. Pereverzieva
Master of Business Economics Department,
SHEI "Kyiv National Economic University
named after Vadym Hetman"

In a market economy, it is increased the importance of objective necessity and the innovative development of market relations, which determines the level of their performance and innovations become the crucial precondition for competitiveness in a competitive environment.

The development of economic activity and the national economy can be achieved in various ways, depending on the selected strategies [4]. Let's consider the main ones (Fig. 1):

Innovative development should be considered, like the development based on the continuous searches and using new methods and fields of realizing the potential of the company in variable environmental conditions within the chosen mission and adopted motivating activity that is associated with the modification of existing and formation of new markets.

Innovative potential is a potential that incorporates industrial, scientific, financial, marketing, human, organizational resources and capabilities that allow the company to plan and innovate in continuous improvement of management on the basis of dynamic market environment.
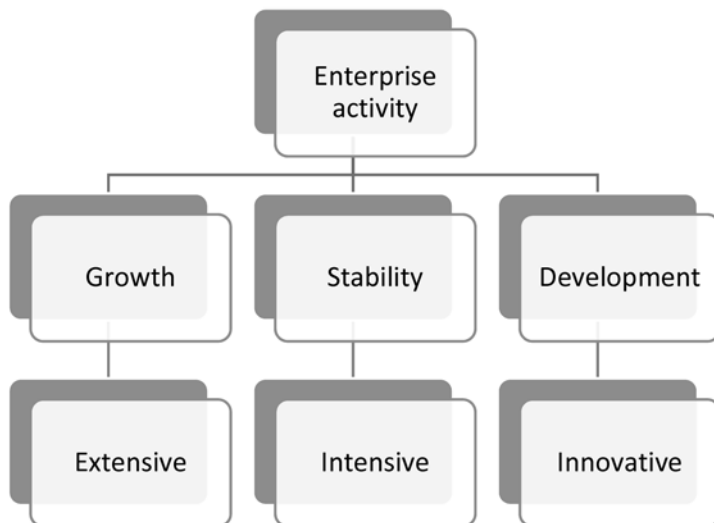
Fig. 1. Selection directions of enterprise development based on strategy*
* Source: compared by author on the basis of [4]

Some scientists propose to introduce a broader concept of "potential innovation development" [PID], which includes a set of innovative resources the constituent elements of the enterprise as a system: (logistical, technological, informational, financial, economic, etc.) [6].

Analyzing approaches to interpretation and evaluation PID that exist in modern economic science and practice, we note that most often it is based in isolation on the components of the internal environment of organizations and form innovative development potential (IDP) [5] (Fig. 2):

→ Market potential

→ Innovative potential — intellectual, interface, information and scientific and research components.

→ Production and sale potential: financial, labor, technology and others.

It is best to select the following items IDP:

Moving on an innovative path of development is possible only under certain conditions (Fig. 3).

In order to reduce the backlog of business enterprises of Ukraine from companies of developed countries and not to allow the country to become

an eternal outsider and raw materials appendage, it is necessary to change radically the strategy and the model of economic development.

Fig. 2. The structure of the potential of innovative development*
* *Source: compared by author on the basis of [5]*

Fig. 3 Prerequisites of transition subjects of market relations to the of innovative development models*
* Source: formed by the author

It should be mentioned the fundamental difference between showing innovative models in the works of local and foreign scientists: in the latter the definition "model of innovative development" as such is rare. Instead commonly used definition is "innovative business model" that is carried out a systematic approach to evaluating IDP [25-28].

Emphasis of the analysis of innovative company development displaced depending on the time period and the level of economic activity.

Using the approach to defining the essence of innovative forms of assessment criteria in the time, there are two groups of methodological approaches, including:

✓ Innovative audit, as a way of evaluating and analyzing the innovative development and determination of the existing capacity of the company at a certain time.

✓ Analysis methods of using available innovation potential of the enterprise, assessment of prospects and performance conceived projects.

Innovative audit includes assessment processes of innovative business opportunities and their components:

– Innovative position;

– Innovative activity of the enterprise.

– Innovative environment;

– Innovative potential;

Analysis methods of using available innovation potential of the company, evaluating prospects and performance conceived projects can be identified in areas of use:

The financial efficiency and effectiveness, based on modified dynamic methods of calculation of economic efficiency of innovative projects:

• method of net present value NPV.

• method of calculating the profitability index PI.

• method internal rate of return IRR.

• method of calculating payback period PBP.

It should be noted that, despite the fundamental importance of these indicators design procedure requires constant improvement and adjustment, taking into account the specific objectives and activities. These methods are the most interesting for investors and shareholders.

✓ Methods that include evaluation of various options.

To summarize the various methods of assessing the potential of innovative and the prospects for its use, they should be distributed into two groups:

• Quantitative: economic and mathematical modeling and analytical methods;

• Qualitative: using subjective forecasts of experts;

✓ Combined: is often the most effective, as it includes all of the above (or most of them), and have a minimal level of subjectivity.

The most famous in the CIS are classic methods of calculating the economic efficiency of innovative projects, economic and mathematical models, market methods when developing a new product, their modernization and adaptation according to the specifics of the company.

Regarding the the developed foreign countries, we can give as an example of comprehensive evaluation method RADAR Improvement Model EFQM (Excellence Framework), which is one of the main standards of quality evaluation of innovative projects in the EU. This technique allows to measure deployment approaches in all areas of the organization (criteria group "Opportunities").

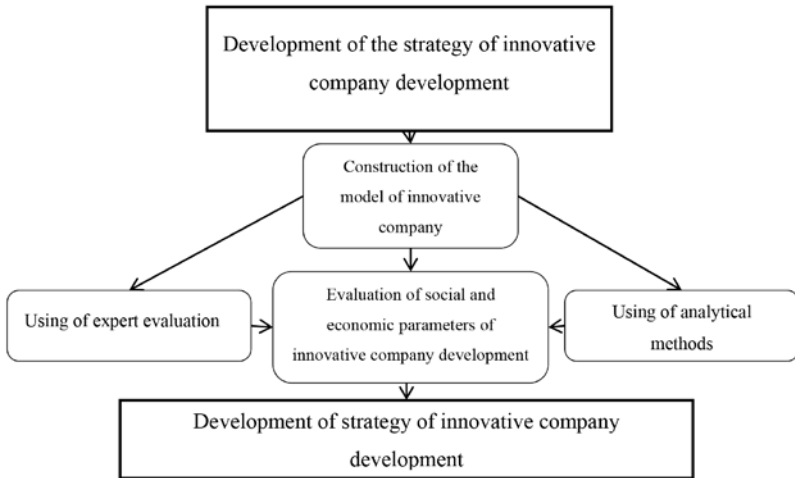In general form the evaluation process of innovative potential of the company is shown further (Fig. 4).

Fig. 4. A typical procedure for evaluating the potential of innovative development *
Source: compared by author on the basis of [14]

As already mentioned above, the basic methods of evaluating the potential of innovative development can be divided into expert, quantitative and comprehensive.

It should be noted that all methods are somehow related to each other, due to, firstly, the specificity and scope of the company, and as a conse-

quence, the impossibility of creating universal indicators, secondly, without preliminary expert evaluation, quantitative methods be inflexible and does not cover everything that leads to distortion of the assessment.

Thus, based on a study of existing methodological approaches to the evaluation of innovative development company, we provide recommendations to improve the system of evaluation of innovative development company. We found that the main task of developing guidelines is to ensure the construction of such a system of evaluation of potential of innovative company development that could:

I. Comprehensively cover all the components of the enterprise as an economic organization;

II. Determine the number of participants IDP assessment process;

III. Determine the composition of indicators and evaluation criteria;

IV. Consider the regulated and unregulated influence factors to the level of innovation in the development of the evaluation system.

V. To have a high level of flexibility associated with its ability to adapt and effectively use in any enterprise, given the characteristics of its business.

It is proposed a general evaluation of IDP exercise by components that characterize its most important aspects, taking into account external factors influencing them. Appropriate, in our view, should be evaluation procedure IDP and its recommendations for testing to a specified company (individually) (Table 1).

Table. 1

Parameters of structural components for evaluating IDP

Elements	Indicators of the development components	Indicators of innovative components	General indicators components
Organizational	The legal form of the company. The organizational structure of the company. Infrastructure of the company	Organizational structure, process technology on all functions and projects and organizational culture. Availability departments responsible for development and innovation. Availability of established relationships between departments to implement innovative projects	The presence of a key person in management;

Elements	Indicators of the development components	Indicators of innovative components	General indicators components
Financial and economic	Revenues from the sale. Non-operating income. Production costs. Distribution of profits. Profitability. Break-even point. Accounts receivable and accounts. The value of working capital. The capital structure. Share premium. Financial stability	New or improved ways of financing innovative projects. The share of the production of new or improved products. Potential investment opportunities for innovation. The possibility of funding different types of innovation. New or improved methods for obtaining the loan. The share of investment in research and development and intangible assets	The presence of staff empowered and interested in innovation; Evaluation of organizational management structure and internal communications; Assessment (and) the introduction of new techniques and management standards; The presence of of mechanisms of adaptation or reorganization of the management structure; The Balanced Scorecard
Industrial	The cost of fixed assets and the degree of wear. The degree of utilization of production capacity. Ensuring raw material and fuel and energy resources. The volume and range of products. Commodity stocks	The cost of research equipment needed to perform research and development. The average value of intangible assets (know-how). The use of advanced raw materials. The number of new products introduced (essentially new, new to the industry, new to the enterprise). Number of new developed technologies	
Marketing	The volume of trade. The main suppliers of raw guilt. Major producers of products. The main markets. Remains of finished products in stock. The maximum and minimum prices. Competitive strategy	The proportion of new markets. The share of new sales methods. The development of new sources of supply of crude or semi fault. The number of existing and potential channels through which distributed new products. The system is efficient customer service. Availability of databases existing and potential customers and buyers	New trading methods, markets The emergence of new brands and trademarks

Elements	Indicators of the development components	Indicators of innovative components	General indicators components
Human resource	The number of workers. The structure of employment. The level of wages. The level and dynamics of labor productivity. The level of complexity. The intensity of traffic on the reception staff. Productivity	The proportion of workers in the intellectual sphere in total employment. The proportion of people who are highly qualified in the specialty and profile work. The proportion of those engaged in research and development, which are the authors of patent applications in total employment. New methods of training staff. The development of radically new organizational forms of cooperation with employees	The effectiveness of the mechanism of management of intellectual property; Prospects for attracting innovative managers; The use of new organizational forms of cooperation with internal and external entities: active, passive, indirect
Social	Types and amount of social payments to employees. The cost of SC measures. The structure and the cost of non-productive assets	New types and amounts of social benefits and measures. The latest non-productive assets. The share of social and cultural activities	
Scientific and technological	The number of scientific developments that have been put into practice activities of technologies, types of goods. The amount of research and development. The stage of the product life cycle. The competitiveness of goods	Using new methods of production, advanced technology. The combination of different types of scientific data and information from innovation, scientific and technical information. New high technologies, systems and equipment, computer systems. Scientific and technical and design documentation	Patent data and / or Data on international patenting

Source: formed by the author

It is expedient to use these Fig.s, because these parameters are most influence on the system of the innovative capacity and can see a more complete picture, and easily get their calculation of the available sources for researchers.

Analysis of innovativeness of PHC "Farmak"

"Farmak" today is a large and powerful company, which every year is growing, evolving, moving to new, higher levels. "Farmak" occupies a leading position among pharmaceutical companies in Ukraine and CIS drugs' market (Table 2).

Table 2

Key activity indicators of PHC "Farmak", 2016

Indicators units. of measurement	Value 2016	Value 2015
Sales bln.	2,6	2,45
The market share of Ukraine		
among all manufacturers of medicinal products, %	6,2	5,6
among Ukrainian manufacturers, %	17,1	16,26
The share of export, %	22,61	22,37
The amount of investments in technology projects, mln. UAH	250	
Including in the innovative technologies (innovative project in Shostka), mln. UAH	70	
Other investments (Project «PLZ 2» is an open modern development laboratory of liquid medicines), mln. UAH	480	
Company's own funds, ths. UAH	1 684 033	
Capital	2 736 756	

* Source: formed by the author

Based on the data table shows that the PHC "Farmak" is a company that is a leader in its field and has an active innovation. The biggest project to date — the plant for the production of substances (c. Shostka). It is not just individual production and complete plant with all modern utilities. The ability of modern infrastructure that has this area, will further develop the production of substances directly not only to "Farmak", but also for other pharmaceutical companies Ukraine and abroad.

Conduct the rapid evaluation of innovative development (Table 3):

Table 3

Calculation of component indicators of innovative potential (IP)

Component IIP	Calculation / Value		Weight number ($\Sigma mj = 1$)
Human resources	quotient of the research-active staff (with higher degrees of education) to the total number: $I_{hr} = 1402 / 2409$	0,582	0,2
Financial and economic potential	quotient of the Company's own funds / The total amount of capital $I_{fe} = 1\ 684\ 033 / 2\ 736\ 756$	0,615	0,1
Scientific and technological potential	quotient of the registered own new developments to existing amounts being developed: $I_{st} = 40 / 74$	0,541	0,2
Production and sale potential	– The level of development of new products and / or new technologies: 20/131 = 0,153, in percentage: * 100 = 15,3 %, If the technology: 1/6 = 0,167, in percentage: * 100 = 16,7 % – quotient of the possible (such planned) sales to existing routes, or uncaptured market shares: Distribution channels: taken mainly exported (because exported more than 22.3% of production): Available : CIS and Asia — 5 from 10 possible, Europe — 3 from 5 possible in time: (5 + 3) / (10 + 5) = 0,533 $I_{ps} = 0{,}6*15{,}3 + 0{,}4*53{,}3 = 0{,}0918 + 0{,}2132$	0,305	0,4
Patent and legal potential	quotient of the unpatented products to produced $I_{pl} = 131/220$	0,595	0,1
Indicator innovation potential	$IP = \dfrac{(I_{hr} \cdot m1 + I_{fe} \cdot m2 + I_{st} \cdot m3 + I_{ps} \cdot m4 + Ipl \cdot m5)}{\Sigma mj}$	**0,472**	X

* Source: formed by the author

The results obtained by calculations it can be concluded that the existing innovation potential is now at 47.2%.

If the indicator shows the innovative potential of analytics possible provisions for innovation and share their use, the intensity of this Figure shows innovation activity.

Calculate defines innovation activity index IA, which characterizes the rate of innovation and creation of innovation of market relations in the economy (industry) (Table 4).

Table 4

Calculation of component indicators of innovation activity (IA)

Indicators IA	Calculation / Value		Weight number ($\Sigma m_j = 1$)
1. The impact of innovation	(Net) Income from implemented innovations / Total earnings (income) 79330 / 241865	0,328	0,1
2. The attitude of employees working in research and development toward to the total number of staff with higher education	115/1402	0,132	0,1
3. The attitude of actually implemented innovative projects to planned and / or which are at the stage of implementation, in quantitative or qualitative terms	one realized at the moment of the three planned (№ 6 workshop in Shostka): 1/3	0,333	0,1
4. The level of innovation financing:	investment in the implementation of innovative projects and products / Total investments = 70 / 250	0,28	0,1
5. Savings resulting from innovation	Effective cost / General spent money for innovative projects and products = 81 492 / 131 427	0,62	0,2

6. Timeliness implementation of innovative projects	The planned / actual elapsed time (in months) Project in Shostka was completed a year of the planned one and a half: 18/12	1,5	0,4
Index of innovative activity (IA)	IA = 1,5*0,4+0,62*0,2+0,28*0,1+0, 333*0,1+0,132*0,1+0,328*0,1	**0,831**	X

* Source: formed by the author

Consequently, the company that was analyzed sufficiently has a high level of innovative activity and quickly realizes conceived projects.

Index of innovative development I_{id} defines as:

$$I_{id} = \sqrt{IP \cdot IA} = \sqrt{0,472 \cdot 0,831} = 0,626.$$

The closer the value of I_{id} to one, means the higher the level of IDP. (Table 5).

Table 5

Verbal and numerical scale values Harington's interpretation of I_{id}

Graduation of quality intensity	The numerical intervals
Very High	1,0 — 0,81
High	0,8 — 0,631
Middle	0,63 — 0,371 (**0,625**)
Low	0,37 — 0,21
Very Low	0,2 — 0

* Source: formed by the author

Consequently, the company has studied the average level of innovative development, a great-untapped innovation potential and high level of innovation activity that is PHC "Farmak" this is now developing.

The results suggest that the strengths PHC "Farmak" can result in a significant level of their capital for innovation, infrastructure and existing facilities that have no analogues in Ukraine.

Weaknesses is the lack of innovation and employment potential of employees as part of a small busy towards R & D, so it is necessary further explore the willingness of employees to identify innovative changes and

innovative ideas and initiatives. There is not realized potential sale of the company.

Conclusions. In order to adequately assess the current situation and the choice of perspective directions of innovative development of the enterprise should conduct systematic and timely assessment of the existing innovation potential that will enable them to adjust and predict the likelihood and character of the results of innovative activity.

The need for making an objective assessment of innovative company development also because using this indicator entity can promptly detect a threat to innovation crisis and quickly prepare appropriate tools to overcome the crisis, allowing the maximum to minimize impact and increase the effectiveness of decision-making.

Having performed an analysis of the problem, it was concluded that there is no single methodology for evaluating of innovative company development, due to ambiguous interpretation of the concept of "innovation capacity" scientists and various theoretical and methodological approaches to its evaluation. The most famous in the CIS are classic methods of calculating the economic efficiency of innovative projects, economic and mathematical models, market methods when developing a new product, their modernization and adaptation according to the specifics of the company.

Having a rapid evaluation of PHC "Farmak" using modified methodological approaches, it was found that the analyzed company has the average level of innovative, a great untapped innovation potential and high level of innovation activity, that is such an enterprise develops.

REFERENCES

1. Law of Ukraine "About Innovation Activity": as at Dec 5. 2012/ Verkhovna Rada of Ukraine. — Official. edit.– K.: Parliamentary publishing house, 2012. –p. 14 — (A series of "Laws of Ukraine")
2. Osmyatchenko L. M., The methodology of evaluation of intellectual capital: monograph / L. M. Osmyatchenko. — K.: KNEU, 2012. —205 p.
3. Radziwilo I. M., Improving the mechanism of estimation of innovative potential of industrial enterprises / BusinessInform,– 2012. — № 8 — pp.142-148.
4. Melnyk L. G., Karintseva O. I., Illyashenko S. M. and others. Enterprise Economics: Textbook / According to the gen. edit. PhD., prof. L. G. Melnyk. — Sumy: SHS "University Book", 2004. –648 p.
5. Management and marketing innovations: monograph / According to the gen. edit. PhD., prof. S. M. Illyashenko. — Sumy: SHS "University Book", 2004. –616 p.

6.   Balabanov I. G. Innovative management: Train. Allowance / I. G. Balabanov. — St. Petersburg.: Peter, 2001. — 340p.

7.   Lengrand L., SMART INNOVATION: A Practical Guide to Evaluating Innovation Programmes,/ A Study for DG Enterprise and Industry/ Supporting the Monitoring and Evaluation of Innovation Programmes/ Louis Lengrand & Associés, — January 2006.– 199 p.

8.   Shestov A. G., Issues of assessing the effectiveness of business incubators in the tasks of combined analysis and evaluation of innovation structures,/ «Naukovedenie»/ Shestov Andrey Gennadievich, — 2013.– № 4 — pp.2-6.

9.   Auerswald P., Placing Innovation: A Geographic Information Systems (GIS) Approach to Identifying Emergent Technological Activity,/ Philip Auerswald, Lewis Branscomb and Sean Gorman/ National Institute ofStandards and Technology/U. S. Department ofCommerce, — 2007.– NIST GCR 06-902 — 91 p.

10.   Osterwalder A., Pinje I. Building Business Models: A Handbook of the Strategist and the Innovator — Alpina Publisher, 2011 –288 p.

11.   Sai L. P. Innovative development stage on scientific and technical preparation of production: Abstr. diss. PhD: 08.06.01 / L. P. Sai ; Nat. University "Lviv Polytechnic". — L., 2006. — 21 p. — ukr.

12.   Mouhallab S., Standing Points of Innovation Capacity,/ Sofia Mouhallab and Wei Jianguo/ Journal of Economics/ Business and Management,– 2015.– V.4, №. 1,– p.53-57

CHAPTER 6.

Priority sectors for small and medium enterprises as drivers of economic growth

SME POLICY INDEX IN ASSESSMENT OF BUSINESS DEVELOPMENT LEVEL IN UKRAINE

A. Ivashchenko

PhD (in Economics), associate professor,
Corporate Finance and Controlling Department
State University "Kyiv National Economic
University named after Vadim Hetman"

Due to the importance of small and medium business development for economic growth it is essential to analyze the main benefits and constraints for its creation and further development. The mentioned analysis could be conducted by using different international rate methodologies namely Doing Business, Economic Freedom Index, SME Policy Index, etc.

In the research, it is reasonable to analyze SME Policy Index aimed at revealing the main business strengths and weaknesses. This index is applied for emerging economies regarding monitoring and evaluation progress in SME development policies.

The SME Policy Index was developed by Organization for Economic Co-operation and Development (OECD), the European Commission, the European Training Foundation (ETF) and the European Bank for Reconstruction and Development (EBRD). The structure of index is presented by 10 principles of the Small Business Act for Europe (SBA), based on the best practices of doing business in the EU.

The assessment of the SME Policy Index is focused on the Eastern Partner (EaP) region, countries-representatives of which have almost similar conditions and business features exemplified as vast agricultural land area, considerable energy and natural resources, well-educated workforce, different trade agreements etc.

EaP region consists of Armenia, Azerbaijan, Belarus, Georgia, the Republic of Moldova and Ukraine. The first assessment of these countries was carried out in 2012 identifying the main challenges for business development.

The second assessment was made in 2016 main idea of which was to highlight key developments and challenges in comparison with the 2012 results. The analysis mainly covers the policy environment for micro, small and medium-sized enterprises [1].

The main idea of the assessment reports is to define the degree of approximation to the EU practices and standards. The principles of SBA were made up for creation of equal conditions for SME and support of business development and competition [2].

The mentioned above assessment provides the officials with the detailed analysis of SME policy implementation and recommendations for its improvement. It also defines strengths and weaknesses in creation, implementation, control and monitoring processes compared to previous country achievements.

The SME Policy Index can be considered as the comparative analytical tool of EaP economies development. The fig. 1 presents the methodology of SBA assessment.
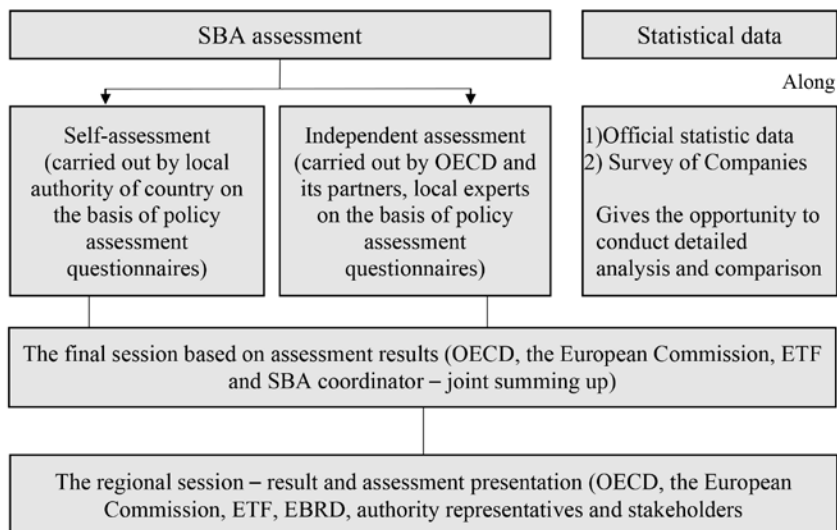

Fig. 1. Methodology of SBA assessment (formed by author on the basis of [1,3])

Along with methodology 10 SBA principles play the pivotal role for scope of SME Policy Index for every country, which are represented in Table 1.

Table 1

Thematic areas for SBA principles

Thematic area	Indicator	Assessment framework
Institutional, regulatory and operational environment	3.Regulatory framework for SME policy making	3.1. Institutional framework SME definition Availability of statistical data Inter-governmental co-ordination in SME policy-making SME development strategy SME policy implementation agency or equivalent Measures to tackle the informal economy (Planning and design, Implementation, Monitoring and evaluation) 3.2. Legislative simplification and regulatory impact analysis Legislative simplification and regulatory guillotine Regulatory impact assessment (Planning and design, Implementation, Monitoring and evaluation) 3.3. Public-private consultations Frequency, transparency and formality of Public-private consultations (Frequency and transparency, Private sector involvement, Monitoring and evaluation)
	4.Operational environment for SMEs	4.1. Company registration Implementation: One-stop-stop company registration Online registration Administrative identification numbers in dealing with the public administration Silence-is-consent principle Performance: Number of days, administrative steps and cost of issuing company registration certificate Number of days, minimum capital

Thematic area	Indicator	Assessment framework
		requirements and cost for completing the overall registration process 4.2. Interaction with government services (e-government) Online filling of tax returns and social security returns Extension to other services (e.g. e-pensions, e-procurement, e-cadastre etc.) Reporting on enterprise statistics Electronic signature (or equivalent) Connection between the databases of different public administrations, companies providing information only once, unless for updates (Planning and design, Implementation, Monitoring and evaluation)
	2.Bankruptcy and second chance for SMEs	2.1. Bankruptcy procedures Laws and procedures on distressed companies, receivership and bankruptcy, including debt settlement Implementation Performance Bankruptcy time Cost (% of estate) Recovery rate (cents on dollar) 2.2. Second chance Promoting positive attitude towards giving entrepreneurs a fresh start Discharge from bankruptcy
Access to finance	6. Access to finance for SMEs	6.1. Legal and regulatory framework Creditor rights Register Credit information bureau Banking regulations Stock market 6.2. Bank financing Lending practices Credit guarantee scheme 6.3. Non-bank financing Microfinance Leasing SLAs Factoring

Thematic area	Indicator	Assessment framework
		6.4. Venture capital Legal framework Implementation Monitoring and evaluation 6.5. Financial literacy Planning, design and implementation Monitoring and evaluation
Human capital	1. Enter-preneurial learning and women's entre-preneurship	1.1. Entrepreneurial learning Policy development – policy partnership – policy development – monitoring and evaluation Policy implementation: – non-formal entrepreneurial learning – good practice exchange – key competence — lower secondary education – key competence — upper secondary education – entrepreneurial experience – entrepreneurship in vocational education and training – entrepreneurship in higher education – higher education cooperation with business – good practice exchange in higher education 1.2. Women`s entrepreneurship – policy support framework – institutional support – good practice exchange – training
	8A. Enterprise skills	Training needs analysis Training for start-up firms E-training for SMEs Training for SME growth Quality assurance Training for internationalization of enterprises

Thematic area	Indicator	Assessment framework
Support measures for competitiveness improvement of SMEs	5A. Support services for SMEs and start-ups	5A.1. SME support services provided by the government Inclusion of business development services in policy framework Information support (e.g. website, campaigns) Business development infrastructure (e.g. incubators) Tailored support services for different SME segments (e.g. start-ups, exporters etc.) (Planning and design, Implementation, Monitoring and evaluation) 5A.2. Government initiatives aiming at stimulation of private business support services development Policy framework Information on private business support services (e.g. B2B portal) Financial incentives for SMEs to use private business development services (e.g. co-financing mechanisms, vouchers, etc.) Business plan competitions (Planning and design, Implementation, Monitoring and evaluation)
	5B. Public procurement	Cutting tenders into lots Information and publication of public procurement Penetration of eProcurement Ensuring that payments are made on time Openness to foreign enterprises, either SMEs or large Setting proportionate qualification levels and financial requirements Allowing SMEs to bid jointly, i.e. to rely on the economic and financial standing and technical ability of other undertakings (Planning and design, Implementation, Monitoring and evaluation)

Thematic area	Indicator	Assessment framework
	8B. Innovations	8B.1. Policy framework for innovation Innovation strategy SME inclusion in innovation strategy Coordination body IP legislation (Planning and design, Implementation, Monitoring and evaluation) 8B.2. Government institutional support services for innovation SMEs SME and research institutions linkages Institutional support services (e.g. incubators, science and technology parks, innovation centers, etc.) Financial support for innovation infrastructure Information support (Planning and design, Implementation, Monitoring and evaluation) 8B.3. Government financial support for innovative SMEs Financial support recognized in innovation strategy Financial support schemes R&D tax incentives (Planning and design, Implementation, Monitoring and evaluation)
	9. SMEs in Green Economy	9.1. Environmental policies targeting SMEs Inclusion in SME strategies Responsible government body Private sector consultation Budget mobilization Sector-specific policies targeting SMEs Operationalization of government body Effective co-ordination with stakeholders (Planning and design, Implementation, Monitoring and evaluation) 9.2. Incentives and instruments Regulatory incentives Financial incentives Private sector consultation

Thematic area	Indicator	Assessment framework
		Evidence of SME benefits from incentives Sectoral approaches in environmental permitting and compliance Environmental management systems Guidance of SME environmental compliance (Planning and design, Implementation, Monitoring and evaluation)
SME internationalization	10. Internationalization of SMEs	10.1. Export promotion Export promoting program Export promoting agency Support services for SMEs Export finance (Planning and design, Implementation, Monitoring and evaluation) 10.2. Integration SMEs into global value chains Business linkage programs Industrial competitiveness clusters Supplier development programs (Planning and design, Implementation, Monitoring and evaluation)
	7. Standards and technical regulations	Overall coordination and general measures Technical regulations Conformity assessment Standardization Metrology Accreditation Market surveillance

Source: formed by author on the basis of [1,3]

Though, it is necessary to analyze indicators described in table 1 for detailed examination of SME policy development in Ukraine.

Taking into consideration such current urgent problems existed in Ukraine as conflict on the east of the country and long-term lack of key reforms, the economy stagnation and recession could be observed as the main constraints for creation and implementation of SME support policy. As the result from 2012 SBA assessment little progress occurs for the majority of business spheres in Ukraine.

Besides, the positive moments of business development within 2012-2016 include implementation of the key measures for business registration simplification, extension of e-government services, elimination of trade

technical barriers, EU standards adoption and so on. On the other side, a lack of access to finance and real long-term strategy for SME could be considered as the constraining force for business development.

For deeper understanding the level of economic conditions` favorableness in Ukraine it is essential to analyze the macroeconomic situation in the country (table 2).

Table 2

The main macroeconomic indicators within 2010-2015 in Ukraine

Indicator	Unit	2010	2011	2012	2013	2014	2015	2016
GDP growth	%, compared to previous year	0,3	5,5	0,2	0,0	-6,8	-9,8	2,3
Inflation rate	%, on average	9,4	8,0	0,6	-0,3	12,1	43,3	12,4
State balance	% GDP	-2,8	-3,2	-4,6	-4,8	-3,1	-3,2	n/a
Balance of current operations	% GDP	-2,2	-6,3	-8,1	-9,2	-4,0	-1,4	-3,8
Export of goods and services	% GDP	50,7	49,8	47,7	43,0	49,2	n/a	n/a
Import of goods and services	% GDP	53,6	56,4	56,4	52,1	53,2	n/a	n/a
Net DFI	% GDP	4,2	4,3	3,8	1,8	0,1	n/a	n/a
External debt	% GDP	86,0	77,2	76,5	78,6	97,6	131,5	129,6
Gross reserves	% GDP	24,5	18,6	12,9	10,6	n/a	n/a	n/a
Private sector lending	% GDP	62,4	56,5	53,6	59,1	n/a	n/a	n/a
Unemployment coefficient	% total amount of labor forces	8,1	7,9	7,5	7,3	10,5	11,5	n/a
Nominal GDP	bln US dollars	136,0	163,3	175,7	179,6	130,7	85,4	94,2

Note: n/a — data not available

Source: formed by author on the basis of [4-7]

From the table 1 tendency of external debt sharp growth and GDP decline can be seen. Although there was noticeable rise of the inflation rate within analyzed period, that negatively influenced business development. Additionally, the amount of direct foreign investments significantly dropped in 2014, which proved the low level of attractiveness of Ukrainian economy.

However, criteria of micro, small and medium enterprises are used for SME Policy Index calculation, that's why the next step of the research should be dedicated to analyses of such important indicators in dynamics as number of enterprises, their turnover and number of employees (fig. 2-4).
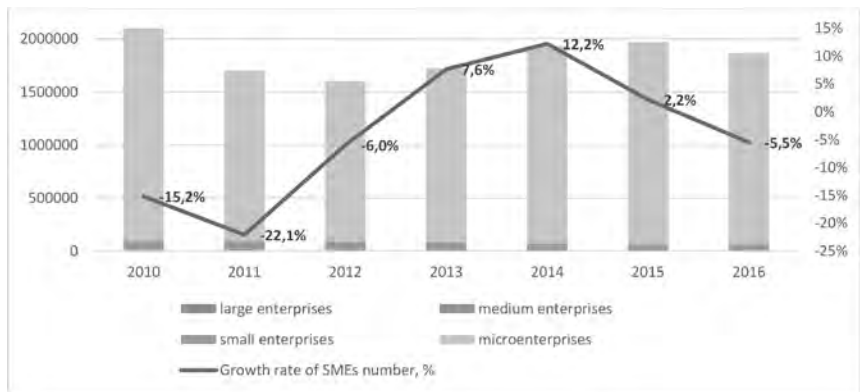

Fig. 2. Number of enterprises in Ukraine according to its size in 2010-2016, units (formed on the basis of [9])

Analyzing fig. 2 it can be specified that in 2016 in total SMEs made up more than 99 % of the legal entities in Ukraine. Overall, it is clear that while the growth rate of SME number fluctuated, the general trend was downwards from 2,2 millions of entities in 2010 to 1,8 millions of entities.

In 2016, the private sector constitute in Ukraine was represented by 95,6 % of microenterprises, 2,6 % of small and almost 1 % of medium enterprises.

The chart from fig. 3 provides the dynamics of number of people employed in Ukraine within time period of 2010-2016, which decreased from 8,4 million people in 2010 to 6,5 million people in 2016. Almost all analyzed period of time it can be observed negative growth rate of employed people for SMEs.
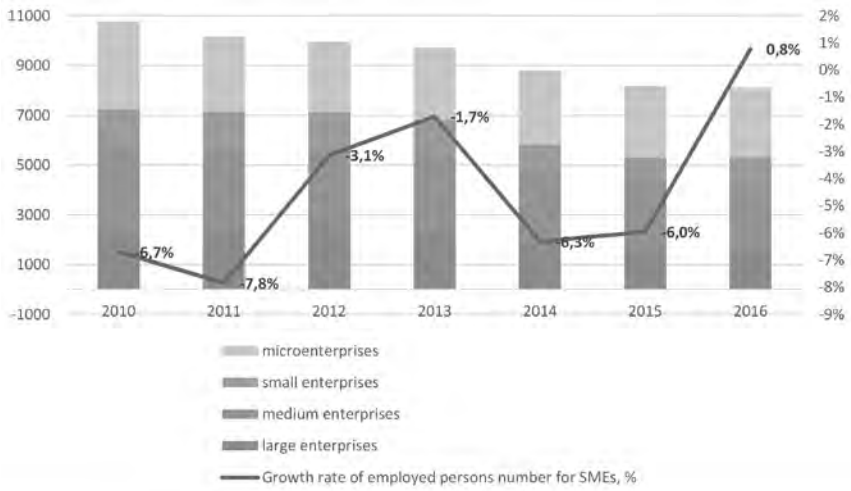
Fig. 3. Number of employees in Ukraine according to enterprise size
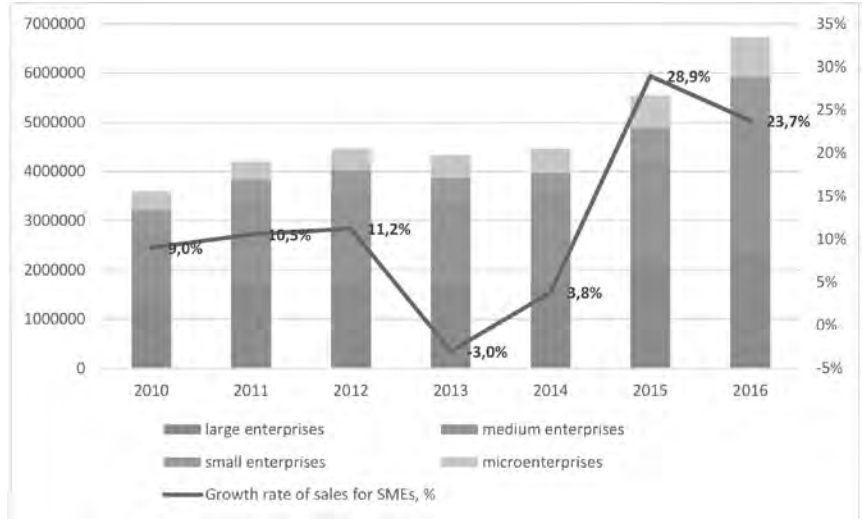in 2010-2016, thousands of individuals (formed on the basis of [9])

Fig. 4. The total turnover of enterprises in Ukraine according
to its size in 2010-2016, millions of hryvnias (formed on the basis of [9])

260

The share of SMEs in employment remained stable over all time period and equaled approximately 77 %, herewith the share of medium enterprises in employed individuals was about 32 %. That's why the significant imbalance can be marked because the share of medium enterprises is low than 1 % of total legal entities in Ukraine.

Fig. 4 shows the positive dynamics in turnover increasing in Ukraine within 2010-2016 with the growth rate about 87 % in 2016 by comparison with 2010. But the highest percentage have been observed for large and medium sized enterprises, equaled at about 30 % each.

The considered tendencies of business development in Ukraine (table 2, fig. 2 -4) relate to SBA assessment, rates of which are illustrated in fig. 5.

Fig. 5 shows the main changes in results of SME Policy Index for Ukraine evaluated according to each SBA principle. The positive tendency of growth can be observed for the majority of principles, but exceptions also exist, which are connected with innovations and SME internationalization. The highest growth is showed by 7 dimension — standards and technical regulations and 1 dimension — entrepreneurial learning and women`s entrepreneurship.

Some of positive sides of changes are related to strengthening the institutional, regulatory and operational environment (dimension 3 — Regulatory framework for SME policy making, 4 — Operational environment for SMEs and 2 — Bankruptcy and second chance for SMEs).

The progress mainly was achieved because of implementation of the deregulation of economic activity, the streamlining of business registration and the use of e-government tools.

 The weaknesses remain in the areas of bankruptcy, regulatory impact assessment, overall regulatory burden for businesses. Lack of SME strategy and action plan enhance unsystematic way of SME policy in Ukraine and gaps in the institutional framework for SMEs.

The rank of Ukraine in dimension 6 — access to finance– was improved in 2016 compared to 2012 SBA assessment (the absolute difference equals 0,63) because of strengthening the coverage of private credit bureaus and financial literacy. But such problems as bank insolvencies, currency fluctuations, high interest rates are among these which could complicate access to finance for SMEs.
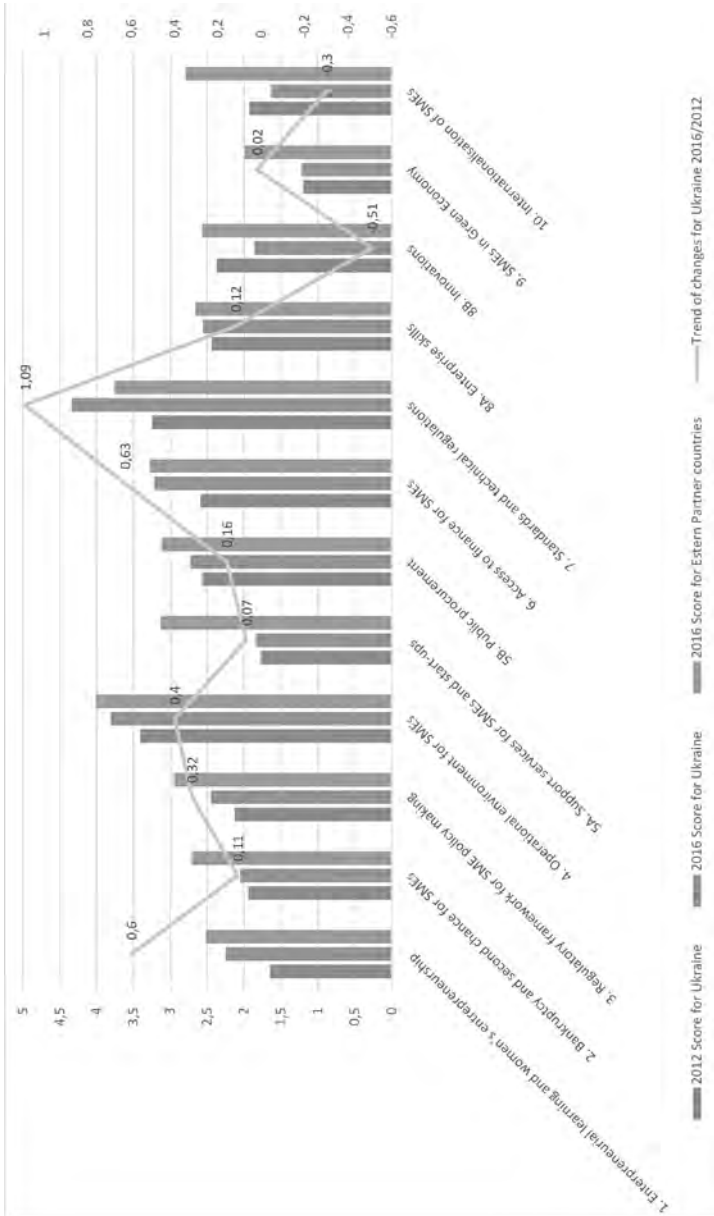
Fig. 5. SME Policy Index in Ukraine in 2012 and 2016 and EaP countries in 2016 (formed by author on the basis of [1, 8])

Dimension 1 — Entrepreneurial learning and women`s entrepreneurship and dimension 8A — enterprise skills introduce such area as promoting skills and entrepreneurship development. The positive change includes institutional support for lifelong entrepreneurial learning (SME strategy including entrepreneurial learning developed by the Ministry of Economic Development and Trade). There is no specific policy for women's entrepreneurship development in Ukraine.

Development of SME skills is not in focus of SME policy agenda, the difference between 2016 and 2012 SBA assessment is about 0,12.

Taking into account SME competitiveness, namely Dimension 5A — Support services for SMEs and start-ups, 5B — Public procurement, 8B — Innovations and 9 — SMEs in green economy, it can be seen very limited progress since 2012. Insufficient funding and lack of a clear strategy, especially in the sphere of implementing initiatives for competitiveness improvement, constraint business development in overall.

There is no real support for innovative SMEs, which exists only in operational official documents. The lack of coordinated efforts for SME green economy promotion and cooperation mechanisms for business development services are among characteristic features of SME policy in Ukraine. The adoption of new procurement system, exemplified ProZorro, became the first step in compilation with EU standards and simplifying access to this market for Ukrainian SMEs.

The final stage of assessment is analysis of supporting SME internationalization (Dimension 10 — Internationalization of SMEs and 7 — Standards and technical regulations). Such great results of difference in these dimensions mainly were achieved because of signing of the DCFTA with the EU which opened opportunities for export to the largest market.

Due to DCFTA assignment four new laws on standardization, metrology, conformity assessment and sectoral legislation were adopted in 2014-2015 aligning with EU regulations. But shortage of export promotion strategy aimed at complementation these regulatory acts and initiatives remain as constraints for widening business opportunities.

2016 SME Policy Assessment [1] includes roadmap for policy reforms in Ukraine detailed for 5 thematic areas described in table 1.

So, institutional structure of SME policy implementation in Ukraine is now on restructuring stage. Deregulation and simplifying of administrative

procedures can be considered as positive changes. But lack of complex approach for business development constraints SME doing business.

Long-term strategy of SME development, including creation of more attractive legislative system, improving effectiveness of consultation between public and private sectors, in particular interest intermediation of SMEs in legislative adoption, enhancing cooperation between academia and business, creation incentives for innovative activity of SMEs should become among the priority measures for implementation by Ukrainian authorities,

Therefore, international rating, namely SME Policy Index should be examined as the way for economy evaluation in aspect of business development, underlying the main strengths and weaknesses, which could be useful for investors, financial and governmental institutions and other market participants.

REFERENCES:

1. SME Policy Index: Eastern Partner Countries 2016. Assessing the Implementation of the Small Business Act for Europe. Available at: https://www.keepeek.com//Digital-Asset-Management/oecd/development/sme-policy-index-eastern-partner-countries-2016_9789264246249-en#page23.
2. Індекс політики щодо МСП: країни східного партнерства (2016). Оцінка виконання Акта з питань малого бізнесу для Європи. [Електронний ресурс]. — Режим доступу: http://www.oecd.org/global-relations/SMEPI_Launch_Agenda_UA.pdf.
3. Індекс політики щодо МСП: країни східного партнерства (2016). Вступний захід в Україні. [Електронний ресурс]. — Режим доступу: https://issuu.com/mineconomdev/docs/ukr_smepi_launch_ukraine_v3.
4. Стратегія діяльності в Україні 2011 — 2014 р. EBRD. Available at: http://www.ebrd.com/downloads/country/strategy/ukraine_uk.pdf.
5. Україна: економічний огляд. 4 квітня 2017 р. The World Bank. Available at: http://pubdocs.worldbank.org/en/818761491297156049/Ukraine-Economic-Update-April-2017-uk.pdf.
6. The World Bank in Ukraine. Available at: http://www.worldbank.org/en/country/ukraine/overview.
7. Характеристика країн на основі принципів акта з питань малого бізнесу: Україна. Індекс політики щодо МСП. Країни східного партнерства, 2016 рік. Оцінка реалізації акта з питань малого бізнесу (АМБ) для Європи. [Електронний ресурс]. — Режим доступу: http://www.oecd.org/global-relations/Ukraine-chapter.pdf.
8. SME Policy Index. Eastern Partner Countries 2012. PROGRESS IN THE IMPLEMENTATION OF THE SMALL BUSINESS ACT FOR EUROPE. Available at: http://www.oecd.org/global-relations/SMEEasternPartnership.pdf.
9. State Statistics Services of Ukraine. 2016. Available at: http://www.ukrstat.gov.ua/.

TRENDS OF ENTERPRISE DEVELOPMENT IN THE FIELD OF DIGITAL TECHNOLOGIES IN GLOBALIZATION CONDITIONS

O. Chukurna

PhD Economics sciences, associate professor
of marketing department
Odessa National Polytechnic University, Odessa, Ukraine

Globalization in the context of world economic relations, influenced the emergence of general trends in the development of entrepreneurship in various sectors and spheres of economic activity. The fourth industrial revolution, which is characterized by the proliferation of digital technologies and the informatization of economic relations, has had a special impact on the deepening of globalization. The report of the World Economic Forum for 2015 presented 19 turning points that shape the future digital world [1]. These turning points, which affect the shift in economic and technological systems of countries and the development of entrepreneurship, include the following:

• *Implanted technologies* (implantable mobile phone, smart tablet, pacemakers, unique chips, smart tattoos) can have ambiguous implications for development, which can be attributed to: increased longevity; change in the nature of the relationship between people; identification and real-time mode; cultural changes; increase in the effectiveness of treatment; access to personal data; violation of a person's personal life. It is predicted that by 2025 this technology will become so widespread that it will reach a technological shift, that is, it will be adopted by the majority of society.

• *Digital presence* is due to the availability of the person to the Internet and its activity in the virtual space. It is anticipated that by 2025 this aspect will also achieve a technological shift. Today, the proliferation of digital technologies is created a society of common consumption, which affects the reduction of logistics chains and logistics costs. This economic phenomenon appeared thanks to the Fourth Industrial Revolution, and contributed to the fact that consumers can simultaneously be producers of products and services that contribute to the quality of life standards. Thanks to digital technologies, the consumer has free access to informa-

tion relating to the consumption of goods and services, whereby the cost of storing this information in the present is zero (for example, the cost of storage 1GB today is $ 0.03 per year compared to $ 10,000 twenty years ago) [2, p.23]. The ambiguous results of this megatrend development are next: more targeted advertising, information and news; constant identification of the person; the convenience of creating and developing a social movement in the on-line mode.

• *Digital video as a new interface*. It is predicted that by 2025, the technology of direct access to applications and databases on the Internet by means of digital view (digital glasses) will increase the functional capabilities of communication with other virtual environment. Today, this technology is already presented in the field of 3D design and 3D graphics, but the turning point will be its distribution of more than 10% market share. Ambiguity of the development of this direction can be the creation of a new segment in the field of entertainment and increased volume of one-time dissemination of information.

• *The mobile Internet* will facilitate changes in personal relationships and image recognition and access to personal data. According to Gartner, approximately 514 million smart watches and other devices will be sold within the next five years.

• *Distributed computations* using computer calculations that are rapidly becoming widespread and accessible. Today, 43% of the world's population is connected to the Internet, which surpasses any media channel in terms of distribution, it will has expected that in just a few years, three quarters of the planet's population will have regular Internet access. In the future, regular access to the Internet and information will not be the advantage of advanced economies, since wireless technologies require less relevant infrastructure. This megatrend will promote: the dissemination of free access to education, medicine, public services from remote areas and areas with poorly developed infrastructure; free access to information and an increase in the democratization of society, while the availability of closed platforms can limit access to Internet sites and develop a system of manipulation of public opinion.

• *Increasing the number of Smartphone and other mobile devices* users and exceeding their number on the owners of the PC. The society is moving toward the development of even more rapid devices that allow solving diffi-

cult tasks while remaining mobile. It is highly probable that the number of devices used by each person will grow rapidly not only in terms of new functions that are performed, but also in terms of the specialization of disassembled tasks. At the same time, ambiguous results of the development of this megatrend are: round-the-clock use and erasing the boundaries between business and personal communication; environmental impact in the production process; increasing manipulation of public opinion at the expense of restrictions on access to information and manipulation of information.
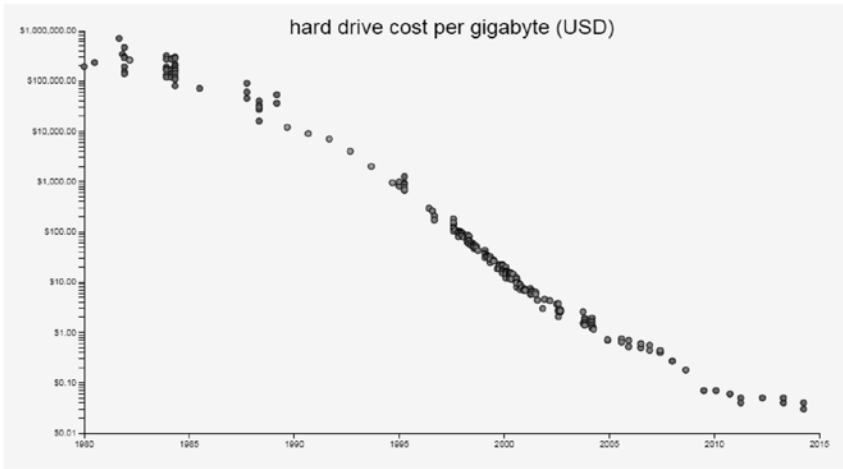

Fig. 1. The cost of one gigabyte of hard disk (1980-2015 gg.) [3]

This information is very interesting considering the fact that about 90% of all data in the world was created in the last four years, and the amount of information generated by companies is doubling every 1.2 years. Storage services are also commodity leadership which include such companies as: Amazon Web Services and Dropbox [2]. The world is moving to a complete transformation of the storage of information into goods, with the provision of unlimited free access to users. Many companies also now provide free cloud storage capacity from 2 GB to 50 GB. The undoubted disadvantage of this megatrend is the interference with the private life of a person, but at the same time an unconditional positive effect is an increase in content volumes, its eternal storage and overall consumption.

• *General information storage* — this means achieving 90% of humanity access to unlimited and unpaid data storage. According to the forecasts of the experts of the World Economic Forum, the turning point in this direction should also take place in 2025. Today, there is a clear tendency to commercialize storage capacity of storage devices and databases. The main reason for this tendency is the fact that the price of information storage falls exponentially (approximately every five years) (Fig. 1.) [3].

• *Internet for things and things*. With the continuous increase in computing power and lower prices for hardware devices from an economic point of view it is possible to connect all things to the Internet. Experts predict that in the future, every physical thing can be connected to a single communications infrastructure, and common sensors will allow a person to fully perceive the environment. This megatrend will help: create new types of business; adding digital products to the main functional product; shifts in labor markets and professional knowledge; generating additional knowledge and values based on connecting to smart things; automation of work related to knowledge; increase of standards of use of complex and technical goods; a digital twin becomes an active participant in information and business processes and provides ongoing monitoring, management and forecasting.

• *Connected home*. There are structural shifts and changes in the field of automation of households, which allows a person to manage simultaneously the system of lighting, conditioning, ventilation, audio and video content, security and home appliances. This technology ensures the efficiency of resource utilization, comfort and safety of the person, while making it more vulnerable to cyber attacks and observing her personal life. However, the turning point for technological change will come at a time when 50% of the Internet traffic will fall on devices and devices, not entertainment and communication.

• *"Smart cities"*. World Economic Forum experts predict that by 2025, in most major cities on the planet, all city services (utility services, electricity and communication services, supplies, logistics services, passenger transport, etc.), utilities and roads will be connected to the Internet [1]. Such smart cities will control the flow of energy, materials, logistics and traffic. Progressive cities such as Barcelona and Singapore today are implementing a variety of data-based services, including intelligent parking

solutions, intelligent garbage collection and intelligent lighting. Smart cities are constantly expanding their network of sensor technology development and are working on platforms that collect information from sensors. These platforms become the focal point for connecting various technology projects and adding various services to them. Ambiguity of the development of this direction may be the change in the nature of the city's residence and the impact on urban culture. However, the positive effect of this trend is more than negative and manifests itself in the following: the growth of labor productivity; process automation; increasing access to resources and transparency of their use; reducing the cost of services; increase of mobility level; quick access to service markets.

• *"Big Data" (large data)* for decision making. Using the benefits of "large data" allows faster decisions in a wide range of industries, using mobile applications and the Internet. Automated decision making can simplify the lives of citizens and allows businesses and government to provide real-time services as well as comprehensive support based on customer interaction. The effective use of "Big Data" technology is associated with the creation of consumer confidence in algorithms that take automated solutions. This process will be related to changing the mentality of a person and creating a security system for access to her personal data. In addition, complete automation of many systems will destroy many professions or replace them with other activities. A definite positive impact of the introduction of this technology is the cost savings, the speed of decision-making and the introduction of innovations.

• *Unmanned vehicle*. Implementation of this technology will increase the level of safety, reduce the negative impact on the environment, reduce the level of stress and aggressive behavior on the roads. However, it will become an irreversible move to the unclaimed occupation of the driver and a reduction in the total number of cars. In 2012, the United States in Nevada has already passed a law that allows the movement of unmanned vehicles. In 2015, Tesla has already developed cars with a semi-autonomous driving function using upgraded software. Google plans to sell unmanned cars by 2020 on the US market. Experts believe that the turning point of this technology will come when the distribution of unmanned cars in the US market will reach almost 10% of the total car market. Google plans to sell unmanned cars by 2020 on the US market. Experts believe that the turning

point of this technology will come when the distribution of unmanned cars in the US market will reach almost 10% of the total car market.

• *Artificial intelligence and decision making*. Scientists have found that artificial intelligence can be used effectively when searching for reproducible combinations and automating processes. In addition, driving with artificial intelligence can draw conclusions from past situations to provide input information and automate the process of making complex decisions in the future, accelerating the receipt of concrete conclusions. This trend will affect of jobs computerization in the future, the complete replacement of human labor with artificial intelligence. The study, which was conducted by the Oxford-Martin School, was aimed at studying the propensity of computerized workplaces through artificial intelligence and robots, which allowed for a number of interesting results. The model used by them for forecasting has shown that up to 47% of jobs in the US in 10-20 years will become fully computerized. The greatest risks of complete replacement of artificial intelligence are the following areas of activity: management, business and finance; computer equipment, engineering and science; education, jurisprudence, public service, art and the media; physicians and technical staff in health care; Service Industries; trade; office and administrative activities; agriculture, fishing and forestry; construction and extraction of minerals; maintenance and repair; production; transportation and logistics.

• *Robotics and services*. Robotics starts to affect a large number of professions — from production to agriculture; from retail sales to services. According to the International Federation of Robotics in the world today there are 1.1 million functioning robots, and in the production of cars 80% of work is performed by a robot. In addition, extensive development has also robotics in logistics, warehouses in the management and automation system of transportation of raw materials in-plant logistics.

Blocks chain. Tech chain blocks or "Blocks chain" is based on the ability to track transactions trusted system in some way. This technology is the basis for the creation of digital currencies. Bitcoin and other digital currencies created with technology "Blocks chain". It is forecasted that by 2025, 10% of the world's gross product will be stored using the "Blocks chain" technology. The chain of blocks creates both opportunities and risks. On the one hand, it is not controlled by any central bank, which makes it

possible to avoid monetary regulation. On the other hand, this technology creates opportunities for building new tax mechanisms directly into the chain of blocks (for example, transaction tax). Technology "Blocks chain" creates phenomenal economic environment on the Internet, which increases the amount of liquid assets by handling all types of exchange values and completely eliminates the need for financial intermediaries. In addition, a high level of transparency is ensured, due to the fact that the technology "Blocks chain" is a worldwide bookkeeping book that stores all transactions made. The turning point that will create a technological shift will be the government tax collection system using the "Blocks chain" technology. For example, the Estonian government became the first in history to be a real government that uses "Blocks chain" technology.

• **_Economy of common consumption_**. The phenomenon of a common consumption economy is the technological opportunity for individuals or legal entities to share goods or services at a level that was previously impossible at all. Such distribution of goods or services is possible through virtual platforms and mobile platforms. They allowed them to reduce transaction costs in the system to the extent that all its participants receive economic benefits. The economy of common consumption contains a certain number of components and next characteristics or descriptors: the technological component, the advantage of access to possession; interaction between two equal parties; sharing of personal assets; ease of access; strengthening social interaction; Consumption in cooperation and feedback from consumers in the open access. The most successful examples of a common consumption economy exist is in the transport sector. For example, Uber and Lyft company offering efficient taxi service using a mobile application. Ambiguous results of this megatrend include new next directions: forms of ownership of property and assets; the blurring of the boundaries between employment and consumption; the complexity of measuring such a "shadow" economy; the complexity of income taxation. However, today there are fundamental changes in the global economy. Examples of these changes are the activities of such companies as: "Amazon", which is the largest retailer of the world, but does not have any physical retail store; Airbnb is the largest supplier of hotel rooms, without having any hotel in its ownership; Uber Company is the largest supplier of transport services without having any means of transport. The emergence of this

271

economic phenomenon has become possible thanks to the proliferation of digital technologies.

• *3D printing technology*. The use of 3D printing technology is being implemented today in many spheres of activity, from the production of goods and housing construction to health and medicine. In the production use of 3D-printing technology have a positive effect in the following areas: accelerating product development; reduce life cycle stage to "develop a new product-production"; ease in the production of complex parts; significant reduction of costs and the issuance of minimum series of goods; the potential for instant copying of any innovation. In the sphere of production and consumption of consumer goods, the positive effect of the use of 3D printing technology will be achieved in the greater personalization of products and individual production; creating niche products for narrow market segments; reduction of logistics costs and more efficient use of energy and resources. The unconditional negative consequences of the introduction of this technology are: the destruction of global logistics chains and job cuts; increase of pollution of the environment; a significant destruction of the control system for production, compliance with product quality standards, trade barriers, taxes and other economic constraints, and the need for a system of adaptation to such changes. Despite the ambiguous consequences of using 3D-printing technology, statistics show that in 2014 it sold nearly 133 thousand. 3D-printer units, 68% more than in 2013. Most printers are able to work with applications that meet the needs of laboratories and schools to small businesses. As a result, the size of 3D-industry materials and services increased significantly and reached 3.3 billion of USD. In Fig. 2. Represents the use of 3D printing in various industries. [5].

• *Gene engineering*. This revolutionary technology is not only the ability of scientists to modify the genes of plants and animals, and a greater ease by providing sequencing technology and modifications that significantly increase the number of researchers who will be able to conduct their own experiments. Already, technology of genetic engineering is widely used in agriculture, ecology and medicine. Ambiguity is the impact of this technology, primarily in the plane of moral and ethical standards and the impact on the health and safety of human life. Experts believe that the turning point of using this technology will be the birth of the first human genome which has been specially modified.
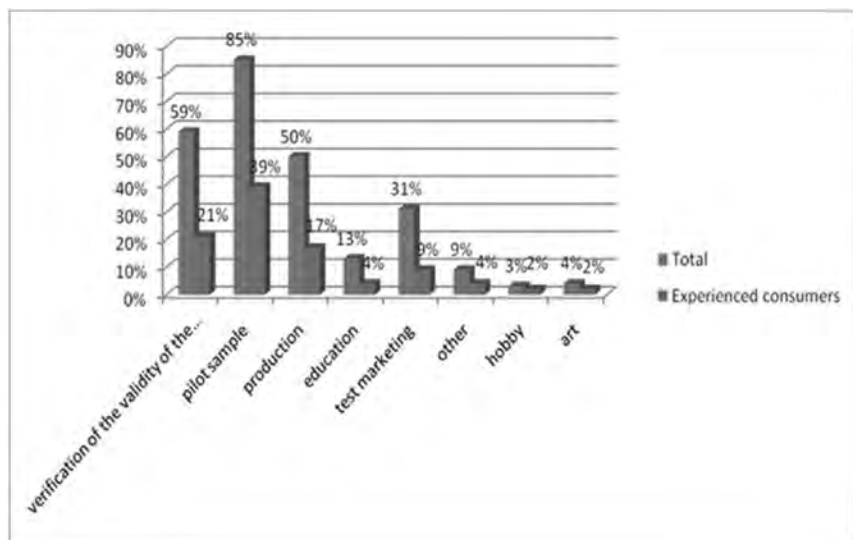
Fig. 2. Using 3D printing in various industries in the US [5].

Neural technologies. Neuronal feedback provides the ability to monitor brain activity in real time and offers many opportunities for areas of its use. The deep changes that arise from the introduction of these technologies are the expansion of human cognitive capabilities in the field of consumer behavior and the emergence of new types of behavior and the elimination of the boundaries between man and machine. However, there is a great danger of the destruction of human creative activity, the reading of human thoughts, full control over human behavior and erasing personal boundaries completely.

Based on the analysis of megatrends, the emergence of which was promoted by the fourth industrial revolution, there are certain consequences for all spheres of business and entrepreneurship, with the following expression:

• Changing consumer expectations;

• The quality of goods and products is improved on the basis of data that increase the productivity of assets;

• New partnerships are formed as companies become aware of the importance of new forms of cooperation;

• Operational models are transformed into new digital [2, c. 68].

Consider the effect of these impacts on business and entrepreneurship.

1. Expectations of consumers in the context of global challenges are transferred to the field of obtaining experience. Traditional consumer behavior studies are moving toward a target group with digital criteria, where potential customers can be identified by their willingness to provide data about themselves and interact. As we move from ownership to shared consumption, data sharing will be a necessary part of the value proposition. The emergence of a common consumption economy is an incentive to change consumer expectations, which increases the access to information and increases its transparency. It is an opportunity to turn to different sources of information, from personal to industrial gives a multidimensional picture of consumer behavior.

2. Products that are improved by data. Improving products and services through digital modifiers that increase their value leads to an increase in company assets over time. That is, due to the possibility of software updates, the value of the product may increase in time. Until now, the value of the product over time but had a tendency to depreciation, except for luxury goods. Predicting the functionality of a product or product provides plenty of new pricing capabilities. The price of a product with high bandwidth (elevators, complex technical equipment) can be determined based on their functional characteristics. Moreover, payment service providers may be based on their actual capacity as labor under the threshold of 99.5% uptime incorporation for the corresponding period.

3. New partnerships. This process can promote joint innovation, which involves the joint implementation of the company's resources within the framework of innovations that create significant value for both parties. Such cooperation requires significant investment from both sides in order to develop a corporate strategy, search partners, establish channels of communication, align processes, and respond flexibly to changing partnerships. Sometimes such cooperation creates completely new business models.

4. New operating models based on digital platforms. The use of digital platforms, coupled with high customer orientation and product development using data leads to a shift in emphasis in many sectors from selling products to providing services. There is an increasing number of consumers who do not buy products, but they make a payment for the product

access service through an appropriate digital platform. This trend has significant potential and allows for the establishment of more transparent and sustainable patterns of exchange of goods and services in the economy. However, it also has the problem of determining the consumer choice of a digital platform. Absolute advantage of the use of business models based on digital platforms is creating new sources of revenue that are based on access to valuable information about customers and in identifying new opportunities increasingly rely on analytics and engagement data with the software. These technological capabilities require the need to review professional skills and corporate culture. Successful companies, market leaders are trying to overcome the hierarchical management structures and move to a greater extent to networking and collaboration. This approach allows companies to combine their work with the Internet of things, which benefits both employees of this company and its consumers. Under the conditions of globalization, the introduction of such an approach to business organization provides companies with an unconditional competitive advantage, which builds on the accumulation of client experience, combined with a reduction in operating costs to overcome the factors that interfere with the transaction. In addition, these companies quickly and in a convenient way choose the matching of supply and demand, which allows them to also take precedence over traditional business models of competitors that have long been present on the market. This market-based approach undermines the position of traditional market players and destroys the boundaries between business and industry. In addition, this approach facilitates the rapid squeezing of intermediaries from logistics chains and the formatting of value creation chains. Thus, new business models that use combined digital platform-based business approaches are more flexible in demand-response research and responsive to mobile, less costly and more competitive.

In the area of global challenges that affect business development, particular attention should be paid to the inequality of development between countries, which deepens as technological advances. The fourth industrial revolution, which greatly influenced the global development of mankind, creates significant transformations in the field of supply of goods and services, in the labor market and in production. Over the past few years, most developing economies and fast-growing economies (such as China) have received a significant reduction in labor share in GDP. This was due to the

fall in relative prices for means of production, which, in turn, was caused by the development of innovations. Creation of technological clusters in which there are innovative processes leading to the replacement of labor by capital that can be invested in venture capital and innovation. As a result of this process, the main benefits of the fourth industrial revolution providers receive intellectual or physical capital. This trend contributes to further deepening the inequality between capital owners and employees. Further advantages of concentration, values and capital small percentage of the world population increases and distribution of digital platforms because it allows you to create new digital business models thus combining a wide range of vendors and bu and thus increasing revenues through economies of scale. The advantages for the consumer are: higher consumer costs, greater convenience and low cost. This means that the creation of a unit of value takes place with the use of less labor and the minimal cost of digital business, which tends to zero. Despite all the benefits of business and entrepreneurship due to global changes taking place against the background of the Fourth Industrial Revolution, there are certain risks for developing countries. Ukraine is also relevant to emerging economies, therefore, it is necessary to understand what risks and negative impacts are faced with underdeveloped economies. Research in this area confirm that to overcome the economic and technological gap to countries with poor economies should form the industrial basis. Possibility of developing effective production sectors that can serve the world economy on the basis of cost advantages will allow countries to accumulate capital, transfer technology and increase incomes. Only the industrialization of the economy and the closure of the technological chain of product creation can form the process of reproduction of capital within national economies, thereby creating conditions for its accumulation. In the conditions of the Ukrainian economy, from 1990 to 2014, the economic basis was formed due to the development of the industrial sector of the economy (Fig. 3).

If we consider the structure for activities of SME, it appears that 90% of entrepreneurs engaged in the services sector, the share of which 53% are entrepreneurs engaged in the wholesale, retail, maintenance and repair of vehicles (Fig. 4.). This trend is maintained since 2012 with a slight decrease. Significant place in the division is occupied by information and telecommunications services (7.6%), professional, scientific and technical activi-

ties (6.4%), transport, warehousing, postal and courier activities (6.10%) and industry (5.7%). During the last four years, the share of information and telecommunication services and professional, scientific and technical services has increased. This tendency is typical of the fourth industrial revolution and shows the flexibility of Ukrainian entrepreneurship. In addition, this process is accompanied by the reduction of enterprises engaged in wholesale and retail trade. Only in the last four years the number of enterprises engaged in wholesale and retail trade and repair of motor vehicles has decreased by 6.7%. This is due to the shift in many areas of trade in digital format and the intensification of competition between entrepreneurs in this business format. The number of unique trade offers is shrinking among Ukrainian entrepreneurs in the sphere of small and medium business as a result of the penetration of large foreign companies operating in the format of a common consumption economy. The share of industrial enterprises in the sphere of small and medium business in Ukraine remains almost unchanged during the period from 2012 to 2016.
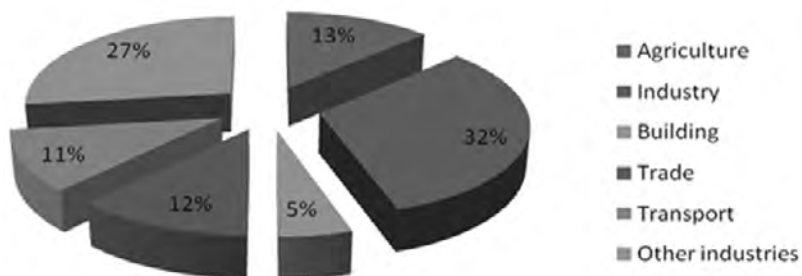

Fig. 3. Structure of the economy of Ukraine for 1990-2014 by industries [6].

A statistical survey of the development of small and medium-sized businesses in the Ukrainian business sector shows a negative dynamics. In the period from 2010 to 2016, the number of small and medium enterprises decreased by 18.6% and 29.3% respectively (Fig. 5).

The reduction in the number of small and medium-sized enterprises is accompanied by a reduction in the number of people employed in this area. Thus, for the period from 2010 to 2016, the reduction in the number of entrepreneurs was 27.1% (Fig. 6).
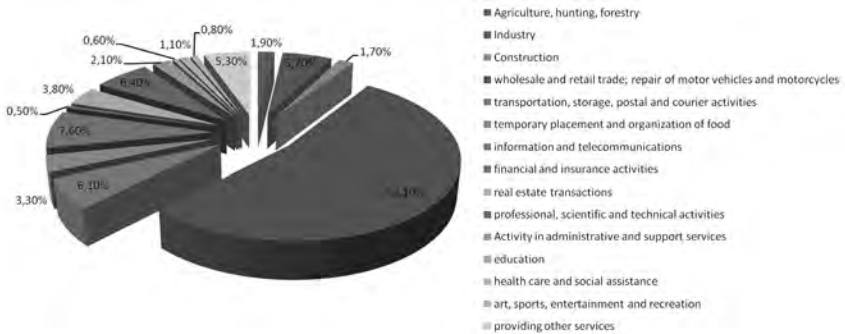
Fig. 4. Small and medium businesses for activities in Ukraine in 2016 [6].
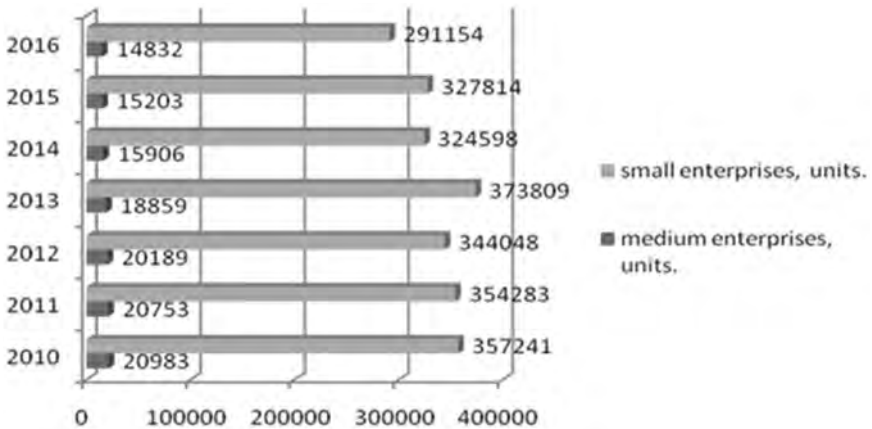

Fig. 5. The number of small and medium enterprises in Ukraine for 2010-2016 [6].

However, volumes of sales of products by small and medium-sized businesses show a significant increase in absolute terms, which is due to high rates of inflation. Such an indicator of the efficiency of the enterprise as labor productivity also has a significant increase over this period (Fig. 7). Growth in productivity can occur at the expense of reducing employees, while increasing the volume of sales in absolute terms. However, labor productivity, as an indicator of business performance, should increase with the introduction of innovative technologies into the business and methods of production management or its complete automation.

Fig. 6. Dynamics of changes in the number of employed workers
in the sphere of small and medium business [6].
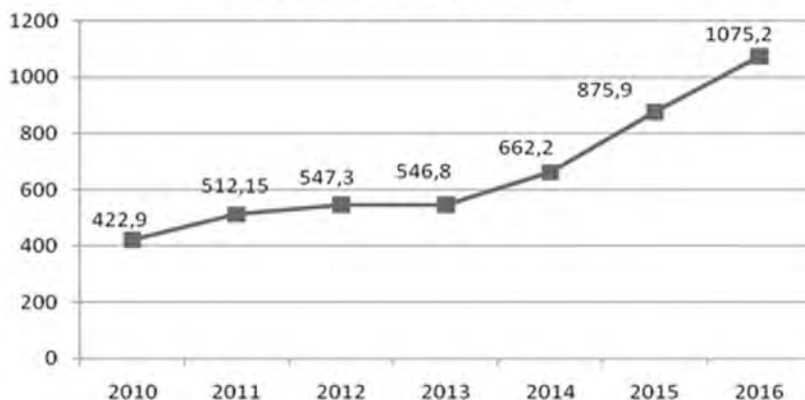
Fig. 7. Dynamics of changes in the indicator of labor productivity
at small and medium-sized enterprises [6].

According to the leading experts of the World Economic Forum [2, p. 46-48] over the past decades, world labor productivity remains stagnant, despite exponential growth in technological progress, investment and innovation. This fact is a manifestation of the paradox of change of produc-

tivity in terms of the fourth industrial revolution, which manifests itself in the inability of technological innovation to provide a high level of performance. According to the opinion of K. Shwabe [2, p. 46-48], such a paradox arises for the first time in the world economic history, because to date, all previous industrial revolutions have provided an increase in the level of productivity. The problem created by the fourth industrial revolution is that innovative products and services have higher functionality and quality, but are supplied to markets that are fundamentally different from traditional (informational and digital) markets. Under new economic conditions, new goods and services are not competing, have zero marginal costs or go to highly competitive markets through digital platforms. All these factors contribute to lowering the price. In such circumstances, traditional statistics may be incapable of fixing the actual increase in value, since the consumer surplus is not yet reflected in total sales or in increased profits. This situation creates the basis for the formation of new competitive strategies for enterprises, which should be based not only on cost leadership, but also on more innovative ways of promoting goods and services.

Taking into account the world's megatrends of business and entrepreneurship development, Ukrainian small and medium-sized businesses need to find niche in the field of economy of the common consumption, Internet of things, technologies of using 3D-printing in different spheres of activity and used digital interfaces in the entertainment field and used in creative professions.

REFERENCES:

1. World Economic Forum "Data-driven development: the path of progress", January 2015. The electronic resource. Access mode: http: // www3.weforum.org/docs/ WEFUSA_DataDrivenDevelopment_Report2015.pdf
2. Schwab K. The fourth industrial revolution: translation from English / Klaus Schwab. Moscow: Publishing house "E". 2017. 208s.
3. The electronic resource. Access mode: http://www.mkomo.com/cost-per-gigabyte-update.
4. Frey C. B. and Osborne M. A. The Future of Employment: How Susceptible Are Jobs to Computerization?,17 September 2013
5. Jessica Hedstrom. Status of 3D printing, May 23, 2015. The electronic resource. Access mode: http://jesshedstrom.guora.com/ Thr-State-of-3D-Printing
6. The State Statistics Service of Ukraine. The electronic resource. Mode of access: http:// www.ukrstat.gov.ua

ELECTRONIC GOVERNANCE TECHNOLOGIES IN THE SYSTEM OF PROVIDING ADMINISTRATIVE SERVICES

Yu. Danshina

Ph.D in Economics,
Department of Public Administration and Customs Administration
University of Customs and Finance
I. Britchenko,
Doctor Habil., Professor of State Higher Vocational School
Memorial of Prof. Stanislaw Tarnowski

The practice of using the term "electronic governance" does not differentiate the concepts of the subject of management, that is, the three branches of government, with forms, processes and technologies of governance [1, p.22], which is not correct, since the use of information technology in state activities is not a top priority. On the other hand, electronic governance technologies cannot be considered separately from the automated governance processes as well as electronic governance technologies are not a supplement or an analogue of the traditional state, as intended to communicate by means of electronic governance technologies to increase the efficiency of the entire system of public administration, in particular in the system of administrative services .

Goal of this study is to investigate the state and determine the importance of electronic governance technologies in the system of providing administrative services.

One of the most characteristic features of any modern harmoniously developing state is electronic governance, the introduction of which into the system of providing administrative services will make it possible to transform it into an electronic form, and also provide administrative services remotely to all subjects of circulation, in particular the business sector. The presence of fully functioning electronic governance in the system of providing administrative services is not only an indicator of the state's involvement in the global information society, but also one of the main universal tools for supporting the development of small and medium-sized businesses, stabilizing the socio-economic situation in the country and further its comprehensive development.

A great contribution to the study of the theoretical foundations of electronic governance technologies was made by such scientists as A. Bell, M. Bonham, M. Bones, S. Zuridis, S. Clift, S. Buras, N. Katris, P. Norris, etc.

The works of such famous scientists as M. Demkov, D. Dubov, S. Dubov, A. Zhuravlev, I. Klimenko, S. Kuznetsov, K. Linev, A. Mitchenko, S. Piskovets, I. Pogrebnyak, V. Sheverd etc. are devoted to the research of the problems of electronic control, its characteristics and the state of implementation in the practical activity of public authorities.

Formation of this concept started in the 70s, having replaced the traditional paradigm of hierarchical state management based on orders, control and submission to management through information technology, which allowed public administration authorities to conduct network interaction.

Nowadays, the system of providing administrative services, transforming into an electronic form, primarily due to the introduction of electronic forms of interaction, is filled with all kinds of information and communication technologies, namely: the portal of administrative services, sites of subjects providing administrative services, the information system «Electronic Government», an electronic document , electronic digital signature, etc., which can be considered as elements of the information and communication system of providing administrative services.

One of the founders of Twitter S. Biz states that «modern high-tech projects should serve one purpose: to simplify any of the actions of the users in their everyday life.» Therefore, the system of providing administrative services, transforming into an electronic form, is supposed to carry out the interaction of the subjects of circulation and the subjects of provision, making this process simple and accessible for individuals and business.

Without delving into the search for truth about what information is, if it exists itself or it is an abstraction, we can state with certainty that it has become a part of the everyday world of modern individuals. In 1957, K. Steinbuch, in the term of informatics, defined activities related to the fact that information can be extracted, converted from one information to another, for example, from one language to another, stored in a database or transferred. This is followed by four fundamental functions: to extract, to convert, to save and to transfer.

Thus, we can discuss two types of technology for working with information: "hard" — technical support and "soft" — technological support to technical support.

The economist J. Galbraith [2, p.14] expounding the concept of technology considers it as a set of methods of development and application of systematic scientific knowledge in practical problems. The scientist emphasizes the special importance of knowledge as the basis of technological development, and also determines the practical focus of knowledge on the organization of the provision of services. The term "technology" in the spheres of public life was popularized due to the synthesis of science and manufacturing.

Polysemicity of the term "technology" allows to assume under it: "the science of the types, processes and methods of multiple obtaining the final result; others focus on the organization and objectives of the activity, and others state that technology is the use of scientific knowledge to determine effective ways and means of doing any work "[3]. To determine the meaningful content of the concept "technology", which will most fully reflect the purposes of our research, it will address its main features, among which there are the following ones:
- delineation, division and partition of the process to internally related stages, phases and operations;
- coordinated and step-by-step actions aimed at achieving the desired result
- the uniqueness of the implementation of procedures and operations included in it [3, p. 44-47].

Thus, the set of interconnected and interdependent processes and methods of "hard" and "soft", providing high speed of extraction, transformation, saving and transmission of information flow, and also allowing to reduce transaction costs of information services operation allows to designate it as information technology.

The technical basis of modern information technologies is the technology of telecommunication, through which one of the main functions of management activity is realized — organization of internal work and interdepartmental interaction.

We propose to define a set of information and telecommunication technologies implemented and used in management activities to provide

administrative services in electronic form, as information and technology services of the system.

The sphere of providing administrative services in the countries of the developed West is characterized by a long history and a lot of positive practices. A brief overview will make it possible to understand the feasibility of using information technology services to improve the system of providing administrative services in Ukraine.

In most EU Member States, it is important to introduce centralized information technology services that meet the one-stop-shop concept to improve the quality of the provision of administrative services. As noted in [4, c. 1] "an important activity in the development of electronic administrative services are electronic platforms for services of public authorities. This is an administrative portal, created in order to allow the subjects of circulation to use electronic services provided by public authorities. "

Special attention should be paid to the use of information technology services in the provision of administrative services in France. In particular, the "single window" of the City Hall of Paris [5], through which a significant number of electronic services are provided.Individual-subjects of circulation can get registered on the site, creating their own electronic cabinet, and the corresponding administrative services are formed in relation to the life cycles of a person. For example, the "family information service", through which young parents can use all the necessary services, not only from administrative ones, from birth registration to "forming an electronic dossier for a child, which contains all the necessary data relating to the child" [6, p. 1].

At the same time, a nationwide portal for the provision of services by public authorities operates, which in a month satisfies more than four million subjects of circulation [7, p. 1].

An example for imitation is the provision of administrative services in Belgium, where there is an electronic platform that contains links to regional and municipal information technology services.Belgian e-services provide the possibility of registering with a personal card that allows you to download some of the data from the general register, submit all the necessary documents online, and also receive on-line services such as a certificate of residence, a certificate of family composition and a map of a local resident, excerpts from police registers, coupons for parking, birth certificates, certificates of marriage, divorce, etc. [8, p. 1].

A single database of citizens should be considered as the achievements of the Belgian practice of electronic governance in the provision of administrative services. With the introduction of a personal identification code, most of the necessary information is downloaded automatically, thus, the subject of circulation must fill a small number of special forms. In Belgium, almost all services can be obtained on-line [9, c. 1].

In the UK, the services provided by the public administration authorities are grouped for the convenience of the subjects of circulation in groups and are placed on the "joint service of administrative bodies", through which you can get the following online services: obtaining benefits; registration of births, deaths, marriages; services in the field of business and entrepreneurs; services for obtaining citizenship or the right to permanent residence in the UK; services in the field of political rights; services in the field of ships and police; services in the field of property rights; services in the field of immigration. Separately, the grouped services for people with disabilities were provided. [10, c. 1].

This service is a vivid example of electronic governance technologies in the service sector, most of which can be obtained remotely. Also in the UK there is an extensive network of "service supermarkets", called "One Stop Services".

In Germany, special attention is paid to electronic governance technologies to simplify the registration procedures for small and medium businesses. In particular, this is the developed information and technological service "BundOnline2005" [11, c. 1].

A special portal for the provision of electronic administrative services for business is developed in Sweden, the main purpose of which is to simplify procedures for starting a business. To register an entrepreneurial activity, a personal identification code of the subject of circulation is entered, a description of the entrepreneurial activity that the person plans to engage in is entered and a registration fee is collected from the personal account [12].

With the assistance of information technology services providing administrative services to the population of "Norge.no" in Norway, significant work was done to improve the provision of administrative services. With the help of the service are provided services grouped according to life situations: the birth of a child and the registration of paternity, death and inheritance, marriage, the design of a divorce, change of residence, etc. [13, c. 1].

A bright, but unsuccessful example of a decentralized implementation of electronic governance services is Finland, which, operating in the spirit of a diversity of information technology services, had to spend 60 million euros a few years to create a single platform for providing electronic administrative services to the subjects of circulation.

Domestic practice of electronic governance technologies in the system of providing administrative services does not have a similar level of functionality as in European countries, but this does not justify the negligent attitude of the government to the possibilities of modern information technology services.

When creating a system for the provision of electronic administrative services, Ukraine took as a basis the model of centralized provision of administrative services, under which the procedures for their provision are simplified as much as possible and in which the government is an integral subject of provision.

Currently, the Unified State Portal of Administrative Services is one of three ways to provide administrative services.

Developers of the Unified State Portal of Administrative Services identified two stages of development:

– development of information and consulting component: providing comprehensive information: the register of administrative services, templates and sample documents, provided and approved by law, necessary to obtain the service, information containing contact details of the subjects providing a particular service;

– development of the information and technological component: the consistent transformation of services into an electronic form, the expansion of methods for identifying and authenticating the subjects of circulation and the introduction of transactional services that provide remote payment services for the services provided.

At the moment, the Portal contains all the necessary consulting information on all administratives, and in fact most likely it is an electronic information reference center where all the comprehensive information is collected. It can be stated that the first stage of the formation of the Unified State Portal was passed without difficulties, if not to take into account that the portal contains a huge amount of information exclusively about administrative services. It should be noted that there is still a significant part of public services, which, given the international practice of the functioning

of portals, should be provided through the portal, however, according to the Law of Ukraine "On Administrative Services" [14], they are not considered administrative, so there is no information on them.

Despite the international trends and dynamic processes of development of information technology services that allow public administration authorities to implement new effective approaches to the organization of internal and interdepartmental workflow and interaction, work continues with documents and information, mostly in paper form, which significantly complicates the rapid exchange of information, procedures for the provision of administrative services and management decisions, public information and services Maintenance business.

Exemplary examples of electronic document circulation are the Parliament of Scotland and the Senate of the Netherlands, which completely abandoned paper carriers, and all document circulation is carried out electronically.

Electronic interaction of the subjects of provision prescribes both the exchange of electronic documents and the possibility of obtaining electronic data from information technology services of other delivery entities in an automated mode in accordance with the requests and authorities of these bodies.

In practical terms, the introduction of the electronic interaction of the subjects of provision preassumes the possibility:

– of transfer and receipt by public authorities of organizational and administrative documents in electronic form;

– automated exchange of electronic data (messages) between information technology services of public authorities;

– automated access of the public administration authority to electronic data of information technology services of other public administration authorities in accordance with the authority.

Thus, the totality of processes related to the creation, processing, sending, receipt, storage, use and destruction of electronic documents or messages should be translated into electronic form, providing such processes with legal significance and legal force.

An analysis of the European experience in the construction of national systems of electronic governance technologies demonstrates the existence of a single established approach to the development of an infrastructure or an indicative e-governance model, the central element of which is the system of inter-agency electronic interaction.

The achievement of interoperability and the provision of electronic interaction of various information and technological services of the subjects of provision is identified as one of the main priorities of the Digital Agenda for Europe 2020 and the European Action Plan for e-Governance for 2011-2015 as a prerequisite for the formation of a single digital market in Europe and the provision of cross-border services.

The tasks for ensuring electronic interaction were determined by one of the main priorities, starting with the Law "On Basic Principles of the Information Society Development in Ukraine for 2007-2015" [15], the Concept of the Development of Electronic Governance [16] and the Strategy and Information Society Development in Ukraine [17] . However, currently, the tasks outlined are mostly declarative in most cases.

The concept of e– governance development clearly states that the introduction of electronic document management is an important component of the development of e-governance. It should be noted that with the development of information technology services that allow e-management, electronic document circulation extends to all areas of state activity and ensures interaction between all branches of government and subjects of provision of all levels, as well as subjects of provision and business structures, subjects of delivery and individuals. At the same time, such interactions go beyond the exchange of documents only and there is a need to exchange data (information) in its various forms and applications, which, of course, is more complex in the organizational, scientific, technical and technological sense. The task of creating a single state-wide electronic document circulation is implemented through the introduction of a system of electronic interaction between the subjects of the provision [16].

The first real steps to introduce information and technology services for electronic interaction were made in 2012, by means of introduction of the Concept of the creation and operation of an information system for electronic interaction of state electronic information resources [18]. In 2013, a comprehensive plan for the implementation of this Concept was approved, and it prescribed the development of a number of regulatory and legal and technical documents necessary to achieve interoperability and ensure the electronic interaction of information technology services.

However, today the developed plan requires clarification and refinement due to non-compliance. Since the formation and use of information

technology services of the subjects of provision is characterized by poor coordination, consistency and permanence , which reduces the efficiency, effectiveness and flexibility of e-governance. As a result, entities providing administrative services have introduced a significant number of integrated information technology services, including departmental registries, in-house electronic document management systems, typical activity automation systems, and management decision support systems that do not interoperate with various technologies, standards and formats .

Currently, there are more than seven hundred various information and technological services in the public administration bodies of Ukraine. At the same time, it is necessary to note the fact that there is no National Register of Information Technology Services of Public Administration Bodies, despite a number of decisions of the President of Ukraine, the Government and Parliament on its creation and operation.

The foregoing resulted in considerable difficulties in organizing electronic interaction between the numerous implemented information and technological services, and the absence of mandatory requirements (standards, formats) and a single national coordinator in this field led to the establishment by separate central public authorities of their own rules for electronic interaction of information technology services , developed for a specific urgent task and not compatible with each other.

For example, currently, only the State Fiscal Service of Ukraine approved a dozen different protocols for the exchange of information by information technology services with other public authorities. Also, similar rules for the needs of electronic interaction are established by the Ministry of Social Policy of Ukraine, the State Treasury Service and others.

To solve the problem of electronic interaction between departmental services of electronic document circulation, in 2012 the Electronic Interaction System of Public Administration is being integrated in Ukraine, which should ensure the creation of a single information and technological infrastructure for the exchange, processing and storage of organizational and administrative electronic documents and create prerequisites for transition to the domestic electronic document management. It is assumed that regardless of the availability or absence of electronic document management in the internal service department, the above-mentioned system will allow integrating to it all legally significant orga-

nizational and administrative documents of all central and local public administration authorities.

Currently, sluggish implementation of the system is accompanied by a critical number of comments from public authorities, mainly questions of technological perfection of the system and the unresolved issue of property rights.

In addition, the work on the creation of a unified system of electronic interaction of information services, which should ensure the automated exchange of data from various information systems of public administration authorities and address the compatibility of these services, has started.

Also, separate projects for the formation of the Electronic Parliament Information System, which should unite all existing databases of the Verkhovna Rada of Ukraine and the Electronic Court system for the exchange of electronic documents between courts and participants in the trial, should be mentioned.

Taking into account the abovementioned, the following main problems of integrating the electronic interaction of subjects providing administrative services can be defined:

– the presence of a large number of heterogeneous inherited and implemented information technology services of granting entities that are not intended for electronic interaction. Subjects of provision in the process of decentralization, not coordinating their actions and not adhering to common rules, have formed internal information technology services that are not at all compatible either technically or normatively;

– low quality of information technology services of the subjects of provision, since the vast majority of these services are put into operation in violation of the requirements of the current legislation regarding the design, development and operation of such services, as well as information protection requirements;

– the absence of unified identifiers that connect the same type of information in various information technology services, which leads to significant difficulties at the stage of achieving organizational-legal and semantic interoperability of information technology services;

– the absence of minimum requirements for interoperability of information technology services of granting entities, at the design and development stage it does not allow to take into account the further electronic interaction of its services with external services;

– uncertainty of unified requirements to electronic interaction of information technology services (formats, standards, order) of the subjects

of provision, the absence of which allows creating separate departmental and, in some cases, regional electronic interaction systems that present a problematic compatibility;

– the absence of a unified functioning electronic interaction system, the operation of which will ensure the automated exchange of information from information technology services of the subjects of delivery in accordance with standardized rules;

– the lack of basic state electronic registers, such as the demographic register and the register of addresses.

Particularly, we can mention the problems associated with the regulatory uncertainty of the archiving process of electronic documentation, departmental closeness and reluctance to attach their services to the electronic document management system.

A structured unit of information intended for perception, formalized and fixed in a certain order in compliance with the form of its submission and the formation of mandatory features, such as functionality, authorization and registration is called a document [19].

When a document is executed in written, an important component is its signing. It is the signature that guarantees the legality of what is being implemented and the condition for providing the document with legal force.

The development of information technology resources led to the appearance of an electronic document and an electronic signature, which are rapidly penetrating the economic activities of highly developed countries.

Today, there are many variations of electronic signature in the world, which, first of all, should be distinguished by the level of security, scope and methods of their implementation. However, in Ukrainian practice, the most controversial and ambiguous in the need for use is a kind of electronic signature, namely an electronic digital signature.

In this context, let us pay attention to the essence of the contents of these signatures. If the electronic signature is nothing more than data in electronic form, the main purpose of which is the identification of the subject of electronic data circulation, then the digital signature is the data obtained by cryptographic transformation of the set of electronic data, which firstly makes it possible to verify the integrity of the document , as well as to identify the subject of circulation.

If it is necessary to have a paper version of the electronic document, the authenticity of the copy is certified by the electronic key certification centers in accordance with the current legislation [19, part 6, Art. 7; 20]. A paper copy of an electronic document obtained in another way, for example, the use of readers or the use of the printscript function of an electronic document, is not coded and can only be used for informal electronic document circulation.

In addition to all above mentioned, according to [19, part 3 of Art. 6] it is possible to have parallel existence of an electronic document and a paper original identical in information and requisites, with the same legal force.

The proponents of the digital signature claim that it is designed to legitimize the remote provision of administrative services, thus significantly saving time and volume of paperwork. Accordingly, it can be concluded that this type of electronic signature, firstly, has a wide scope of application, in particular in business, banking and customs, with electronic reference to the subjects of providing administrative services. Secondly, when using the digital signature, it does not matter in governmental or business structures, there is a significant reduction in the volume of paperwork. Third, it protects the integrity of the document.

However, the electronic signature, like any other innovation in Ukraine, calls into question its application according to Ukrainian legislation, presuming several conditions under which an electronic signature can be similar to a handwritten one. Observance of such conditions requires an enhanced certificate, which is not defined by international law.

Therefore, using an electronic signature for the implementation of international treaties between legal entities or individuals in which one party is located within Ukraine, can provoke disagreements, and in case of conflict it will be difficult to decide on the legality of a document.

A storage place of such a signature, for example, a flash card, the loss or theft of which can not be ruled out, and as a result allows you to take certain actions in favor of third parties without the real consent of the person, unlike the signature that is carried out with your own hand and is inseparable from the author can also be referred to the risk zone.

Electronic signature with the greatest difficulty is spreading in the Ukrainian business sphere, the reason for this how this sphere is regulated and the need for additional costs for its receipt and use.

Despite the importance of the digital signature for an electronic document, the Electronic Signature Law prescribes the possibility of using other types of electronic signatures, for example, Mobile ID or Bank ID, which are actively used in all countries of the world.

For certainty, the Law of Ukraine "On Electronic Trust Services" was adopted with alternative types of electronic digital signature. The law prescribes the improvement of regulatory and legal regulation in the sphere of using the public key infrastructure, the development of a unified system of electronic confidential services, the mutual recognition of Ukrainian and international certificates of public keys and digital signatures, taking into account international trends, thereby ensuring the active development of cross-border cooperation of Ukraine, and its harmonious integration into European society.

Conclusions. Technologies of electronic governance in the system of providing administrative services have both significant advantages and disadvantages, but based on the above mentioned, it can be stated that at this stage they are a negative phenomenon, and in fact, they develop spontaneously and fragmentarily. In our opinion, the technologies of electronic management will enable harmonious functioning of the the system of providing administrative services:

– when the norms of ukrainian and international legislation on provision of administrative services are agreed;

– the procedure for providing administrative services will be simplified, and after that it will be translated into an electronic form;

– after the improvement and systematization of the regulatory and legal regulation of electronic governance technologies in ukraine in general.

REFERENCE:

1.   Соколова О. С. Электронное государственное управление // Правовые вопросы связи, 2007, № 2. с. 22-23.
2.   Гелбрэйт Дж. К. Новое индустриальное общество / Дж. К. Гелбрэйт. — М.6 Эксмо, 2008. — 429 с.
3.   Сурмин Ю. П., Туленков Н. В., Теория социальных технологий: Учеб. пособие. — К.: МАУП, 2004. — 608 с.
4.   Drobiazgiewicz J. Elektroniczna Platforma Usług Administracji Publicznej (ePUAP) — założenia a rzeczywistość [Electronic resource] / J. Drobiazgiewicz. — Access mode : http://rocznikikae.sgh.waw.pl/p/roczniki_kae_ z24_04.pdf. — Дата доступа: 10.09.2017. — Screen title.

5. Guichet des professionnels de Paris [Electronic resource]. — Access mode: https://guichetpro.paris.fr/crm/. — Дата доступа: 15.09.2017. — Screen title.

6. Point info famille [Electronic resource] : official website. — Access mode: http://www.toulouse.fr/web/education/point-info-famille. — Дата доступа: 21.09.2017. — Screen title.

7. Service-public.fr : the official gateway to the French civil service [Electronic resource]. — Access mode: http://www.service-public.fr/langue/ english/. — Дата доступа: 17.09.2017. — Screen title.

8. City ofBrussels [Electronic resource] : official website. — Access mode: http://www.brussels.be. — (Viewed on September 25, 2015). — Screen title.

9. Belgian Federal public service social security [Electronic resource] : official website. — Access mode: http://www.socialsecurity.fgov.be/en/. — Дата доступа: 03.08.2017. — Screen title.

10. Gov.uk [Electronic resource] : official website. — Access mode: https://www.gov.uk. — Дата доступа: 10.08.2017. — Screen title.

11. BundOnline 2005 Umsetzungsplan für die eGovernment-Initiative. — Berlin : Bundesministerium des Innern, 2001. — 76 p.

12. Starta företag [Electronic resource] : offizielle Seite. — Access mode : https://www.verksamt.se/starta. — Дата доступа: 10.08.2017. — Screen title.

13. Norge.no [Electronic resource]: official website. — Access mode: http://www.norge.no/en. — Дата доступа: 10.09.2017. — Screen title.

14. Про адміністративні послуги: Закон України від 6 вересня 2012 р. № 5203-VI // Офіційний вісник України. — 2012. — № 76. — Ст. 3067.

15. Про затвердження плану заходів з виконання завдань, передбачених Законом України «Про основні засади розвитку інформаційного суспільства в Україні на 2007-2015 роки». Розпорядження Кабінету Міністрів України від 15 серпня 2007 № 653-р. — Режим доступу : http://zakon2.rada.gov.ua/laws/show/653-2007-%D1%80.

16. Концепція розвитку електронного урядування в Україні. Рзпорядження Кабінету Міністрів України від 13 грудня 2010 № 2250-р. (утратил силу). — Режим доступу : http://zakon2.rada.gov.ua/laws/show/2250-2010-%D1%80.

17. Стратегія розвитку інформаційного суспільства України. Поставнова Кабінета Міністрів України від 15 травня 2013 № 386-р. — Режим доступу : http://zakon3.rada.gov.ua/laws/show/386-2013-%D1%80.

18. Про затвердження Концепції формування системи національних електронних інформаційних ресурсів : розпорядження Кабінету Міністрів України від 5 травня 2003 р. № 259-р // Офіційний вісник України. — 2003. — № 18–19. — ст. 864.

19. Про електронні документи та електронний документообіг. Закон України від 22 травня 2003 року № 851-IV // Офіційний вісник України. –2003. — № 25. — Ст. 1174.

20. Порядок засвідчення наявності електронного документа (електронних даних) на певний момент часу. Постанова Кабінету Міністрів України від 26 травня 2004 № 680. — Режим доступу : http://zakon2.rada.gov.ua/laws/show/680-2004-%D0%BF.

21. Про електронні довірчі послуги. Закон України від 5 жовтня 2017 року № 2155-VIII// Голос України. — 2017. — № 206.

MODERN FORMS OF CONSOLIDATION
OF PRODUCTION AND THEIR ROLE OF SMALL
AND MEDIUM BUSINESS DEVELOPMENT

O. Zubko

Phd in Economics, associate professor,
Kyiv National University of Trade and Economics

K. Kravets,

Phd in Economics, Senior Lecturer
Kyiv National University of Trade and Economics

The essence of the consolidation of production should be determined through the prism of the forms of its practical implementation. Like any complex phenomenon, the consolidation of production is characterized by various forms of implementation. The economic literature presents a large number of variants of classifications of forms of the process of consolidation of production. However, all classifications are formed without a comprehensive approach. The analysis of scientific sources indicates the absence of a holistic classification of production consolidation, and therefore there is a need for systematization of classification characteristics by types, levels, directions and forms of implementation.

The elements of scientific novelty include the improvement of the classification features of the consolidation of production, which, unlike traditional ones, unite such taxonomic groups as types (absolute and relative), levels (micro, macro and international), directions (internal and external) and forms of implementation (internal integration, integration, cooperation). These classification features allow us to deepen the theoretical and methodological basis and practical value for the development of small and medium businesses. The study of the classification signs of the consolidation of production at enterprises is shown in Fig. 1.

Consolidation of production is manifested in the consolidation of the size of enterprises (absolute consolidation) and in the distribution of total production of subbranches between enterprises of different sizes (relative consolidation) [1, c. 16]. Such a division into species is important given the assessment of the level of consolidation of production, since both absolute and relative indicators are used to analyze the level of consolidation.
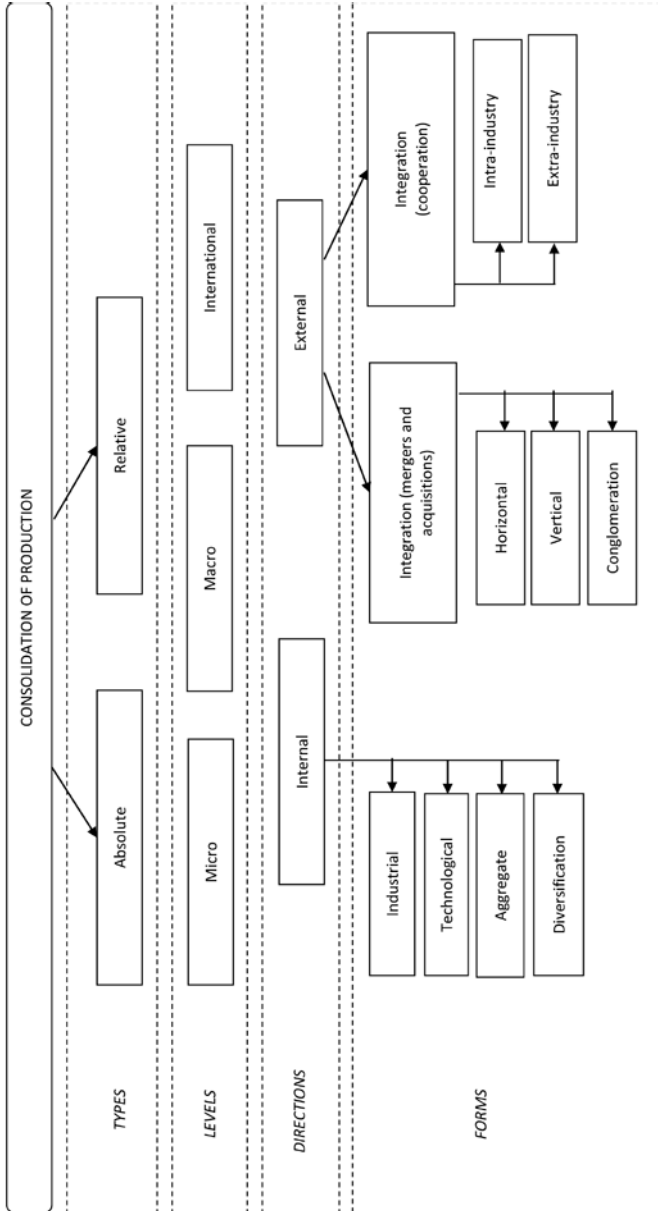
Fig. 1. Classification characteristics of the consolidation of production Source: constructed by the author on the basis of [7; 8, p. 90; 9, p. 69].

Absolute consolidation characterizes the size of production of individual enterprises, and its level is determined by indicators such as output; average annual cost of fixed assets; average number of employees. The most objective indicator is the volume of output [2, c. 90]. Other indicators of absolute consolidation are used to deepen the comprehensive analysis of the level of consolidation of production.

Relative consolidation is characterized by the distribution of total production in the industry between enterprises of different sizes [3]. The level of relative consolidation is determined by indicators such as the proportion of output of any product of one, two, three, etc. enterprises in the volume of its production in the whole industry. The indicators of the level of relative consolidation to a certain extent characterize the degree of monopolization of enterprises [4, c. 10]. In addition, for a better understanding of the essence of the consolidation of production, it is advisable to consider the levels of its implementation.

Consolidation of production can be considered at the microeconomic, macroeconomic and international levels both in statics and in dynamics. Systematization of classification marks provided the opportunity to construct a matrix for differentiation of levels of consolidation of production (Table 1).

Table 1

Differentiation of the levels of consolidation of production

Approach	Micro level	Macro level	International level
Dynamic	1 Integration of individual resources of the subject of economic activity	3 The consolidation of the productive resources of the share of large enterprises in the total output of the industry	5 Consolidation of productive resources in TNCs
Static	2 Concentrating a significant share of production in one owner	4 Concentrating a large proportion of production under the control of a limited range of economic entities	6 Concentrating a large proportion of production under the control of TNCs

Source: constructed by the author on the basis of [5, p. 34; 6].

Thus, there is an equal definition of the essence of the consolidation of production at different levels of implementation of this process. The first quadrant implies the definition of the consolidation of production as a process of consolidation of production at the level of an individual enterprise and may be characterized by changes in the volume of production of the enterprise.

The second quadrant, which examines the consolidation of production at the microeconomic level, defines it as a static indicator of the structure of the volume of production of one owner, which determines the degree of influence of an individual entity on the formation of a general economic policy of the enterprise and strategy of its behavior in the future.

The third quadrant is the consolidation of production as an increase in the share of the largest enterprises in the total output of the industry (in dynamics) and the concentration of a significant share under the control of a limited number of economic entities (in statics).

Vertical concentration is considered as the process of focusing on one enterprise successive stages of the production of the final product [10], that is, enterprises of different stages of production in the chain of a single production process of goods and services are autonomous, within the enterprise, instead of purchasing them in other enterprises. Vertical consolidation strategy is justified when an enterprise can increase its profitability, while controlling various strategically important links in the process of production and marketing of products do not characterize the entire population [11]. The motivation in this case is to ensure control over the sale of products, sometimes the desire to better know its consumers [69, c. 16]. This strategy is acceptable for enterprises with a strong competitive position (a significant market share). A prerequisite for the selection of vertical consolidation is often the unequal level of prices for raw materials and finished products [188, p. 138]. Consequently, there is control over the purchase of raw materials, aimed at its cheapening, as well as the establishment of guaranteed access to it [12, c. 11-12], which, in our opinion, is an important source of competitive advantages in terms of reducing production costs. In this way, product differentiation and control of sales channels are achieved.

According to the generalized results of the study of literary sources, we conclude that the positive effects of vertical consolidation are [11]:

– Getting the enterprise control over costs and avoiding margins on raw materials by the counterparty;

– control and reduction of transaction costs;

– reduction of total expenses of the enterprise due to an effective combination of factors of production.

Among the negative consequences of vertical consolidation can be highlighted:

– increase of expenses for administrative activity of the enterprise;

– loss of part of the enterprise's profit as a result of price competition;

– the complication of entering the market, which operates technologically more advanced enterprises.

It should be noted that some scholars [13], the process of consolidation of production is represented only in the form of horizontal and vertical consolidation, which, in our opinion, is not entirely justified, since at the present stage of economic activity the conglomerate structure becomes of great importance.

Conglomerate consolidation is an association under the sole financial control of enterprises that do not have productive links and belong not only to different types of production but also to various spheres of the economy [14, p. 305]. This type involves the merger of enterprises of other industries, with which they are not in direct or indirect industrial communication, direct association of diverse enterprises that can synthesize elements of horizontal and vertical concentrations. Accordingly, there is an increase in the profitability of production due to the expansion of the scope of activities, reduction of economic risks, the development of market shares in other markets. The main purpose of participants in such consolidation is diversification of operations as a means of reducing risk in conditions of active market fluctuations. This form of production consolidation can also be used in the framework of the strategy of redevelopment of enterprises, and as a way of alternative use of temporarily free productive resources, and as a mechanism for the creation of large enterprises, etc.. The negative consequences of conglomerate consolidation include the fact that branching leads to a deterioration in the quality of management of structural units [15].

Another goal of creating conglomerates is to obtain large profits from securities transactions: the issue of shares and bonds, their exchange [16]. Conglomerate mergers and acquisitions require appropriate financial resources and awareness of the state of affairs of enterprises. Both banks and financial

institutions can provide both. The latter comprise lists of potential candidates for absorption, obtaining for information not only commission but also the ability to manipulate securities of absorbing and absorbing enterprises. Next, we will examine the main integration forms of production consolidation. Analysis of literary sources shows a variety of interpretations of the terms «merger», «absorption» and «accession». For the most part, «absorption» is interpreted as an association of two enterprises, while the absorbing enterprise retains its status as a legal entity, and the enterprise which is absorbed as a legal entity or ceases to exist, or becomes controlled by ownership of a controlling block of shares or shares of capital.

Foreign economic literature provides an interpretation that assumes that enterprises combining enterprises with approximately the same economic parameters are combined. At the same time, both sides of the agreement act as equal partners, and there is no acquisition (absorption), and the merger of two equally valuable business [17, p. 54]. The same definition is followed by some domestic economists [11].

A number of scholars, in particular O. Hrytsay, identify the process of «merger» of enterprises with the concept of «consolidation», and, consequently, the process of merger involves processes of absorption and accession [18, p. 12-13]. In our opinion, such identification is inappropriate, as the process of consolidation is a broader concept and involves the processes of absorption, adherence and internal development of enterprises.

Commercial Code of Ukraine Art. 59 the concept of «merger» is defined as the effect of economic entities, as a result of which «all property rights and obligations of each of them pass to the entity created by the merger» [19]. That is, each enterprise ceases to exist, and the joint venture becomes a new legal entity.

Note that in each case it is quite difficult to determine which form of consolidation of production takes place — mergers or acquisitions. For the most part, depending on the legal form of the transaction, it is possible to distinguish the dominant and dependent parties, that is, in any case, the acquisition of a business takes place. Therefore, in foreign economic literature, both terms are used as synonyms on an interchangeable basis, since they mean phenomena of the same economic nature. In our opinion, when interpreting and using the concept of «merger» and «absorption» they should be regarded as processes with different legal form.

The term «mergers and acquisitions» (M&A) has gained popularity in domestic practice over the past few years. However, there are certain differences between what western scientists regard as the M&A, and how they interpret the concept of the practice of Ukrainian corporate disputes and peaceful alliances.

The term «mergers and acquisitions» is a literal translation of the Anglo-Saxon legal terminology (mergers & acquisitions). The use of the term «takeover» in the purely legal sense is not entirely correct in Ukraine, since it is absent in the legislation, but it exists in international practice.

The essence of the terms «merger and acquisition» is not limited to the implementation of a separate transaction (sale and purchase, accession agreement, etc.). When it comes to a friendly or unfriendly business take-up, it always means a business strategy consisting of many structural elements and organized in time as an independent project [20]. The ultimate goal of mergers and acquisitions is to acquire control over the activity of an enterprise. The strategy is a set of coherent actions and is usually implemented through a series of public-legal, organizational and economic activities.

In the context of the globalization of economic activity, mergers and acquisitions of enterprises occur not only within the country. Depending on nationality in economic literature distinguish national (within a single country) and transnational (associations of enterprises located in different countries) M&A. In domestic practice, there are terms that are often used in describing similar operations: mergers, acquisitions, mergers, divisions, acquisitions of controlling stakes and the like. Note that the distinction between M&A is almost technical and refers to the order of organization of the financial side of the transaction and the future legal form of the united corporation. An enterprise that initiates the takeover of another business is called the buyer, and the company that is being absorbed is the target. As a rule, in the processes of M&A, the shareholders of the company being absorbed rarely receive cash (both cash and non-cash). For the most part there is an exchange of shares, and the rate of this exchange is the subject of bargaining between the buyer and the target. The difference between the market price of shares and the price offered by the buyer at its increase is called «premium», with a decrease — «discount». Sometimes, if several buyers compete, one of the parties proposes cash equivalents to share [15]. When merging, two or more enterprises with common interests are

united in order to create a new company — a new legal entity, often with a new name. The enterprise takes control and management of all assets and liabilities of enterprises — their components of the agreement, after which the latter as legal entities can be liquidated or integrated into the holding structure as subsidiaries of the new legal entity.

When acquisition a buyer, the company takes control and management of the company-goal with the acquisition of an absolute or partial ownership of it. This is most often done through buying up stocks of the absorbing company on the stock market. Acquisition may be accompanied by the sale of assets, when the buyer company sells part of its new ownership to the target enterprise [20].

When acquiring in the form of accession, the enterprise-goal is embedded in the legal entity of the buyer. In this case, when combining two or more enterprises, only one enterprise survives as a legal entity, while others lose their legal independence and cease to exist. Their assets are fully aligned with the buyer company.

Depending on the attitude of the managerial staff of the enterprise to the merger and absorption, scientists allocate:

• friendly — mergers, in which the management and shareholders of the company-goal and the buyer-in-house maintain the agreement;

• hostile (unfriendly) — mergers and acquisitions, in which the management of the target enterprise (the target company) does not agree with the agreement and takes a number of countermeasures, and the company that buys has to conduct on the securities market against the target enterprise for the purpose of it absorption As an example, one can find a confrontation between two powerful enterprises operating in the beer market — Sarmat and Obolon.

Often, with a hostile takeover, enterprise-goal management involves a counter-buyer, who is a «white knight» for the absorbing company, while blocking the first one. «White Knight», even when gaining control over the enterprise, leaves its management the target [21]. Thus, the introduction of the «white knight» transforms the friendly absorption into unfriendly.

As for the methods of hostile takeover, it is possible to group them into three main types:

1) «white absorption» — a clearly planned takeover of the enterprise, which occurs, albeit against the will of the main owner, but strictly in accor-

dance with the requirements of the current legislation. Typically, this kind of absorption applies to enterprises with ineffective corporate governance and financial difficulties;

2) «black absorption» — illegal seizure of property, based on the application of criminal methods, — forgery of documents, bribe officials, blackmail, fraud, etc. This kind of absorption can be applied to any enterprise, but, first of all, to a non-public enterprise;

3) «gray absorption» — the absorption of an enterprise, which is, at first glance, lawful methods that are similar to the methods of «white absorption», but the combination of these methods in general is a scheme of fraud, similar to the methods of «black absorption». This is a very common type of absorption that applies to any enterprise that is semi-transparent and has a double accounting system [67, c. 68-70].

Depending on the way of combining the potential of enterprises, the following types are distinguished:

• corporate alliances — an association of two or more enterprises focused on a particular business direction, which ensures a synergistic effect only in this direction; other activities are carried out by the enterprise on its own. Enterprises can create joint structures for these purposes.

• corporations — a contractual association based on a combination of the industrial, scientific and commercial interests of the united enterprises, delegated by them separate powers of centralized regulation of each of the participants to the governing bodies of the corporation [20].

It should be noted that enterprises can be united on the production potential — combining the production capacity of two or more enterprises in order to obtain a synergistic effect by increasing the scope of activities, and financial potential — uniting enterprises that do not act as a whole, with this does not expect significant production aids, but there is a centralization of financial policy, which contributes to strengthening the position of the securities market in financing innovative projects.

Collaboration (co-operation) is the next form of consolidation of production, which takes place on an external basis, is an agreement between the enterprises on joint work. This form is manifested in intra-industry (cooperative enterprises of one industry) or intersectoral (with the co-operation of enterprises of various branches) ties. The most common forms of cooperation are joint programs and the establishment of joint ventures.

The internal (organic) direction of the exposure can include the following forms:

1. Aggregation consolidation occurs by increasing the capacity of machines and equipment as a corporate unit the aggregate use a separate unit. We believe that aggregate form of consolidation by its nature is the result of progress, and concrete indicators of power of the future unit can not always be foreseen [11]. In practice aggregate consolidation is closely interwoven with technological concentration.

2. Technological consolidation is accompanied by an increase in the sizes of technologically homogeneous production, which is conditioned by the existing level of aggregate consolidation. The unit serves the production — a complete cycle of complex manufacturing process at the shop floor [22, c. 21]. This form of production consolidation, in our opinion, is part of the process of modernization, which is formed on the basis of the progress of certain machines and equipment.

3. Industrial Consolidation. The volume of production of large enterprises in the total output is increasing [15]. At the same time, an increase in the size of enterprises can be carried out both at the expense of intensification of technological consolidation, and as a result of the expansion of varieties of production and assortment of goods and services, that is, the actual changes are actually the process of production, and enterprises form a single production and economic complex.

4. Diversification of production is one of the most complex forms of internal development of consolidation. It means the simultaneous development of non-related types of production services, expansion of the range and range of products produced within the enterprise. Diversification reflects the process of expanding the activity of the enterprise, which uses its own accumulation not only to support and develop the main business, but also to direct them to the development of new types of products, the creation of new productions and the provision of various services to industries or industries that form a single technological chain, ranging from processing of raw materials and finishing with the release of finished products (vertical integration) [11].

Therefore, the classification of possible forms of consolidation of production is investigated. The process of consolidation of production on the basis of classification was divided by: species, levels, areas of implementation, forms.

The proposed classification of the classification features of the consolidation of production allows to deepen the understanding of these processes and create the necessary theoretical basis for the development of methodological support for assessing the effectiveness of consolidation of production.

REFERENCES:

1. Куцевол Н. Г. Развитие концентрации производства в условиях экономических преобразований в России : дис. … канд. экон. наук : 08.00.01 / Н. Г. Куцевол. — Казань, 2003. — 167 с.
2. Скопенко Н. С. Основні підходи до визначення ризику при формуванні нових організаційних структур // Проблеми підвищення ефективності інфраструктури. — К.: НАУ, 2010. — 258 с.
3. Кравець К. П. Чинники розвитку концентрації виробництва на підприємствах України/ К. П. Кравець // Вісник ПГТУ. — 2015. — № 30. — С. 186-192
4. Стародубцева О. І. Державне регулювання ринку злиттів та поглинань: автореф. дис. ... канд. екон. наук : 08.00.03 / О. І. Стародубцева. — Донецьк, 2011. — 20 с.
5. Герасименко А. Г. Концентрація капіталу в трансформаційній економіці: дис. ... канд. екон. наук : 08.01.01 / Герасименко А. Г. — К.: КНЕУ, 2007 — 265 с.
6. Кравец К. П. Осуществление концентрации производства в пищевой промышленности Украины / К. П. Кравец, Т. Н. Мельник // Экономика и предпринимательство. — 2013. — № 6. — С. 390–396.
7. Матвєєв В. В. Концентрація та централізація капіталу в процесі економічного розвитку / В. В. Матвєєв, Т. А. Нікітіна // Екон. вісн. нац. техн. ун–ту України «КПІ». — 2012. — № 9. — С. 3–9.
8. Мостенська Т. Л. Організація виробництва на підприємствах харчової промисловості : підруч. / [Т. Л. Мостенська, І. А. Бойко, І. М. Болотіна та ін.]; ред.: Т. Л. Мостенська. — К. : Кондор, 2012. — 490 с.
9. Литвин О. Є. International mergers and acquisitions : навч. посібник. / О. Є. Литвин. — К. : Зовнішня торгівля, 2012. — 435 с.
10. Гуторов А. О. Вертикально інтегровані структури у сільському господарстві: економічні засади формування та розвитку / А. О. Гуторов // Економіка і прогнозування. — 2011. — № 1. — С. 120–130.
11. Мостенская Т. Л. Особенности развития интеграционных процессов в пищевой промышленности Украины / Т. Л. Мостенская, Н. С. Скопенко // Рос. академ. журн. — 2012. — № 4. — Т. 22. — С. 16 — 22.
12. Метановская Н. Н. Механизмы вертикальной интеграции предприятий рыбохозяйственного комплекса / Н. Н. Метановская. — Мурманск : Изд–во МГТУ, 2010. — 469 с.
13. Гуторов А. О. Вертикально інтегровані структури у сільському господарстві: економічні засади формування та розвитку / А. О. Гуторов // Економіка і прогнозування. — 2011. — № 1. — С. 120–130.
14. Ларионов И. К. Корпоративное структурирование экономики в современных условиях хозяйствования: монография / И. К. Ларионов, Ю. А. Герасина, В. Ю. Бородулин. — М. : МГИУ, 2008. — 321 с.

15. Кравец К. П. Осуществление концентрации производства в пищевой промышленности Украины / К. П. Кравец, Т. Н. Мельник // Экономика и предпринимательство. — 2013. — № 6. — С. 390–396.

16. Сергеев И. В. Экономика организаций (предприятий): учеб. / И. В. Сергеев, И. И. Веретенникова.; — [5–е изд.], перераб. и доп. — М.: ТК Велби, Изд–во Проспект, 2013.–671 с.

17. Brealey R. A. Principles of corporate finance / R. A. Brealey, S. C. Myers, F. Allen: 7ed. — The McGraw–Hill Companies, 2003. — 517 p.

18. Антимонопольний контроль за концентрацією господарських структур на рівні регіону: автореф. дис. ... канд. екон. наук : 08.10.01 / О. В. Грицай. — Донецьк, 2002. — 21 с.

19. Господарський кодекс України від 06.11.1991 № 1798–ХІІ. // Відом. Верхов. Ради України. — 1992. — № 6 із змінами від 13.04.2017 р. згідно із законом 13.04.2017 від № 2019–VIII.

20. Марченко В. М. Інтелектуальний капітал у процесах злиття та поглинання корпорацій / В. М. Марченко // Формування ринкових відносин в Україні. — 2012. — № 9. — С. 101–105.

21. Шабліна Я. В. Злиття і поглинання в Україні / Я. В. Шабліна, Ю. В. Гончаров // Актуальні проблеми економіки. — 2012. — № 1. — С. 120–128.

22. Аржевітін С. М. Концентрація виробництва і малий бізнес в харчовій промисловості / Аржевітін С. М. , Кірпот О. І., Лебединська О. Ю.; Ю. П. Лебединський (ред.). — К. : ГРОТ, 2003. — 108 с.

BLOCKCHAIN TECHNOLOGY INTO THE LOGISTICS SUPPLY CHAIN IMPLEMENTATION EFFECTIVENESS

I. Britchenko,
Doctor of Economic Sciences, professor,
State Higher Educational Institution named prof. Stanislaus Tarnowski
T. Cherniavska,
Doctor of Economic Sciences, professor,
Higher socio-economic school in Pshevorsk
B. Cherniavskyi,
Master, aspirant,
Higher socio-economic school in Pshevorsk

Technologies currently have a tremendous impact on all spheres of economy, business and a state. They integrally change people's conception of trade, property, and market entities interaction.

Artificial intelligence, additive, information-communication, green technologies, biotechnologies, and blockchain technologies development and implementation confirm their leadership importance and inevitability in relation to the activities traditional approaches. In the modern world only the companies with flexible vision, equipment and technologies able to instantly reform, adapt to new conditions and challenges, will benefit. The point at issue is Industry 4.0 as a new technological mode emergence.

One of the latest technologies, which may soon change business models essence in many sectors of the economy including logistics should be pointed out. It is subject to blockchain technology. For the first time blockchain was used in Bitcoin payment system, due to which the technology has exposed to the world. Bitcoin was designed by an unknown software developer (or a group of software developers) Satoshi Nakamoto in 2008. Along with the platform launch Nakamoto published a protocol describing mathematical and conceptual principles of the system. He wanted people to transfer money directly to each other, without banks and other intermediaries servicing [1].

However, cryptocurrency is currently a special case of blockchain application, the product based on it. While digital currencies are gaining fa-

vor, leading corporations and business organizations are beginning to concern Blockchain-technologies.

The technology is not sufficiently extensively introduced in scientific literature. Blockchain technology in financial sector application is described in most of the articles, as well as cryptocurrency current status and development in the near future are highlighted. Blockchain technology practical application is proposed in articles of I. M. Kiselev, "Blockchain Technology in Economy Application" [2], S. Korchagin "Current Trends in Blockchain Technology Development" [3], V. V. Dorokhov "Blockchain Technology: The Future of Financial System" [4]. Scientific development of blockchain technology in logistics application issue is presently fragmented, hence causing interest to this issue study.

In general, blockchain technology essence can be limited to the following. Blockchain is a continuous sequential containing information chain of blocks (linked list), built according to the certain rules [5]. The basic idea of the technology is simple: a distributed registry or database that runs simultaneously on the set (sometimes it is about millions) of cross-points is created and distributed between different users (organizations) around the world. Every new user expands and strengthens the network. It is noteworthy that all computers are equal and there are no organizers, moderators, supervisors and managers. Everyone is responsible for himself.

Five essential characteristics of this technology are emphasized, they are:

Transparency. Access to the entire events history, i.e. cash transfers, agreements and other records are always available to all participants of the system.

Decentralization. Transaction history is stored by each participant on the hard disc drive, not on some master server.

Anonymity. Identity disclosing is not necessary for blockchain operation.

Equality. All blockchain participants have the same status and opportunities with no administrators or information custodians.

Security. Snapshot Blockchain data can neither be forgotten nor counterfeited. It can be trusted valid [6].

Blockchain uniqueness is in downloaded data permanence or irreversibility, which is ensured by cryptographic protection system. Any system in which information is transmitted, freedom of access is required and reliability is guaranteed can be created on this technology basis.

In 2013 blockchain technology development was seriously influenced by Vitaly Buterin, a young Russian-born Canadian software programmer. He realized that in addition to transactions data information as to absolutely any events can be recorded into the chain of blocks. The system can also be embedded with the software that allows creating applications that operate on the "smart contracts" principle, that is stand-alone programs that are run when certain conditions are met [7].

A recognized technological visionary, scholar and author of books on the future of digital economy, Don Tapscott calls blockchain "the second generation of the Internet" and the technology that will likely to have the greatest impact on the nearest future of the world economy. The blockchain value is expected to increase in the near future, and it will be spoken about more often [8].

When blockchain technologies just appeared, they were considered to be the future basis of all social and economic processes. Most of these ideas, as well as smart contracts application are still related to the futurology area. Dozens of blockchain projects emergence allows to assess the overall market situation and find prospective directions.

The first group of blockchain applications brings together projects initiated by "traditional" companies. New technologies application makes significant optimization of business processes possible. Such projects economic effect is operating time and personnel costs reduction.

It should be noted that the distributed economy scope is only a limited start-ups founders' imagination. For example, currently funds are being actively invested to implement blockchain technologies projects:

- in banking;
- in stock trade;
- in the field of rules and regulations compliance monitoring;
- in the field of smart contracts;
- in medicine;
- in education;
- in the field of cybercrime defenses;
- in the networking technology and "Internet of things";
- in the field of cars leasing and sale;
- in the air transport industry;
- in the field of logistics and food supply;
- in music industry, etc.

Published literature analysis has revealed [1-4, 6-9] that Blockchain technology has significant potential and prospects for application in various fields of economy but the most interesting area for this technology is logistics.

Given that supply chain is a sequence of delivery points on route from the origin to destination, information on goods through decentralized records movement is rather essential. One of the most universally applicable blockchain technology performance capabilities is that it can become a successful solution for supply chains elements recording and controlling while providing entire cycle operations secure and transparent monitoring [9].

Blockchain, which is bitcoin technology core, in fact, is a very reliable and effective way of information exchange between the parties. This creates an immutable digital Transactions Ledger that is maintained by computers distributed network. This technology sharing potential, its protected from unauthorized access architecture and complete transparency make it an ideal tool for today's supply chain management methods revolutionizing.

Logistics is defined as a planning structure for material, service and information flows management. Physical goods logistics typically involves information flow, transportation, warehousing and often security integration.

Logistics chains often involve numerous stages and hundreds of geographical locations. Due to this, transparency in the process (goods production and transport) assurance, quality and origin of goods to the ultimate buyer (counterfeit and/or low-quality goods) guaranteeing seem extremely difficult. This issue is especially acute for the food group products, where a buyer, for example, can not in any way identify harvesting, animals and poultry culturing, fishing, etc. location and environmental conditions.

In this aspect blockchain technology introduction main advantage is synchronized audit between partners' provision and the processes in real time optimization. More importantly, blockchain increases the entire promotion chain entities trust level, as well as facilitates decision making process at every stage due to the possibility of providing one-time access to information that allows processes and actions synchronizing and anticipating.

Blockchain, even in the most basic version, into the supply chain introduction allows to ensure the following:

- unnecessary middlemen elimination;
- payment security and fraud protection;

- decentralization, i.e. possibility of a logistics process entities to participate in the real-time operations monitoring: in vehicles and goods movement monitoring; in documents in the form of smart contracts completion and thus errors and fraud risks reduction; in illegal links in the supply chain eliminating: goods counterfeit, smuggling and illegal labor, etc.;

- traceability from the place of the origin to its final consumer; consumer's rights and health safety protection, which allows informed buying decision making.

It is noteworthy that in container carriage the costs of processing documents and information often exceed the physically moved cargo cost more than twofold. The main problem in transportation is a significant time gap and a gap of information transfer and actual goods movement.

In this respect, Maersk in association with IBM experiment result is of interest. The purpose of this experiment was research of feasibility of blockchain technology implementation when transporting one container with flowers from Kenya to Rotterdam. More than 200 interactions with documents and goods, the most important of which are signatures from three agencies for exports approval; completion of six documents confirming origin, chemical composition and quality of the product; customs formalities, etc. are required in the course of such transportation.

With blockcahin application this chain looks like the following:

1. The farm completes a packing list; which information becomes visible immediately to all participants in the chain.

2. This action is the basis for a smart contract drafting, which is sent for approval to the three agencies. Once signatures are affixed, the information is updated for all the participants.

2. Simultaneously, all information as to the flowers verification, refrigerated container on a truck loading, and customs resolution are transferred to the port of Mombasa, enabling them to prepare for the container arrival.

As is evident, by means of blockchain technology all documents and goods processing operations are recorded and available to the public. Promptness of information as to which documents are signed, whom by and when, as well as where the flowers are located and who is responsible for them at a particular stage are especially important in this particular example, since flowers are perishable goods and errors and delivery time are critical for them.

Main advantages of blockchain technology in logistics application are:
- all network participants' consistency and transparency;
- handling operations traceability and recording;
- errors in auditing and payments minimization;
- protection against fraud (hackers);
- confidence of network participants and customers increase;
- real-time feedback, which allows the supply chain participants to react on a timely basis and improve their operations;
- companies' activity scale expansion.

Along with that, bottlenecks of blockchain in modern logistics implementation should be noted. Among these are:
- skepticism as to innovative technologies, particularly by the traditional supply model adherents;
- complexity of participants' coordination and business processes standardization;
- high requirements for personnel qualifications.

Thus, one of the main barriers to the blockchain introduction is the lack of trained personnel, i.e. professionals who have experience in cryptocurrency area and crypto-assets consciousness. Accordingly, a company, which plans to introduce innovations in its operations, should learn more about its specific nature and analyze business in order to assess potential advantages and disadvantages. Along with this, experts note technological imperfections of the system itself, namely technical failures and hacker attacks on the data sets. It should be understood that today blockchain as an innovative technology for supply chain management introduction is rather slow due to associated risks and skepticism of individual companies, but it is very likely will soon gain credibility, and its application will increase the industry efficiency [9].

The above arguments allow to summarize the following. Blockchain introduction guarantees huge potential cost saving benefits for the industry. Such a system can certainly reduce delivery delays and likelihood of frauds, saving billions of dollars for every transportation chain participant. According to the World Trade Organization, barriers in goods international supply chain elimination will increase global GDP by 5% and traffic total volume by 15% [10].

We will give some examples of blockchain technologies startups in logistics implementation.

Thus, in 2015 international Blockchain consortium Hyperledger, which currently consolidates more than 115 companies from various industries including finance, automotive, healthcare, IoT and aircraft, was launched by the Linux Foundation. The main objective of the consortium was to create a single blockchain-platform with an open source code, which will enable organizations around the world to introduce blockchain technology into their business processes.

In October 2016 logistics and legal experiment at Commonwealth Bank of Australia, Wells Fargo and Brighann Cotton was performed.

In its course, 88 bales of cotton valued at $ 35,000 were delivered from the United States to China. Between the continents they were transported by Marie Schulte container ship. After a trip of 11,000 km the goods were unloaded in the port of Qingdao. Evidence that technologies like blockchain and smart contracts combination can produce real business benefits was achieved.

QUASA, a created decentralized logistics platform, which offers innovative solutions based on blockchain technology in supply chain management, introduction enables to make a technological breakthrough in logistics industry by a transparent interaction system between all participants creating.

QUASA Platform will support all participants in gaining tangible benefits of decentralized service and a unique transparent economic system based on its own crypto currency QuasaCoin.

QUASA is a decentralized system that gains blockchain advantage and consists of several smart-contracts within the blockchain and its own crypto currency. Such approach shifts logistics technologies development to a completely new level, as well as ensures complete safety and confidentiality throughout the supply chain.

The system functionality is designed to protect cargo owners and shippers by the aid of blockchain technology and smart contracts to eliminate trust issues, information barriers and legal expenses [11].

 Retailer WalMart was one of the first to believe in blockchain promising future and is testing IBM new technology for mango in the USA and pork in China supply. As suggested by the Company its implementation will increase inventory management efficiency and ensure food supply safety that WalMart considers particularly important after the salmonellosis onset in 2006. At that time, when using paperwork, infection source identification took the Company about two weeks. According to the tech-

nology proponents blockchain will provide the details of any consignment of goods listed in the database in a matter of seconds.

End-users who can be sure of product safety, its freshness, lack of GMOs and unwanted additives will benefit from the supply chain transparency as well. Or alternatively to verify exactly that the tuna bought was not obtained by poaching; to protect itself against such accusations blockchain was put forth by the British Startup Provenance. By the aid of blockchain technology the Company tracks tuna movement, controlling its fishing and shipping.

Currently, the giant e-Commerce Company Alibaba Group in cooperation with AusPost, Blackmores and PwC are exploring a unique technology potential to response food counterfeits. The "Food Trust Framework" project was created to improve supply chains security and transparency.

Intel, which has demonstrated blockchain platform operation to establish seafood supply surveillance, stands out among the other institutions. The resource is specialized in control over marine products harvesting establishing, as well as its accounting accuracy and reliability increasing. The process regulation starts with the harvest and up to the product storage conditions according to the sanitary rules observance [12].

Yojee start-up (Singapore) has already been run for more than a year. Technology platform that provides powerful logistics capabilities in the supply chain management deploys artificial intelligence and blockchain technology. It substitutes the dispatcher, monitors orders status in real time, issues invoices and manages tasks. The Company claims they have already been working with 30,000 vehicles and customers from Singapore, Australia, Cambodia and Indonesia.

Maersk, the leader of maritime transport, together with IBM, having conducted an experiment on blockchain in cross-border global supply chain application, demonstrated that even companies of such level are ready for innovation if it is profitable for them.

According to experts, a large container ship can generate several pounds of paper documents that must be signed manually – a huge expenditure that have long been ripe for automation.

Maersk, which has started testing the technology on several container line routes, is already preparing to receive multi-billion-dollar savings with blockchain successful implementation. Imagine: 90% of foreign trade volume in the world is delivered in containers. Upon each delivery on aver-

age 30 links of the logistics chain (including shippers, consignees, carriers, customs, fiscal, controlling bodies) are involved that are more than 200 information interactions. It is assumed that each of the links in the chain will be able to record each entry into the blockchain using a smartphone, and this will eliminate the need to register tons of shipping documentation at each stage of the delivery. Digital technology for data in real time exchange and storage introduction could make a real quantum leap in supply chains.

The technology will help to measure not only the location, but temperature, humidity and power supply status in real time as well [13].

The Port of Rotterdam, Europe's largest commercial port, has been testing Blockchain logistics technology since 2016; and this could be a starting point in transparency in the industry development. The project is supported by more than fifteen public and private sectors companies based in the Netherlands with the Ministry of Economic Affairs assistance. According to the creators, this blockchain project is unique by the fact that it covers the entire logistics supply chain. Over the next two years the consortium members will test applications for exchange of logistical and contractual information between the parties.

Less than a month ago in Australia a comprehensive testing of the blockchain-based architecture of TBSx3 security system, which is capable of providing a qualitatively new level of global supply chains protection, was carried out.

DP World, DB Schenker, Hamburg Süd and the Australian wine company IUS successfully completed blockchain technology testing in the intermodal supply chain from Kunavarra area (South Australia) to the Chinese port of Qingdao by road and sea transport (chain length is 8,100 km).

The development is based on the 44-bit alphanumeric cryptographic encoding adopted in military-industrial complex (as opposed to publicly used 6-bit digital cryptography). The TBSx3 developers plan to continue multilateral system testing and hope to establish a new world standard for the global supply chains security.

Study groups in Sydney and Beijing monitored the process and the mode changes to develop protocols that would verify goods substitution lack throughout the entire supply chain. KPMG audit and consulting company confirmed the goods authenticity throughout the supply chain and followed -up whether the system could potentially detect falsifications. The

partners involved in the project followed up each link of the chain, as well as the protocols conformity at the end of the chain as to wholesale and retail supplies to retailers and consumers.

The second largest port in terms of container turnover in Europe, the port of Antwerp (Belgium), in late June 2017, announced a pilot blockchain project launch aimed at logistics processes optimization. Pilot testing will be conducted in cooperation with T-Mining blockchain startup.

The port representatives noted that simple handling of containers from point A to point B can cover more than 30 different participants, including freight forwarders, carriers, shippers, etc., as well as approximately 200 different operations. In their view, blockchain technology can improve data exchange transparency and accelerate logistic process and interaction of participants and port customers. This, in turn, will minimize any data manipulation likelihood.

On August 22, 2017 IBM announced a project aimed to explore blockchain technology application to control food supply and improve food safety. This initiative was joined by leading retailers and food companies.

As explained by Brigid McDermott, the Vice-President for IBM blockchain-business development, it is not about creating a technology, but an entire ecosystem. It is assumed that blockchain, capable of hundreds of mass production participants' operation and food supplies chain tracking, will quickly determine the spoiled food source, preventing it from getting to the shelves of the stores.

Annually 400 thousand people die due to contaminated food. Issues affecting food safety, such as pollution, disease spread and waste, are exacerbated by the lack of access to information and ability to track it. It may take weeks to determine the exact contamination location. For example, it took over two months to figure out which farms were used to deliver salmonella-infected papaya supplies, IBM noted.

In addition to the American IT-Corporation, Nestle, Unilever, Tyson Foods, Kroger, Dole Food Company, McCormick & Company, Golden State Foods, Driscoll's, Berkshire Hathaway and McLane Company were included into the new blockchain-consortium [14].

Summing up, it can be said that due to Bitcoin the world has learned about blockchain technology wide possibilities, which can now play a key role in decentralized economy construction.

The world is changing: domestic added value level decrease and market and technological changes speed increase require that procurement becomes a flexible, connected innovation leader and in real time mode; an integrated supply chain manager. In the digital world, procurement will enhance its corporate value as an innovative catalyst by linking significant external knowledge and expertise with internal business partners to ensure technology and market leadership of its own products despite reduction of private incremental costs associated with ambitious Procurement 4.0 [15] term which is believed to be very correct in its essence.

REFERENCES:

1. Как устроен блокчейн и зачем он нужен. Режим доступа: https://daily.afisha.ru/technology/6058-kak-ustroen-blokcheyn-i-zachem-on-nuzhen/
2. Киселев И.М. Применение технологии blockchain в экономике / И.М. Киселев // Экономика и социум, 2016. - №7 (26). - С.597 -597.
3. Корчагин С. О текущих трендах в развитии технологии блокчейн / С. Корчагин // Свободная мысль, 2016. - №4 (1658). – С. 61 – 68.
4. Дорохов В.В. Блокчейн-технологии: будущее финансовой системы / В.В. Дорохов // Современные инновации, 2016. - №6 (8). – С. 44 – 46.
5. Блокчейн. Материал из Википедии. – Режим доступа: https://ru.wikipedia.org/wiki/
6. Как устроен блокчейн и зачем он нужен. Режим доступа: https://daily.afisha.ru/technology/6058-kak-ustroen-blokcheyn-i-zachem-on-nuzhen/
7. Криптовалюты и блокчейн: история и перспективы рынка. Режим доступа: https://vc.ru/25774-young-bitcoin
8. Кудирко О.В. Інновації в логістиці: перспективи використання технології блокчейн у ланцюгах поставок / О.В. Кудирко // Науковий вісник Ужгородського національного університету, 2017. - Випуск 15, частина 1. - С. 158-162.
9. Don Tapscott. Режим доступа: http://thinkers50.com/biographies/don-tapscott/
10. Применение blockchain в логистике. Режим доступа: https://golos.io/ico/@paxplus/primenenie-blockchain-v-logistike
11. QUASA - первая открытая блокчейн-платформа для грузоперевозок. Режим доступа: http://www.quasa.io/src/assets/pdf/whitepapper.pdf
12. Блокчейн и IoT: перспективы развития. Часть II. Режим доступа: https://baksman.org/news/blokchejn-i-iot-perspektivy-razvitija-chast-ii.html
13. Технология blockchain в логистике. Режим доступа: http://logist.fm/publications/tehnologiya-blockchain-v-logistike
14. Блокчейн. Как использовать блокчейн. Поставки продуктов питания. Режим доступа: http://tadviser.ru/a/298820
15. Procurement 4.0 in the digital world. Transforming procurement into an agile, linked innovation leader and catalyst. Arthur D. Little 2016.

CHAPTER 7.

APPLICATION OF THE MATHEMATICAL MODELING IN THE ASSESSMENT OF THE THE SMALL AND MEDIUM BUSINESS PERFORMANCE

MATHEMATICAL MODELING OF THE SMALL AND MEDIUM BUSINESS ENTERPRISES PROFITABILITY

P. Maciaszczyk,
Doctor, Rector of State Higher Vocational School Memorial of Prof. Stanislaw Tarnowski
Iu. Ignatova,
PhD in Economics, Associate Professor,
Associate Professor of the economic -mathematical modeling department,
Kyiv National Economic University named after Vadym Hetman
N. Rudyk,
PhD in Economics, Senior Lecturer of the department of finance,
Kyiv National Economic University named after Vadym Hetman

The issue of assessing the effectiveness of small and medium-sized businesses occupies a key place in economic research. Recently, small innovative enterprises are rapidly developing in Ukraine. Domestic small innovative enterprises attract representatives of Silicon Valley and win competitions at the level of TechCrunch Disrupt (San Francisco), win international competitions and gain grants among other world-class startups.

Among the most famous successful Ukrainian small innovative enterprises is Grammarly. The enterprise develops software that tracks grammatical, syntactic and linguistic errors in the English text (any grammatical services) and corrects them. Also, this software allows you to check texts for plagiarism.

Ukrainian IT is successful not only in software development but also in the creation of hardware. One such project is Petcube. The company is quite young (founded in 2012), but the success was obtained from the first device created: a small cube for observation and playing with pet favorites [1].

Another well-known Ukrainian small innovative enterprise (SIE) is PolytedaCloud. This is the only domestic start-up, which received 1.220.000 EUR of investments from the European Commission in 2016 [1]. The project participated in the research and innovation program Horizon 2020 SME Instrument and won. As part of the competition, the company must introduce the cloud product PolytheaCloud on the basis of three European companies in the microelectronics market. In January 2017 the team has already begun work on a pilot project for Pycloud. PolytedaCloud — cloud technology for the development of software for the purge of integrated circuits at the stage of overproduction. The feature of the product — the user works with him in the cloud and pays for an hour.

The main difficulty for such SIEs is the attraction of financial and credit instruments (FCI). Among the sources of FCI distinguish bank loans, leasing, grants, venture investments and the like. Therefore, in order to obtain borrowed funds, the company can justify not only an innovative idea but also model (calculate) the forecast of profitability of entrepreneurial activity. The study shows that forecasting the effectiveness of the FCI performance and compiling a qualitative forecast based on the analysis of time series.

After analyzing a number of literary sources [1-7], we can conclude that profitability of the FCI can be predicted in two ways. The first way is to find the cause-effect mechanisms, that is, to find the deterministic factors of the behavior of the predicted index. This is the way leading to economics-mathematical modeling, constructing a model of the behavior of an economic object (econometric models). The second way is to try to predict the future state of an economic object by analyzing the time series of its indicator in isolation [3].

Analysis of the time series helps to identify the regularity of the observed variables, to derive the laws that govern observations, to expand the information about the variables in order to predict the future state. The basis of the methodology of these procedures is the ability to decompose a time series into a finite number of independent components determining regularity and thus indicating future values.

In the middle of the XIX century such methodological approach was used by economists Charles Babbage and William Stanley Jevons. The decomposition on components (Fig. 1), depending on various causative factors, was performed at first by Warren M. Persons in 1919 [4].

He highlighted four components:

1. Long-term trend of a series (trend).

2. Cyclic component with a period of more than a year (business cycle).

3. A component containing of bursts and failures throughout the year (seasonal cycle).

4. A component that contains fluctuations that cannot be attributed to any of the components mentioned above (residues).
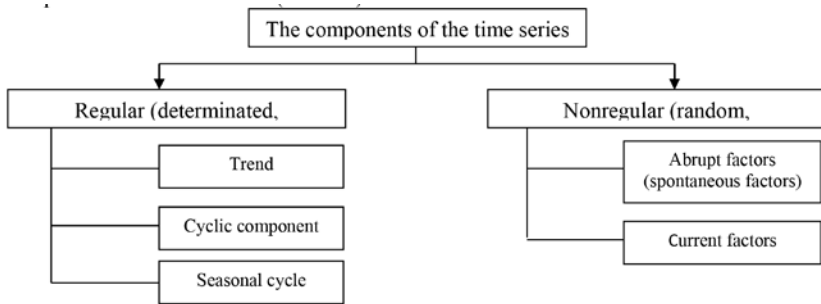
Fig. 1. The components of the time series.
Source: developed by the authors.

Currently, there are many effective and diverse methods of prognostication associated with a powerful mathematical apparatus [3]. The most widely used ones include, in particular, forecasting methods based on bilinear model [5], autoregressive analysis of various types [3; 5], spectral analysis, prediction based on Monte Carlo methods [6], methods based on machine learning and expert evaluations (recursive strategies [7], neural networks [5]), fractal strategies, methods based on multidimensional regression (including using non-parametric estimates of distribution density) [3] and others. Nowadays these methods are ones of the most well-known and widespread approaches in prognostication.

In order to gain grant funds SIE should show its history of activity (financial results) and provide a reasonable forecast for the next periods.

Typically, in order to provide financial instruments such as grants, for example Horizons 2020, Erasmus and venture capital funds, financial results are analyzed for at least six months. Therefore, it is advisable to analyze the time series of financial results of SIE in at least six months.

That is why it is advisable to analyze the financial results of the SIE for at least six months and develop a methodology for estimating and forecasting the profit of innovations, particularly by the example of the American SIE Buffer.

We use the above-mentioned approach of time series analysis to predict the effectiveness of SIE Buffer.

Let's consider in more detail statistical information on a series of dynamics of net profit of Buffer startup for the period from 04.27.2014 to 05.16.2015 (in sum 385 observations). The input time series will be divided into two parts: in the first part are data for the period from 04.27.2014 until 01.17.2015, which will be a training sample of input series, in the second part — will be the rest of data from 01.18.2015 to 05.16.2015 is test. The data of the training sample is shown in Fig. 2.
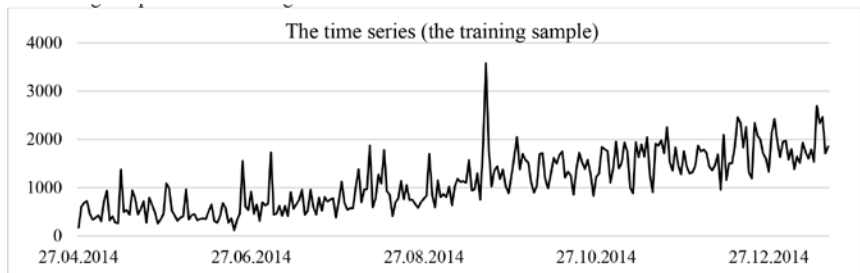
Fig. 2. Time series of Net Profit Buffer from 27.04.2014 until 01.17.2015
Source: developed by the authors based on [8].

The time series (Fig. 2.) is characterized by a growing tendency which has a large number of fluctuations, which is inherent for indicators of profitability of startups.

In order to forecast, let's make the decomposition of this time series (Y_t) on such components: trend (T_t), seasonal component (S_t) and remainder (ε_t). There are additive and multiplicative models of decomposition of time series.

- additive $Y_t = T_t + S_t + \varepsilon_t$ (1)
- multiplicative $Y_t = T_t \times S_t \times \varepsilon_t$. (2)

Let's start an analysis of the time series from constructing an additive model. The process of constructing any of these models is reduced to the calculation of the values T, S and ε for each level of the series by the algorithm shown in Fig. 3.
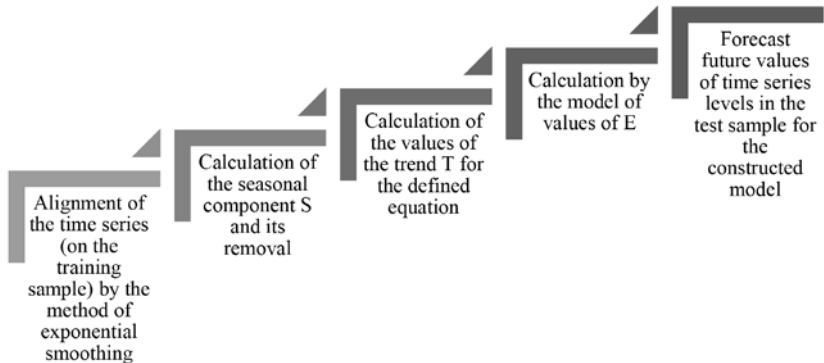

Fig. 3. Algorithm of the time series decomposition
Source: developed by the authors.

For decomposing the time series of the net profit of the SIE Buffer, let's consider how each of the components (seasonal component, trend and remainder) are related to the time series. Let's calculate the additive model (1) as the sum of these components of the series for the training sample.

At the first stage, we make smoothing of the time series. The most well-known methods of smoothing of time series are the method of moving average, exponential smoothing, adaptive smoothing and their modification.

Appling the method of exponential smoothing makes it possible to describe the development of the process, when the greatest weight is given to the last observation, and the weight of the remaining observations decreases geometrically. Obtained as a result of the average value describes the process over the end of the interval smoothing than the beginning and is known as the exponential weighted average.

The calculation of the exponential average makes according to the recurrent formula:

$$\hat{y}_{t+1} = \alpha y_t + (1-\alpha)\hat{y}_t \qquad (3),$$

that is calculated exponential average is taken of the new pre-exponential average and fate (α) of the difference between the past and the supervision of its smoothed value. The parameter of smoothing, we accept α = 0.8 from the condition of the minimum of forecast error. Thus, the exponential average plays the role of a filter absorbing the fluctuations of the time series (Fig. 4).

Fig. 4. Smoothed time series by the method of exponential smoothing (for α=0.8)
Source: developed by the authors based on [8].

We substitute in the equation (3) the values and find a smoothed time series (Fig. 4) for each time t, which are presented in Table 1.

At the second stage, we will simulate the seasonal component. A commonly accepted approach to simulating the profitability of IT industry activities is to take into account the amount of profit dependent on the day of the week. That is, the intensity of visits to users of IT services is higher from Monday to Wednesday, mediocre on Thursday and Friday, and is accordingly low on weekends (Saturday, Sunday).

Therefore, let's build a model of the dependence of net profit of the company from the day of the week. For this purpose, the estimates of the seasonal component are found as the difference between the actual data of the row and the smooth (Table 1). These estimates are used to calculate the values of the index of the seasonal component S of the additive model. The average value for each day of the week (throughout the series) is estimated

of the seasonal component S_i (i = 1, 2, 7). It is assumed that in models with a seasonal component, periodic effects are intergenerational over the season. In additive models, this is reflected by the fact that the sum of the values of the seasonal component in seven days of the week should be zero (Table 2).

Table 1

Model of the dependence of net profit of the company from the day of the week

Period, t	Net profit, Y_t	$Y_{smoothed}$	$Y_t - Y_{smoothed}$
1	2617	-	-
2	2553	2617	-64
3	2382	2604.2	-222.2
4	2976	2559.76	416.24
5	2449	2643.008	-194.008
6	2885	2604.206	280.7936
7	1875	2660.365	-785.365
8	2297	2503.292	-206.292
9	2807	2462.034	344.9663
10	2642	2531.027	110.9731
…	…	…	…
264	6043	5687.014	355.9855
265	6152.5	5758.212	394.2884
266	4660	5837.069	-1177.07

Source: developed by the authors based on [8].

Table 2

Calculation of the seasonal component for time series

DOW	Quantity	Sum	AVG	Seasonal component adjusted S_i
Mon	87	-22435.724	-606.371	-660.194
Tue	87	5630.921	148.182	94.359
Wed	87	15689.737	412.888	359.065
Thu	87	16566.790	435.968	382.145

DOW	Quantity	Sum	AVG	Seasonal component adjusted S_i
Fri	87	19282.932	507.446	453.623
Sat	87	-1944.655	-51.175	-104.998
Sun	87	-17866.724	-470.177	-524.000
Total	265		376.761	
		Correction factor	53.823	7

Source: developed by the authors based on [8].

For this model we have:

$$-606.371+148.182+412.888+435.968+507.446-$$
$$-51.175-470.177=376.761$$

Correction factor: k=376.761/7 = 53.823

Let's calculate the seasonal component values adjusted S_i (Table 3).
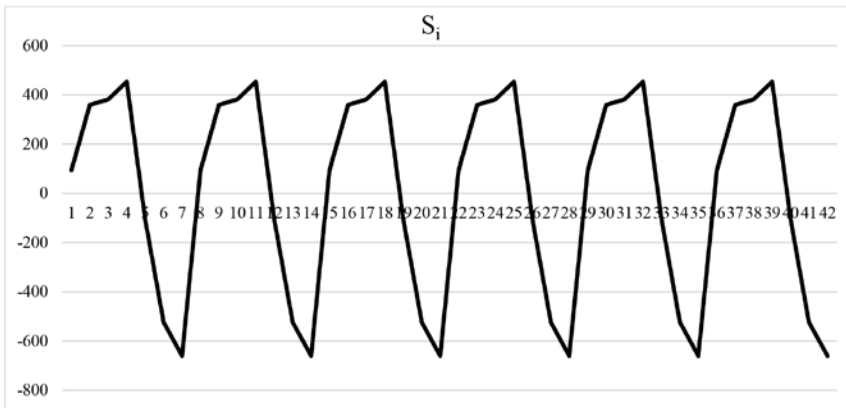
Fig. 5. Seasonal component (for the first 6 weeks) by the additive model
Source: developed by the authors based on [8].

The highest component is observed on the 4th day (Thursday), while weekend is characterized by the decrease of the effective indicator (Net profit).

The calculated values are recorded in Table 3.

Fig. 6 shows the results of the analytical smoothing of the data series after the elimination of the seasonal component.

Table 3

The calculation of the adjusted value of the seasonal component of the time series

DOW	Net profit, Y_t	$Y_{smoothed}$	Estimation of the seasonal component, $Y_t-Y_{smoothed}$	The adjusted value of the seasonal component, S_t	Analytical alignment Y_t-S_t
Mon	2617	-	-	-	-
Tue	2553	2617	-64	94.359	2458.641
Wed	2382	2604.2	-222.2	359.065	2022.935
Thu	2976	2559.76	416.24	382.145	2593.855
Fri	2449	2643.008	-194.008	453.623	1995.377
Sat	2885	2604.206	280.7936	-104.998	2989.998
Sun	1875	2660.365	-785.365	-524.0	2399.0
Mon	2297	2503.292	-206.292	-660.194	2957.194
Tue	2807 2462.034		344.9663	94.359	2712.641
Wed	2642	2531.027	110.9731	359.065	2282.935
Thu	2272	2553.222	-281.222	382.145	1889.855
Fri	2643	2496.977	146.0228	453.623	2189.377
Sat	2601	2526.182	74.81821	-104.998	2705.998
Sun	2460	2541.145	-81.1454	-524.0	2984.0
…	…	…	…	…	…

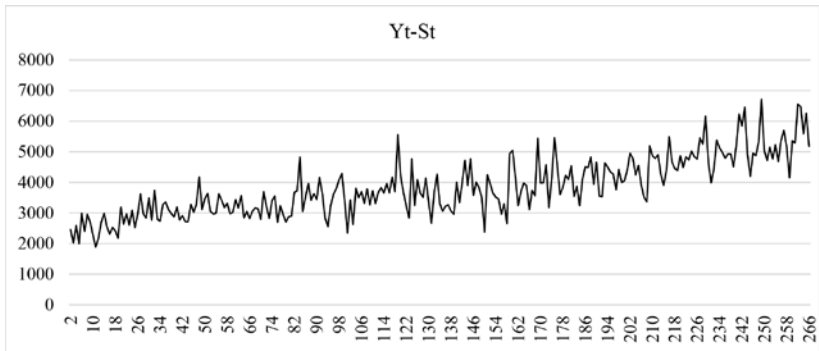*Source: developed by the authors based on [8].*

Fig. 6. Analytical alignment (T + E) after eliminating the seasonal component
for the time series.
Source: calculated by the authors based on [9].

In the third next stage, we will evaluate the trend of the time series, that is, we determine the trend component T. Since we do not know which of the equations of the trend will give the best result, so some analytical alignment $(Y_t\text{-}S_t)$ we will construct several equations and choose the best.

The results of the trend simulation of the time series Y_t of net profit and their determination factors are given below:

a) logarithmic trend $y = 425.637 + 739.007 \cdot \ln t, R^2 = 0.513$;

b) exponential trend $y = 2613.1 \cdot e^{\,0.00264t}, R^2 = 0.672$;

c) power trend $y = 1455.952 \cdot t^{0.203}, R^2 = 0.577$;

d) linear trend $y = 10.101t + 2482.478, R^2 = 0.663$;

e) second-order polynomial trend
$y = 0.00036\ t^3 - 0.1229\ t^2 + 19.7323\ t + 2395.958, R^2 = 0,678$;

f) third-order polynomial trend
$y = 0.00036\ t^3 - 0.1229\ t^2 + 19.7323\ t + 2395.958, R^2 = 0.696 \cdot$

Obviously, the best, qualitative trend equation is variant (f), since the quality factor of this model (determination coefficient R^2) is the highest. Therefore, for the approximation of net profit data we use the polynomial trend of the third order, since this model has the best (among others) determination coefficient and according to Student's criterion, all parameters are significant:

$$y = 0.00036\ t^3 - 0.1229\ t^2 + 19.7323\ t + 2395.958, \qquad (4)$$

Let's substitute the value t = 2, 3, ..., 266 in the equation (4) and find the level of the trend T, which are presented in Table 4 for each time t.

Table 4

The level of the trend T

t	t²	t³	$Y_t\text{-}S_t$	T
1	1	1	—	439.847
2	4	8	2458.641	443.703
3	9	27	2022.935	447.571
4	16	64	2593.855	451.453
5	25	125	1995.377	455.347

t	t²	t³	$Y_t - S_t$	T
6	36	216	2989.998	459.254
7	49	343	2399.0	463.174
8	64	512	2957.194	467.107
9	81	729	2712.641	471.053
10	100	1000	2282.935	475.011
…	…	…	…	…

Source: calculated by the authors based on [8].

Fig. 7 shows the trend line (4) compared to the actual time series data.
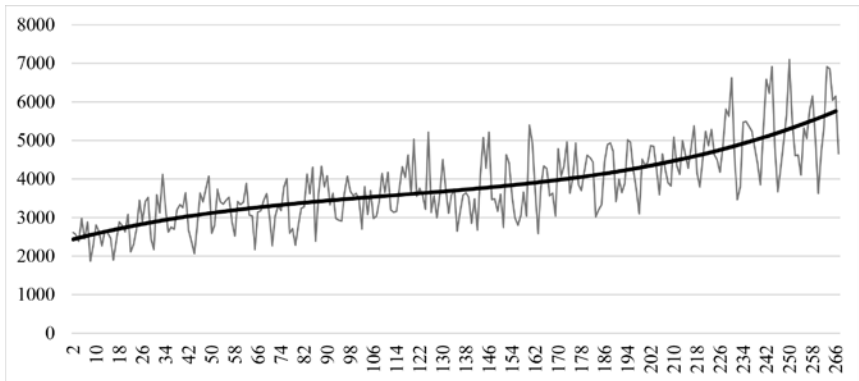
Fig. 7. Time series (actual data) and trend line
Source: calculated by the authors based on [8].

At the fourth stage, let's calculate the absolute errors by the additive model, which are given in Table 5.

Table 5

The absolute errors by the additive model

t	Y_t	S_t	T_t	$T_t + S_t$	$E_t = Y_t — (T_t + S_t)$
1	2617	—	—	—	—
2	2553	94.35918	2434.934	2529.293	23.707
3	2382	359.0649	2454.059	2813.123	-431.123

t	Y_t	S_t	T_t	$T_t + S_t$	$E_t = Y_t — (T_t + S_t)$
4	2976	382.1452	2472.944	2855.089	120.911
5	2449	453.6226	2491.592	2945.214	-496.214
6	2885	-104.998	2510.005	2405.007	479.993
7	1875	-524	2528.185	2004.185	-129.185
8	2297	-660.194	2546.134	1885.94	411.060
9	2807	94.35918	2563.855	2658.214	148.786
10	2642	359.0649	2581.35	2940.415	-298.415
11	2272	382.1452	2598.62	2980.766	-708.766
…	…	…	…	…	…

Source: calculated by the authors based on [8].

The remainders for the input time series are obtained by the additive model (Table 5), which are shown in Fig. 8.
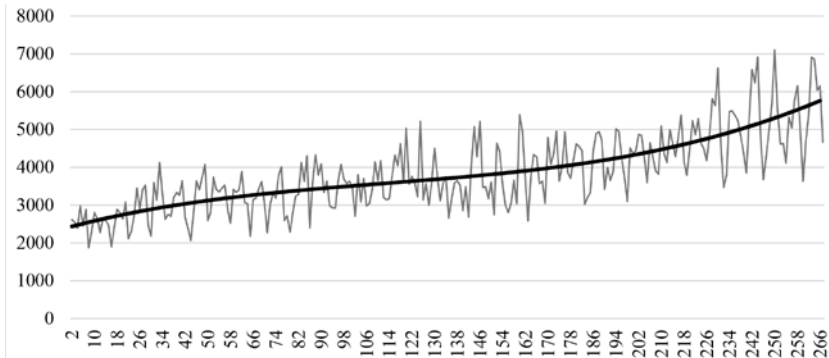

Fig. 8. The remainders for the input time series by the additive model
Source: calculated by the authors based on [8].

As can be seen from Fig. 8 in the time series of the residues obtained by the additive model there is no trend and seasonal component, but there is a large amplitude. Therefore, it is advisable to decompose the multiplicative model for the same training sample (266 observations).

The first stage of the multiplicative decomposition — exponential smoothing, will be similar to the previous method (Fig. 4).

In the next step, we will carry out the analytic alignment of the series $(Y_t / Y_{t\ smoothed})$ and define the seasonal component (5):

$$\frac{Y_t}{S_t} = T_t \times E_t \tag{5}$$

To calculate the values of the index of the seasonal component S of the multiplicative model, use a series of analytical alignment $(Y_t / Y_{t\ smoothed})$ (Fig. 9).
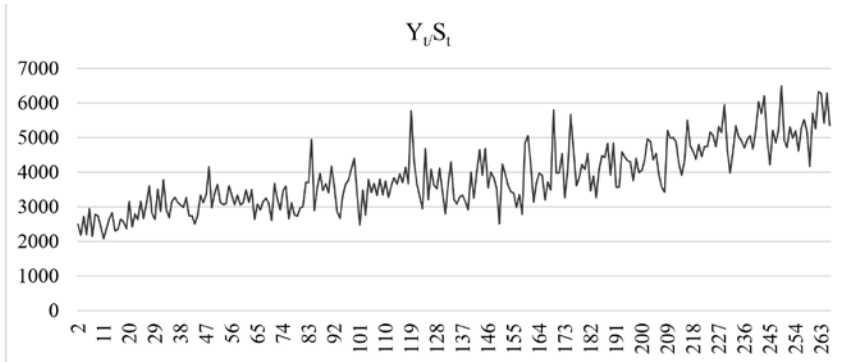

Fig. 9. A number of analytical Y_t/S_t alignments for the multiplicative model
Source: calculated by the authors based on [8].

In the multiplicative model, the periodic effects of the seasonal period are reflected in the fact that the sum of values of the adjusted seasonal component in seven days of the week should be equal to the number of periods, which is seven (Table 6).

Table 6

The calculation of the adjusted value of the seasonal component for the time series

DOW	Quantity	Sum	AVG	Seasonal component adjusted S_i
Mon	37	31.035	0.839	0.825
Tue	38	39.603	1.042	1.025
Wed	38	42.211	1.111	1.092
Thu	38	42.245	1.112	1.093

DOW	Quantity	Sum	AVG	Seasonal component adjusted S_i
Fri	38	43.091	1.134	1.115
Sat	38	37.779	0.994	0.978
Sun	38	33.666	0.886	0.871
Total	265		7.118	
	Correction factor		0.984	7

Source: calculated by the authors based on [8].

For this model we have:

$$0.839+1.042+1.111+1.112+1.134+0.994+0.886=7.118$$

Correction factor: k=7/7.118= 0.984

Let's calculate the corrected values for the seasonal component of S_i (Table 7).

Table 7

The calculation of the seasonal component and analytical alignment of the time series for the multiplicative model

DOW	Net profit, Y_t	$Y_{t\,smoothed}$	The estimation of the seasonal component, $Y_t/Y_{t\,smoothed}$	The adjusted seasonal component, S_t	The analytical alignment Y_t/S_t
Mon	2617	—	—	—	—
Tue	2553	2617	0.976	1.025	2490.809
Wed	2382	2604.2	0.915	1.092	2180.416
Thu	2976	2559.76	1.163	1.093	2721.928
Fri	2449	2643.008	0.927	1.115	2195.933
Sat	2885	2604.206	1.108	0.978	2950.622
Sun	1875	2660.365	0.705	0.871	2151.947
Mon	2297	2503.292	0.918	0.825	2784.479
Tue	2807 2462.034		1.140	1.025	2738.622
Wed	2642	2531.027	1.044	1.092	2418.413

DOW	Net profit, Y_t	$Y_{t\,smoothed}$	The estimation of the seasonal component, $Y_t/Y_{t\,smoothed}$	The adjusted seasonal component, S_t	The analytical alignment Y_t/S_t
Thu	2272	2553.222	0.890	1.093	2078.031
Fri	2643	2496.977	1.058	1.115	2369.886
Sat	2601	2526.182	1.030	0.978	2660.162
Sun	2460	2541.145	0.968	0.871	2823.355
…	…	…	…	…	…

Source: calculated by the authors based on [8].

In turn, the series of analytical alignment Y_t/S_t for the multiplicative model is shown in Fig. 9.

Let's determine the trend for the values of the analytical alignment Y_t/S_t of the time series. The technique of determining the trend is similar to the additive model. The best trend equation for the multiplicative model is also the polynomial of the third degree (6):

$$y = 0.000339\ t^3 - 0.1151\ t^2 + 19.0772\ t + 2412.618 \qquad (6)$$

This model has the highest (among others) determination coefficient ($R^2 = 0.701$) and according to Student's criterion all parameters are significant.

The relative and absolute residues, which are given in Table 8, are obtained for a multiplicative model.

Table 8
The relative and absolute residues for a multiplicative model

t	Net profit, Y_t	The adjusted seasonal component, S_t	Trend, T_t	The analytical alignment, T_t ч S_t	Absolute remainders $E = Y_t - (T_t\ \text{ч}\ S_t)$
1	2617	—	—	—	—
2	2553	1.025	2450.315	2511.494	41.506
3	2382	1.092	2468.823	2697.07	−315.071
4	2976	1.093	2487.107	2719.26	256.740
5	2449	1.115	2505.169	2793.873	−344.873
6	2885	0.978	2523.011	2466.899	418.101

t	Net profit, Y_t	The adjusted seasonal component, S_t	Trend, T_t	The analytical alignment, $T_t \cdot S_t$	Absolute remainders $E = Y_t - (T_t \cdot S_t)$
7	1875	0.871	2540.635	2213.665	-338.665
8	2297	0.825	2558.043	2110.206	186.794
9	2807	1.025	2575.237	2639.536	167.464
10	2642	1.092	2592.219	2831.875	-189.875
11	2272	1.093	2608.991	2852.521	-580.521
…	…	…	…	…	

Source: calculated by the authors based on [8].

Fig. 10 shows the remainders obtained on the basis of the time series decomposition for the multiplicative model (1).
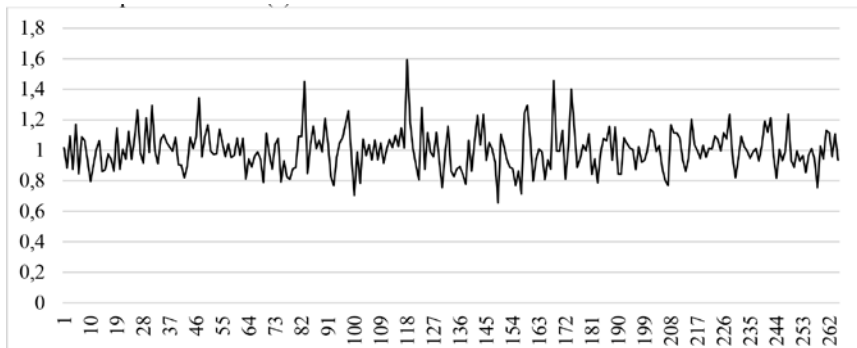

Fig. 10. The remainders (relative) for a multiplicative model
Source: calculated by the authors based on [8].

According to Fig. 10 the time series of remainders for a multiplicative model tend to amplitude decline.

Let's construct a forecast for the obtained models for the test sample. So the forecast for additive and multiplicative decompositions is shown in Fig.11-12.

In order to evaluate the quality of the constructed models (1) — (2), let's carry out a further analysis of models and residues based on:

1) estimation of the determination coefficient $R^2 = 1 - \dfrac{\Sigma E^2}{\mathrm{E}\left(y_t = \overline{y}\right)^2}$;;

2) determination of the mathematical expectation of the remainders;

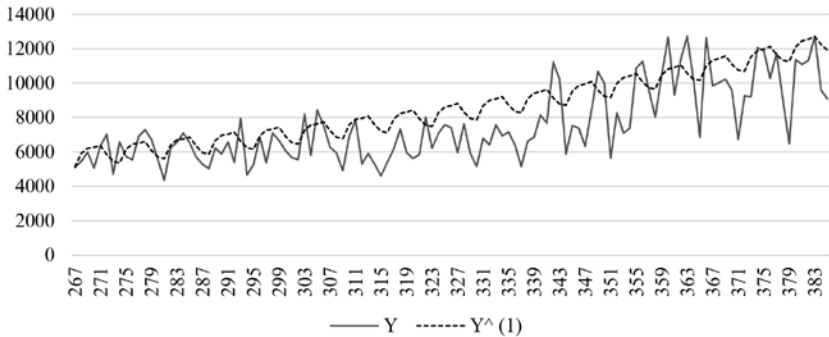3) verification for the presence of the autocorrelation by the Darbin-Watson criterion.

Fig. 11. The forecast for additive decompositions
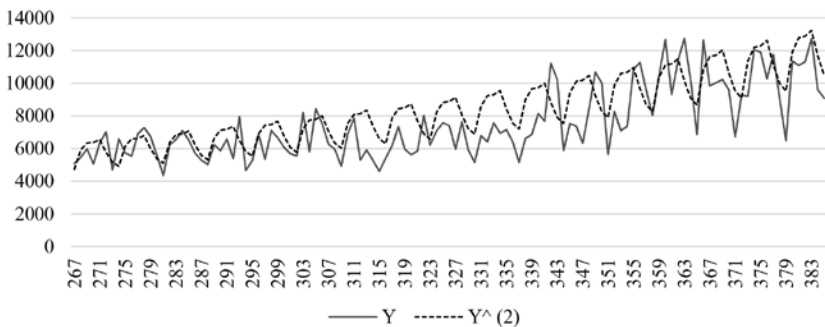*Source: calculated by the authors based on [8].*

Fig. 12. The forecast for multiplicative decompositions
Source: calculated by the authors based on [8].

Let's compile a table of comparisons of models (1) — (2) by the above indicators, given in Table 9.

Based on the Fig. 13-15 is a more accurate prediction based on the autoregressive model of the first order AR. Therefore, in order to predict the net profit of a small innovative enterprise, it is expedient to use the autoregression models AR (q).

Table 9

The comparison of the models (1) — (2)

| Item | | Model | | | | Note |
| The name of | Designations | Additive | | Multiplicative | | |
		educational	test	educational	test	
Determination factor	R^2	0.7353	0.3569	0.75083013	0.4401	The model is better if $R^2 \to 1$
Sum of squares of remainders	$\Sigma(E^2)$	72475011.05	351784342.07	68220312.84	306275182.07	Less is better
Mathematical expectation of remainders	$M(E)$	0.0000	-1050.9539	-3.3947	-859.03	A qualitative model, if $M \approx 0$ for additive one & $M \approx 1$ for multiplicative one

Source: calculated by the authors based on [8].

Based on the results obtained in Table 9 it is obvious that both models are equivalent, and therefore, in the practice of time series research, any of them can be used. The additive model explains 34% of the overall variation of the time series, and multiplicative 58% of the total variation of the time series.

Conclusions. A thorough and comprehensive analysis of the selection of the forecasting method should facilitate the decision-making procedure by the heads of small innovative enterprises. As the results of calculations shows, the forecasting method does not necessarily need to have a complicated mathematical process or be the newest complex method. The method chosen should give the precise, timely and understandable forecast that would help in choosing the best solution for owner of the SIE or investors. In addition, the results of forecasting should generate profits that could cover the costs of its implementation.

REFERENCES

1. Top 10 Ukrainian startups. — [Electronic source]. — Access mode: https://business-journal.com.ua/biznes/item/269-startap-bum
2. Ljjuys K. D. Metody proghnozyrovanyja эkonomycheskykh pokazatelej / Per. s anghl. Demydenko E. Z. — M.: Fynansy y statystyka. — 1986. — 133 s.
3. Boks Dzh. Dzhenkyns Gh. Analyz vremennykh rjadov: Proghnoz y upravlenye. — M.: Myr. — 1974. — 406 s.
4. Guerard J. Introduction to Financial Forecasting in Investment Analysis / J. Guerard. — Hardcover. — 2013. — 236 p. ISBN: 978-1-4614-5238-6
5. Engle R. Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom / R. Engle // Econometrica. — 1982. — Vol. 50, Issue 4. — P. 987–1007.
6. Cheng H. Multistep-ahead time series prediction / H. Cheng et al. // Lecture Notes in Computer Science. — 2006. — Vol. 3918. — P. 765–774.
7. Krychevskyj M. L. Vremennыe rjady v menedzhmente. Chastj 1: monoghrafyja / M. L. Krychevskyj. — M. : RUSAJNS, 2016. — 220 s.
8. Official Buffer's Startup Site. — [Electronic source]. — Access mode: https://buffer.baremetrics.com/stats/net-revenue
9. Бритченко И. Г. Виртуальные банки и их связь с реальной банковской системой // Наука, релігія, суспільство. – № 2. — 2001. — С. 3–10.
10. Брітченко І. Г., Перепелиця Р. К. Оцінка кредитоспроможності емітента корпоративних облігацій // Вісник НБУ. – № 11 (117). — 2005. — С. 32–37.

METODYKA BUDOWANIA PROGNOZ NA PODSTAWIE DWÓCH PROBABILISTYCZNYCH MODELI DZIAŁANIA SYSTEMU PRODUKCYJNO-ZAOPATRZENIOWEGO UMOŻLIWIAJĄCYCH POPRAWĘ EFEKTYWNOŚCI FUNKCJONOWANIA SYSTEMU

dr Maria Borowska,
starszy wykładowca Wydział Nauk Technicznych
i Ekonomicznych Państwowej Wyższej Szkoły Zawodowej
im. prof. Stanisława Tarnowskiego w Tarnobrzegu

Artykuł prezentuje nowatorską metodę budowania prognoz wspomagających proces zarządzania usługami. Przedstawione prognozy zbudowane są na podstawie praw funkcjonowania probabilistycznego systemu produkcyjno-zaopatrzeniowego wspomagającego centrum usług.

Prawa funkcjonowania probabilistycznego systemu przedstawione są w postaci matematycznego modelu — układu równań różniczkowych. Rozpatrywany model przeanalizowany został w dwóch wersjach: zagregowanej i strukturalnej. Uzyskane z probabilistycznego modelu prognozy zależą od parametrów systemu. W związku z takim podejściem do prognozowania staje się możliwa korekta tych prognoz poprzez zmianę wartości parametrów działania systemu w celu podniesienia efektywności funkcjonowania centrum usług. Ponadto przedstawiona w artykule metodyka prognozowania może stanowić podstawę programowania informatycznego usprawniającego technikę obliczeniową dla podmiotów zarządzających centrum usług.

Celem artykułu jest zaprezentowanie nowej — nowatorskiej metody budowania prognoz wspomagających proces zarządzania usługami na podstawie praw funkcjonowania probabilistycznego systemu produkcyjno-zaopatrzeniowego (SPZ), czyli modeli matematycznych tych procesów w postaci pewnych układów równań. W procesie zarządzania badanym obiektem z reguły wykorzystywane są odpowiednie prognozy w celu podejmowania racjonalnych decyzji. Stwierdza się wtedy, że prognozy te wspomagają proces efektywnego zarządzania obiektem.

Zarządzanie w przypadku centrum usług (CU), (zob. rys. 1.) polega na podejmowaniu takich decyzji, które powinny zapewnić efektywne działanie CU, a więc takie działania, aby CU realizowało optymalnie dobrze potrzeby swoich klientów — odbiorców. Istotnie ważnym elementem, który wspomaga proces zarządzania CU jest wykorzystanie, przez decydentów CU, prognoz zdarzeń losowych, które mają wpływ na jakość funkcjonowania CU. Zdarzenia takie są zdeterminowane i uzależnione przez procesy opisujące działanie SPZ, wspomagające CU, a więc przez proces produkcji, proces transportowy i proces wypełnienia magazynu (zob. rys. 2.). Procesy te podlegają zmianom w czasie i nazywane są w niniejszej pracy charakterystykami lub procesami opisującymi działanie SPZ oraz CU.

Dla przykładu: jeżeli w chwili t wystąpi deficyt podaży produktu do odbiorcy, czyli podaż produktu jest mniejsza od zapotrzebowania odbiorcy CU, a magazyn jest pusty, to wystąpi zdarzenie niekorzystne dla funkcjonowania CU. Obliczanie prognozy tej charakterystyki w chwili t podaje wzór (3.1.32.) w niniejszym artykule. Znajomość tej prognozy przez osoby zarządzające CU ma istotne znaczenie dla poprawy efektywności zarządzania CU. Pozostałe prognozy charakterystyk, czyli procesów opisujących działanie SPZ oraz CU są przedstawione w punktach: 3.1. oraz 3.2. niniejszego artykułu.

W teorii i praktyce prognozowania można wyróżnić dwa kierunki badań:

– jeden z nich dotyczy konstruowania prognoz określonych procesów na podstawie realizacji (szeregów czasowych) tych procesów, czyli na podstawie zbioru obserwacji tych procesów uporządkowanych według czasu (zob. np. [23]-[27], [50]-[64], [83], [86], [88], [89], [111]-[113], [117], [118]),

– drugi zaś — budowania prognoz na podstawie praw funkcjonowania badanych obiektów, czyli z wykorzystaniem odpowiednich układów matematycznych równań.

Liczba publikacji ukazujących się w pierwszym obszarze działalności naukowej jest znacznie większa od ilości prac powstających w ramach drugiego kierunku badań (zob. np. [17], [22], [34]-[36], [73], [74], [84], [85]). Nie zajmowałam się w tej pracy prognozowaniem procesów na podstawie szeregów czasowych, ponieważ prognozy takie nie zależą bezpośrednio od praw funkcjonowania badanego systemu, a więc nie zależą od wartości parametrów działania systemu. Uzyskiwaniem prognoz i metoda-

mi prognozowania na podstawie szeregów czasowych zajmowali się m.in.: Hellwig Z., Zieliaś A., Dittmann P., Guzik B., Milo W., Box G., Jenkins G., Kildeszew G., Cieślak M., Brown R., Frenkel A.

Prognozy stanów procesów opisujących badane obiekty prognostyczne wyznacza się więc w drugim z wymienionych obszarów badań za pomocą modeli matematycznych tych obiektów — modeli znanych lub dopiero konstruowanych.

Podstawowym zamiarem niniejszej pracy jest przedstawienie nowego narzędzia — nowatorskiej metodyki wyznaczania prognoz, które wspomagają zarządzanie CU, na podstawie analizy działania probabilistycznego SPZ, prowadzącej do uzyskania przeze mnie dwóch wariantów autorskiego probabilistycznego modelu działania SPZ, czyli odpowiednich układów matematycznych równań (zob. punkt 3). W oparciu o uzyskany model podałam również autorską — nowatorską metodę wyznaczania prognoz (zob. punkty 3.1. i 3.2.). Prognozy te zależą od parametrów badanego systemu, a więc od parametrów podsystemu produkcji, parametrów podsystemu transportowego i poziomu wypełnienia magazynu (zob. rys. 3.). Jeżeli prognozy te okażą się niekorzystne dla działania CU, to istnieje możliwość korekty tej prognozy poprzez korektę wartości parametrów działania SPZ, w celu uzyskania prognozy, która wskazuje zarządzającym CU na efektywne realizowanie interesów swoich klientów. Takiej możliwości korekty prognozy nie dają prognozy uzyskane na podstawie szeregów czasowych.

Niniejszy materiał należy w zasadzie do drugiego z wymienionych obszarów badań. Problematyka ta dotyczy głównie zagadnień zwiększania efektywności funkcjonowania systemów produkcyjno-zaopatrzeniowych, działających w różnych obszarach gospodarki, z wykorzystaniem podejścia modelowego i prognozowania (zob. np. [2], [20], [21], [32], [67]-[69], [76]-[80], [99], [101]-[103], [105]).

Zawsze aktualna i ważna jest aktywność naukowa, która dostarcza narzędzi usprawniających i wspomagających proces zarządzania badanym obiektem. W mojej pracy narzędziami takimi są prognozy charakterystyk procesów opisujące działanie SPZ oraz CU. Prognozy te zbudowane są tak, aby zależały one od parametrów badanego systemu, a więc od parametrów procesu produkcji, parametrów procesu transportowego oraz poziomu wypełnienia magazynu. Prognozy takie dają możliwość ich korekty poprzez zmianę wartości parametrów działania SPZ w celu uzyskania takich

pozytywnych prognoz dla efektywnego działania CU, które satysfakcjonowałyby swoich klientów. W celu konstrukcji tych prognoz zbudowane w pracy zostały prawa funkcjonowania SPZ, czyli probabilistyczne modele matematyczne opisujące działanie SPZ (zob. punkt 3). Na podstawie tych praw zaprezentowałam nową — nowatorską metodykę badania prognoz charakterystyk (procesów) opisujących działanie SPZ i wspomagających CU (zob. punkty 3.1. i 3.2.). Stosowanie ilościowych metod wspomagających analizę i realizację procesu efektywnego funkcjonowania takich systemów ma istotne znaczenie, ponieważ prowadzi do wzrostu ich konkurencyjności i osiągania korzystnej sytuacji finansowej.

Literatura naukowa na temat prognoz badanych na postawie praw funkcjonowania jest bardzo skąpa. Przykładem prognozy strumienia produkcji globalnej badanej na podstawie dynamicznych modeli przepływów międzygałęziowych Leontiefa jest praca doktorska: Ambroch K. p.t. Konstrukcja operatów predykcji parametrów strukturalnych w liniowych modelach przepływów międzygałęziowych. Innymi modelami funkcjonowania gospodarki zajmowali się m.in. Welfe P., Kulikowski L. i Hellwig Z.

Działalność naukowa w kierunku tworzenia nowych narzędzi wspomagających proces zarządzania różnymi obiektami, w tym narzędzi opartych na metodach ilościowych (matematycznych, probabilistycznych, statystycznych, prognozowania, badaniach operacyjnych, ekonometrii i procesów stochastycznych), jest ciągle aktualna i niezbędna dla doskonalenia jakości zarządzania różnymi systemami gospodarki. Przedstawiony artykuł należy właśnie do tego kierunku badań i prezentuje nową, autorską, prekursorską metodykę wyznaczania prognoz na podstawie praw funkcjonowania SPZ współpracującego z CU. Prawa te zostały wyprowadzone w dwóch wariantach działania systemu (zob. [16]) i przedstawione syntetycznie w kolejnych punktach niniejszego artykułu (zob. punkty 3.1. i 3.2.). Na podstawie tych praw zaprezentowana też została prekursorska metodyka wyznaczania prognoz wspomagających proces zarządzania CU (zob. punkty 3.1. i 3.2.).

Celem pracy jest zbadanie działania systemu produkcyjno-zaopatrzeniowego wspomagającego efektywne funkcjonowanie centrum usług. Analizowany w pracy system dostarcza do magazynu produkty, które centrum usług sprzedaje swoim klientom — odbiorcom. Elementami składowymi centrum usług jest magazyn-zbiornik i odbiorca, co przedstawione jest na rysunku 1.
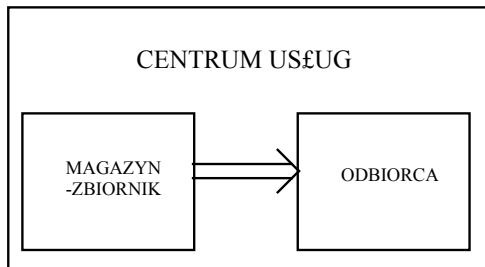
Rys. 1. Centrum usług.

W pracy zostały zbudowane prognozy stanów procesów wspomagających efektywne zarządzanie centrum usługowym (zob. rys. 1), (zob. punkty 3.1. i 3.2.). Przykładem CU jest magazyn-zbiornik gromadzący np. węgiel, piasek, żwir budowlany, gaz czy ropę, a odbiorcą tego produktu jest odpowiednio np. elektrownia, kombinat budowlany, elektrociepłownia, a nawet region kraju. Prognozy stanów tych procesów uzyskane zostały na podstawie analizy praw działania systemu produkcyjno-zaopatrzeniowego wspomagającego centrum usług. System ten składa się z podsystemu produkcji i podsystemu transportowego oraz z magazynu-zbiornika, jak pokazuje rysunek 2.
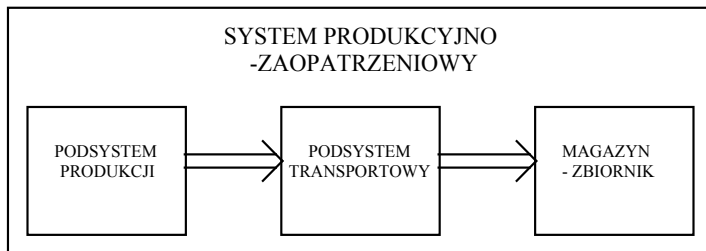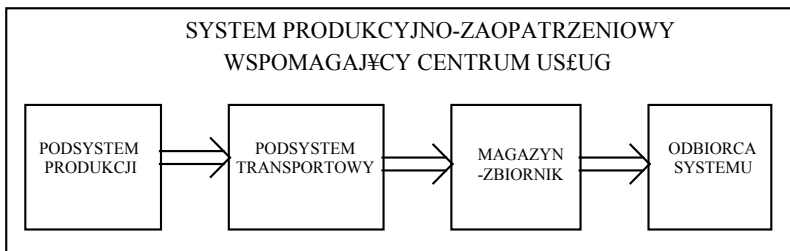

Rys. 2. System produkcyjno-zaopatrzeniowy wspomagający centrum usług.

Przykładem SPZ może być:
– podsystem produkcji np. kopalnia węgla, kopalnia piasku lub żwiru, czy rafineria,
– podsystem transportowy tworzą np. taśmociągi, czy rurociągi przekazujące, wytworzony lub pozyskany przez podsystem produkcji produkt, do magazynu-zbiornika.

System produkcyjno-zaopatrzeniowy (zob. rys. 2) zapewnia efektywne funkcjonowanie centrum usług, co schematycznie ilustruje rysunek 3.
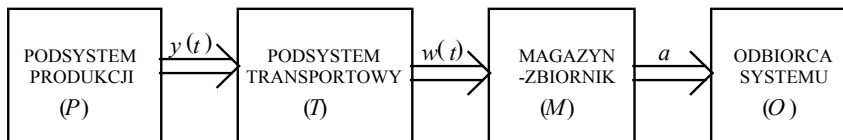

Rys. 3. Schemat funkcjonowania badanego systemu produkcyjno-zaopatrzeniowego wspomagającego centrum usług.

Systemem produkcyjno-zaopatrzeniowym dla centrum usługowego może być np. system dostarczania węgla dla elektrowni, czy paliwa dla elektrociepłowni, ewentualnie materiałów sypkich, takich jak żwir, piasek lub cement itp. dla pewnego odbiorcy, jakim może być centrum usług budowlanych.

Otrzymane w pracy prognozy zbudowane zostały na podstawie modeli matematycznych. Stanowią one probabilistyczne charakterystyki stanów procesów zachodzących w systemie produkcyjno-zaopatrzeniowym wspomagającym efektywne zarządzanie centrum usługowym (zob. rys. 3).

Obiektem badania pracy jest następujący system gospodarki zapasami, stanowiący system produkcyjno-zaopatrzeniowy wspomagający centrum usług, schematycznie zilustrowany rysunkami: 3 i 4.

Rys. 4. Ogólny schemat funkcjonowania systemu produkcyjno-zaopatrzeniowego wspomagającego centrum usług.

Celem badania jest uzyskanie nowych, prekursorskich narzędzi — metod ilościowych wspomagających proces zarządzania usługami. Narzędziami tymi jest autorsko opracowana nowa, prekursorska metodyka wyznaczania prognoz charakterystyk (procesów) opisujących funkc-

jonowanie SPZ współpracującego z CU. Prognozy takie, aby mogły wspomagać proces zarządzania CU, powinny zależeć od parametrów opisujących działanie: podsystemu produkcji, podsystemu transportowego oraz poziomu wypełnienia magazynu. Wówczas prognozy te dają możliwość przewidywania procesu zarządzania CU, a więc jego funkcjonowanie i wspomaganie poprzez wykorzystanie wartości parametrów tych podsystemów. Jeżeli prognozy okażą się niekorzystne dla funkcjonowania CU, to istnieje możliwość korekty wartości tych parametrów w celu uzyskania prognoz korzystnych dla działania CU, a tym samym poprawy jakości jego zarządzania i funkcjonowania.

Do zbudowania takich prognoz niezbędne jest opracowanie dwóch autorskich matematycznych-probabilistycznych modeli (zob. punkty 3.1. i 3.2.), czyli opracowanie praw funkcjonowania SPZ. Tak więc prognozy te zbudowane są na podstawie ww. praw działania SPZ współpracującego z CU (zob. punkty 3.1. i 3.2.).

Artykuł zawiera model działania systemu (zob. rys. 4.), kiedy proces dostawy produktu do magazynu reprezentuje łącznie podsystem produkcji i podsystem transportowy (zob. punkt 3.1.). Można wtedy powiedzieć, że poziom wypełnienia magazynu sterowany jest zagregowanym procesem dostawy produktu $(S(za))$. Przeprowadzona analiza działania systemu w trzech wariantach wypełnienia magazynu: stan pośredni zapełnienia magazynu, stan zerowy zapełnienia, czyli bariera dolna oraz stan pełnego zapełnienia, czyli bariera górna doprowadziła do autorskiego modelu matematycznego tego systemu zaprezentowanego w punkcie 3 artykułu. Na podstawie tego modelu przedstawiona została nowa — prekursorska metodyka wyznaczania prognoz (zob. punkt 3.1.). Dalej dokonana została analiza działania SPZ współpracującego z CU (zob. rys. 4), kiedy proces dostawy produktu do magazynu uwzględnia *explicite* zarówno proces produkcji, jak i działanie podsystemu transportowego (zob. punkt 3.2.), czyli jest to strukturalny proces dostawy produktu $(S(st))$. Podobnie, jak w wersji zagregowanej (zob. punkt 3.1.), również w wersji strukturalnej (zob. punkt 3.2.), przeprowadzona analiza działania systemu, również w trzech wariantach wypełnienia magazynu, pozwoliła uzyskać drugi autorski model matematyczny działania systemu w wersji strukturalnej (zob. punkt 3.2.).

Na podstawie tych modeli została zaproponowana nowa, prekursorska metodyka wyznaczania prognoz ilościowych (zob. punkty 3.1. i 3.2.),

charakteryzujących i opisujących proces zarządzania badanym SPZ oraz wspomagających działanie CU (zob. rys. 3 i 4).

Do odbiorcy O (np. elektrowni[6]), którego funkcjonowanie uwarunkowane jest stałym zapotrzebowaniem a jednostek produktu (np. węgla[7]), dostarczany jest w sposób ciągły (np. za pomocą taśmociągów, gazociągów, linii przesyłowych) strumień produkcji $y(t)$ (gdzie t oznacza czas), realizowany przez podsystem produkcji P, jako nadawcy (zob. rys. 4). Przykładem podsystemu P (nadawcy) może być np. zespół koparek. Losowe zmiany procesu $y(t)$ w czasie t oraz nieplanowane przerwy w pracy (awarie) podsystemu transportowego T są czynnikami wpływającymi na zmniejszenie efektywności funkcjonowania takiego systemu. Efektywność tę można zwiększyć — i jednocześnie zmniejszyć możliwość powstawania przerw w dostawie odpowiedniej ilości produktu do odbiorcy O — poprzez zlokalizowanie w otoczeniu odbiorcy O magazynu-zbiornika M o określonej objętości V. Magazyn-zbiornik ma podstawowe znaczenie dla sprawnego działania CU, ponieważ amortyzuje wpływ losowych czynników zakłócających realizację dostaw produktu do odbiorcy — klienta. Umożliwia on zatem bardziej efektywne funkcjonowanie CU. Strumień produktu $y(t)$ jest gromadzony w podsystemie M: gdy poziom wypełnienia magazynu nie przekracza V oraz gdy $y(t)>a$. Jeżeli chwilowa zawartość elementu M jest równa V oraz $y(t)>a$, to wielkość strumienia $y(t)$ ogranicza się do poziomu a. Gdy element M jest pusty i $y(t)>a$, powstaje sytuacja niekorzystna dla odbiorcy O. Określenie więc prawdopodobieństwa tego zdarzenia ma ważne znaczenie praktyczne dla prawidłowego funkcjonowania centrum usług.

Zdarzenie losowe, kiedy magazyn jest pusty i proces dostawy produktu do magazynu jest mniejszy od zapotrzebowania odbiorcy jest bardzo niekorzystne dla działania CU. Wówczas to CU nie może zrealizować potrzeb swoich odbiorców — klientów. Prognoza dużego prawdopodobieństwa tego zdarzenia jest sygnałem ostrzegawczym dla CU, że zarządzanie SPZ należy koniecznie poprawić poprzez poprawę następujących parametrów: podsystemu produkcji, podsystemu transportowego oraz poziomu wypełnienia magazynu-zbiornika (zob. rys. 4).

Wejście $w(t)$ podsystemu M, opisujące proces dostawy produktu do magazynu M i dalej do odbiorcy O, można badać w dwóch wariantach:

---

[6] elektrociepłowni, czy centrum usług budowlanych

[7] paliwa, żwiru, piasku, czy cementu

wariant zagregowany (punkt 3.1.): $w(t) = y(t)$; proces $w(t)$ reprezentuje łącznie podsystem produkcji P oraz podsystem transportowy T,

wariant strukturalny (punkt 3.2.): $w(t) = y(t)v(t)$; proces $w(t)$ uwzględnia *explicite* zarówno podsystem P (strumień produktu $y(t)$), jak i podsystem T. Proces $v(t)$ (zdefiniowany w punkcie 3.2. wzorem (3.2.1)) opisuje funkcjonowanie podsystemu transportowego.

W celu zaproponowania narzędzi wspomagających analizę i proces efektywnego funkcjonowania badanego systemu (zob. rys. 4) należy przyjąć, że $y(t)$ oraz $v(t)$ są procesami Markowa o skończonej liczbie stanów. W praktyce jest to naturalne założenie. Procesy te opisane są przez intensywność przejścia między swoimi stanami oraz intensywnościami pozostania w tych samych stanach.

System przedstawiony na rys. 4, badany z uwzględnieniem wariantu pierwszego lub wariantu drugiego, oznaczam odpowiednio symbolami: $S(za)$ — wariant zagregowany oraz $S(zt)$ — wariant strukturalny.

Niech funkcja czasu $z(t)$ taka, że $z(t) = z(t,\omega)$ oznacza chwilową zawartość magazynu M o skończonej objętości V, gdzie ω jest parametrem losowym. Zaś funkcja h będzie zdefiniowana następująco:

$$h(z) = \begin{cases} 0, & \text{gdy} \quad z \leq 0 \\ z, & \text{gdy} \quad 0 < z < V \\ V, & \text{gdy} \quad z \geq V, \quad V = const, \quad V > 0. \end{cases} \qquad (2.1)$$

Zauważmy, że proces stochastyczny $z(t)$ w przedziale $[\alpha_1, \alpha_2)$ stałości realizacji procesu: $w(t) = y(t)$ spełnia następujący warunek dla $\alpha_1 \leq t_1 < t < \alpha_2$:

$$z(t,\omega) = h\left[z(t_1) + (y(t_1) - a)(t - t_1) \right]. \qquad (2.2)$$

Proces stochastyczny jest wielkością zależną od czynników losowych (ω) oraz od czasu (t).

Poziom wypełnienia magazynu jest procesem stochastycznym, ponieważ zależy on od działania podsystemu produkcji i podsystemu transportowego, a na ich funkcjonowanie mają również wpływ czynniki losowe i czas. Fakt, że wypełnienie — zapas produktu $z(t)$ w przedziałach stałości realizacji procesu $y(t)$ spełnia warunek (2.2), wynika z fizycznej natury procesu $z(t)$. Jeżeli w chwili t_1 wypełnienie zbiornika wynosi $z(t_1)$, to istotnie w chwili t, gdy $\alpha_1 \leq t_1 < t < \alpha_2$, będzie ono wynosić: $z(t) = z(t_1) + (y(t_1) - a)(t - t_1)$, gdy $0 < z(t_1) + (y(t_1) - a)(t - t_1) < V$. W przypadku maksymalnego wypełnie-

nia magazynu M do jego objętości V, mamy: $z(t)=V$ i $y(t) \geq a$, a więc gdy magazyn M jest już pełny i podsystem transportowy T może dostarczać więcej rezultatów produkcji $y(t)$ podsystemu P, niż potrzebuje odbiorca O, należy wtedy utrzymać zdolność transportową systemu zmniejszając jedynie sumaryczną wydajność podsystemu P do poziomu zapotrzebowania a odbiorcy O. Stan pustego magazynu M, czyli gdy $z(t)=0$ występuje tylko wtedy, gdy poziom dostawy $y(t)$ jest nie większy niż zapotrzebowanie, czyli gdy $y(t) \leq a$. Takie wyróżnienie stanów $z(t)=V$ oraz $z(t)=0$ wskazuje na potrzebę wprowadzenia funkcji h, określonej wzorem (2.1). Funkcja $z(t)$ jest określona za pomocą procesu $w(t)= y(t)$, więc $z(t)$ jest procesem sterownym przez proces dostawy produktu $w(t)$.

Problematyka zwiększania efektywności funkcjonowania scharakteryzowanego wyżej systemu produkcyjno-zaopatrzeniowego, warunkującego sprawne działanie centrum usług, jest głównym nurtem rozważań niniejszej pracy. Podstawowym elementem działania CU jest magazyn-zbiornik. Od poziomu jego wypełnienia zależy sprawny proces obsługi klientów CU. Z kolei na wielkość wypełnienia magazynu ma wpływ sprawne działanie SPZ. Jeżeli SPZ zapewnia odpowiedni poziom wypełnienia magazynu, to CU sprawnie obsługuje swoich klientów (odbiorców).

Podstawowym celem artykułu jest przedstawienie nowego ilościowego narzędzia tj. nowej prekursorskiej metodyki uzyskiwania prognoz procesów, czyli charakterystyk, wspomagających zarządzanie CU. Prognozy te usprawniają proces zarządzania CU dlatego, że są one zbudowane na podstawie probabilistycznych modeli działania SPZ. Modele te zależą od: parametrów opisujących działanie podsystemu produkcji, parametrów opisujących działanie podsystemu transportowego oraz poziomu wypełnienia magazynu. Dzięki wykorzystaniu przy konstrukcji tych prognoz autorskich modeli (zob. punkty 3.1. i 3.2.), prognozy te zależą *explicite* od ww. parametrów i dlatego dają możliwość wspomagania sprawnego działania CU. Jeżeli prognoza pewnej charakterystyki okaże się niekorzystna dla sprawnego funkcjonowania CU — np. gdy w chwili t poziom wypełnienia magazynu wynosi zero i system transportowy dostarcza mniej produktu od zapotrzebowania klienta (odbiorcy) — wtedy istnieje konieczność poprawy wartości parametrów działania SPZ wskazanych przez decydentów CU tak, aby uzyskać prognozę sprawnego funkcjonowania CU. Możliwość tę zapewnia wykorzystanie do budowy takich prognoz skonstruowanych

właśnie przeze mnie probabilistycznych modeli matematycznych. Takiej możliwości wspomagania zarządzania CU nie dają prognozy uzyskane na podstawie szeregów czasowych.

Dlatego w pracy tej przedstawiam autorską propozycję rozwiązania następujących zagadnień:

1) uzyskanie probabilistycznego opisu badanego systemu produkcyjno-zaopatrzeniowego wspomagającego centrum usług w przypadku, gdy poziom zapasów podsystemu M sterowany jest zagregowanym procesem dostawy produktu (system $S(za)$). Opis ten po pierwsze: uwzględnia zarówno dynamikę parametrów procesu podaży produktu przez podsystem P, jak i — różne warianty działania podsystemu M; po drugie: daje możliwość skonstruowania i wyznaczenia ilościowych charakterystyk funkcjonowania systemu $S(za)$; po trzecie: umożliwia uzyskanie prognoz charakterystyk opisujących działanie systemu $S(za)$,

2) określenie i wyznaczenie wskaźników opisujących działanie i poprawność zaprojektowania systemu $S(za)$,

3) uzyskanie prognoz procesów charakteryzujących funkcjonowanie systemu $S(za)$, generowanych zbudowanym modelem probabilistycznym,

4) otrzymanie stochastycznego opisu rozważanego systemu produkcyjno-zaopatrzeniowego wspomagającego centrum usług w przypadku, gdy poziom zapasów podsystemu M sterowany jest strukturalnym procesem dostawy produktu (system $S(st)$). Opis te winien posiadać ww. cechy podane w punkcie 1) oraz uwzględniać *explicite* parametry (wraz z ich dynamiką) podsystemu transportowego T,

5) uzyskanie prognoz charakterystyk opisujących działanie systemu $S(st)$, generowanych zbudowanym modelem.

Całość zagadnień będących przedmiotem rozważań artykułu przedstawiona jest w dwóch punktach: 3.1. i 3.2. poprzedzonych wprowadzeniem charakteryzującym obiekt badania oraz zakończona podsumowaniem.

W punkcie 3.1. zbadany jest system produkcyjno-zaopatrzeniowy (przedstawiony schematycznie na rys. 4), w którym poziom zapasów sterowany jest zagregowanym procesem dostawy produktu (system $S(za)$). Przeanalizowane są trzy warianty: stan pośredni, bariera dolna oraz górna. W wyniku tej analizy został zaproponowany autorski probabilistyczny model działania systemu $S(za)$ (zob. punkt 3.1.). Przedstawione są także trzy — ważne w praktyce — prostsze warianty badanego modelu w wers-

ji zagregowanej. Zdefiniowane są też wielkości charakteryzujące działanie badanego systemu oraz metoda ich obliczania. Zdefiniowany jest: wskaźnik oceny strat produkcyjnych odbiorcy O i podsystemu produkcji P, wskaźnik oceny stopnia wykorzystania podsystemu M oraz wskaźniki opisujące stany graniczne (bariery) tego podsystemu. Podana też jest metodę wyznaczania tych wskaźników.

Procedura obliczania wymienionych charakterystyk i wskaźników jest zilustrowana na przykładzie dwustanowego procesu podaży produktu. Zostały uzyskane wzory *explicite* wyrażające zależność tych wielkości od parametrów systemu. Ponadto dokonana jest analiza uwzględniająca przydatność tych wzorów do rozwiązywania problemów efektywnego zarządzania tym systemem oraz do oceny poprawności zaprojektowania systemu.

Punkt 3.1. zawiera też przykład liczbowy, w którym dla określonych parametrów systemu wyznaczone zostały: wskaźniki oceny strat produkcyjnych systemu (odbiorcy O i nadawcy P), wskaźnik oceny stopnia wykorzystania podsystemu M, wskaźniki opisujące stany graniczne (bariery) podsystemu M.

Sprawdzona też została poprawność zaprojektowania systemu. Punkt 3.1. poświęcony jest również prognozowaniu wielkości opisujących funkcjonowanie systemu $S(za)$. Oprócz metodyki wyznaczania prognozy charakterystyk działania systemu, podane są także procedury obliczania prognoz innych wielkości opisujących działanie tego systemu.

W punkcie 3.2. badany jest system produkcyjno-zaopatrzeniowy wspomagający centrum usług, w którym poziom zapasów sterowany jest strukturalnym procesem podaży produktu (system $S(st)$). Funkcjonowanie tego systemu przeanalizowane jest z uwzględnieniem: stanu nieekstremalnego poziomu zapasów podsystemu M i stanów granicznych (barier): dolnego i górnego. W rezultacie otrzymane zostały następujące wyniki: wzory *explicite* dla prawdopodobieństw warunkowych z uwzględnieniem barier i stanów nieekstremalnych poziomu zapasów magazynu M; relacje, które spełniają funkcje gęstości rozkładów prawdopodobieństwa trójwymiarowego procesu stochastycznego opisującego funkcjonowanie systemu $S(st)$; związki między stanami granicznymi poziomu zapasów, a intensywnościami strukturalnego procesu zaopatrzenia podsystemu M.

W rezultacie zaprezentowano w punkcie 3.2. autorski probabilistyczny model działania badanego systemu $S(st)$ z uwzględnieniem dynamiki para-

metrów procesu wejścia podsystemu *M*. Przedstawione też są, ważne w zastosowaniach praktycznych, prostsze warianty uzyskanego modelu. Otrzymane prognozy zależą *explicite* od parametrów systemu, zatem stwarza to możliwość śledzenia przyszłych zmian w funkcjonowaniu całego systemu produkcyjno-zaopatrzeniowego, które wynikają z przewidywanych zmian parametrów systemu, a w szczególności — ze zmian elementów organizacyjnych.

Otrzymane w pracy: probabilistyczne opisy funkcjonowania systemu produkcyjno-zaopatrzeniowego wspomagającego centrum usług, zdefiniowane charakterystyki działania tego systemu oraz ich prognozy są narzędziami wspomagającymi analizę oraz proces efektywnego funkcjonowania badanego systemu wspomagającego centrum usług. Tego rodzaju narzędzia są elementami podsystemów (teoretyczno-metodologicznych), konstruowanych komputerowych systemów wspomagania decyzji.
Ponieważ ręczne wyznaczanie prognoz na podstawie zaproponowanej — prekursorskiej metodyki przedstawionej w punktach 3.1. i 3.2. wymaga przeprowadzenia żmudnych rachunkowo obliczeń i różnych założeń przy wielu poziomach dostawy produktu do magazynu, to w celu obliczenia tych prognoz można stosować techniki informatyczne bazujące na odpowiednich metodach numerycznych.

Zatem przedstawiona przeze mnie metodyka prognozowania powinna stać się podstawą programowania informatycznego usprawniającego technikę obliczeniową z zastosowaniem nowoczesnego sprzętu elektronicznego. W CU można więc zainstalować system informatyczny, który będzie sprawnie obliczał te prognozy na bieżąco i dostarczał je podmiotom zarządzającym CU.

W celu opisu działania badanego systemu można wykorzystać również znane pojęcie momentów zmiennych losowych (wartość oczekiwana, wariancja, kowariancja (współczynnik korelacji)) oraz różne warianty nierówności Czebyszewa. Nierówności te jednak nie pozwalają dokładnie obliczyć prognozy charakterystyk (procesów), które wspomagają proces zarządzania CU. Jest to prostsze podejście badawcze, ale jego efekty zarówno teoretyczne, jak i praktyczne, są na ogół mniejsze od efektów uzyskanych na podstawie dynamicznego modelowania probabilistycznego, do którego należy zaliczyć wyniki przedstawione w niniejszym artykule.

Dzięki zaproponowanej nowej, prekursorskiej metodyce obliczania prognoz (zob. punkty 3.1. i 3.2.) opartej na dwóch autorskich dynamicznych

modelach probabilistycznych (zob. punkty 3.1. i 3.2.) funkcjonowanie SPZ wspomagającego CU, istnieje możliwość budowy prognoz usprawniających zarządzanie CU. Prognozy takie zależą od parametrów działania systemu, a to daje możliwość analizy jakości zarządzania CU za pomocą korekty wartości tych parametrów, a także możliwość zastosowania komputerowych technik symulacyjnych. Prognozy tych charakterystyk (procesów) pozwalają śledzić w czasie jakość działania CU za pomocą korekty wartości parametrów, od których te prognozy zależą. Ponadto zadając, w odpowiednio zbudowanym programie informatycznym, różne wartości parametrów badanego systemu można uzyskiwać odpowiednio różne komputerowe symulacje dotyczące funkcjonowania centrum usług, a tym samym dokonywać wyboru najbardziej optymalnych wersji dla zapewnienia efektywności procesu decyzyjnego podczas zarządzania centrum usług.

Oba modele (wariant $S(za)$ i $S(st)$) zostały wyprowadzone w [16].

Funkcjonowanie systemu, w rozważanym wariancie, można scharakteryzować dwuwymiarowym procesem stochastycznym $(y(t), z(t))$. Przyjmujemy, że $y(t)$ jest jednorodnym, ciągłym i ośrodkowym procesem Markowa o skończonej liczbie stanów $y_1, y_2, ..., y_n$, będących nieujemnymi, różnymi liczbami rzeczywistymi, a π_{ij} oznacza intensywność przejścia procesu $y(t)$ od stanu y_i do stanu y_j. Natomiast proces $z(t)$, sterowany przez proces $y(t)$, określony jest wzorem (2.2).

Analizę funkcjonowania systemu przeprowadzimy w trzech wariantach:
- częściowe wypełnienie magazynu: $0 < z(t) < V$, stan ten nazywamy stanem pośrednim procesu $z(t)$ lub podsystemu M,
- bariera dolna: $z(t)=0$, stan ten nazywamy barierą dolną procesu $z(t)$ lub podsystemu M,
- bariera górna: $z(t)=V$, stan ten nazywamy barierą górną procesu $z(t)$ lub podsystemu M.

Przypadki te należy rozpatrywać indywidualnie, ponieważ odpowiadają im różne warunki pracy systemu.

W celu rozwiązania wielu problemów związanych z poprawą efektywności funkcjonowania systemu (rys. 1), łącznie z uzyskaniem odpowiednich prognoz, wystarczy wyznaczyć prawdopodobieństwa postaci:

$$P\big(0 < z(t) < \alpha, \quad x(t) = x_k\big) = \int\limits_0^\alpha f_k(z,t)\,dz, \tag{3.1.1}$$

$$P\big(z(t)=0, \quad x(t)=x_k\big), \tag{3.1.2}$$

$$P\big(z(t)=V, \quad x(t)=x_k\big), \tag{3.1.3}$$

gdzie $0<\alpha<V$, $f_k(z,t)$ oznacza gęstość prawdopodobieństwa, zaś x_k jest k-tym stanem pomocniczo wprowadzonego procesu $x(t)=y(t)-a$ ($x_k=y_k-a$), $k=1.2, ..., n$.

Prawdopodobieństwa te odpowiadają trzem wariantom analizy funkcjonowania rozważanego systemu. Wzór (3.1.1) wyraża prawdopodobieństwo, że w ustalonej chwili t proces x osiągnie stan x_k, a poziom zapasów z należy do przedziału $(0, \alpha)$. Analogicznie wyrażenia (3.1.2), (3.1.3) są odpowiednio prawdopodobieństwami osiągnięcia w chwili t przez poziom zapasów bariery dolnej lub bariery górnej oraz stanu x_k przez proces x. Prawdopodobieństwa $P\big(0<z(t)<V, \quad x(t)=x_k\big)$ znajdziemy ze wzoru:
$P\big(0<z(t)<V, \quad x(t)=x_k\big)=\lim\limits_{\alpha\to V}P\big(0<z(t)<\alpha, \quad x(t)=x_k\big)$.

W celu uwzględnienia zmian w czasie parametrów π_{ij} procesu sterującego $y(t)$, analizować będziemy funkcjonowanie rozważanego systemu w m kolejnych okresach czasu T_1, T_2, ..., T_n. Niech zatem okresowi T_l odpowiadają intensywności $\pi_{ij}^{(l)}(l=1,2,\ldots,m)$. Analiza działania systemu zostanie przeprowadzona w okresie czasu T_l[8] z uwzględnieniem trzech przypadków: $0<z(t)<V$, $z(t)=0$, $z(t)=V$, $t\in T_l$. Działanie systemu w wariancie $0<z(t)<V$ zostanie scharakteryzowane prawdopodobieństwami postaci:

$$Q_k^{(l)}(\alpha,t)=P\big(0<z(t)<\alpha, \quad x(t)=x_k\big)=\int_0^\alpha f_k^{(l)}(z,t)dz,$$

$$0<\alpha<V, \, t\in T_l. \tag{3.1.4}$$

Następnie zostanie dokonana analiza pracy systemu w okresie T_l w przypadku, gdy poziom zapasu produktu spełnia warunek: $z(t)=0$. Działanie systemu w tym wariancie dla $t\in T_l$ charakteryzują prawdopodobieństwa postaci:

$$Q_k^{(l)}(\{0\},t)=P\big(z(t)=0, \quad x(t)=x_k\big), \quad t\in T_l. \tag{3.1.5}$$

---

[8] W celu uproszenia zapisu, okres czasu T_l oraz zbiór chwil (momentów) tworzących okres T_l dla $l\in\{1,2,\ldots,m\}$ będzie oznaczony tym samym symbolem.

Z kolei przejdę do analizy pracy systemu w okresie T_l w przypadku, gdy poziom zapasów produktu spełnia warunek: $z(t)=V$. Działanie systemu dla $t \in T_l$ w tym wariancie charakteryzują prawdopodobieństwa postaci:

$$Q_k^{(l)}\left(\{V\}, t\right) = P\left(z(t) = V, \quad x(t) = x_k\right), \quad t \in T_l \tag{3.1.6}$$

Rezultatem tej analizy zaprezentowanej w pracy [16] jest następujący autorski probabilistyczny model działania systemu w wariancie $S(za)$.

Funkcjonowanie rozważanego systemu w okresie T_l $(l = 1, 2, ..., m)$ opisuje następujący układ równań różniczkowych:

$$\frac{\partial f_k^{(l)}(z,t)}{\partial t} = -\pi_k^{(l)} f_k^{(l)}\left(z,t\right) - x_k \frac{\partial f_k^{(l)}(z,t)}{\partial z} + \sum_{i \neq k} f_k^{(l)}\left(z,t\right) \pi_{ik}^{(l)},$$

$$\text{dla } 0 < z < V, \quad t \in T_l, \; k = 1, 2, ..., n \tag{3.1.7}$$

$$\frac{\partial Q_k^{(l)}(\{0\}, t)}{\partial t} = -\pi_k^{(l)} Q_k^{(l)}\left(\{0\}, t\right) - x_k f_k^{(l)}\left(0, t\right) + \sum_{\substack{i \neq k \\ x_i \leq 0}} Q_k^{(l)}\left(\{0\}, t\right) \pi_{ik}^{(l)},$$

$$\text{dla } x_k \leq 0, \quad t \in T_l, \tag{3.1.8}$$

$$Q_k^{(l)}\left(\{0\}, t\right) = 0, \quad \text{dla } x_k > 0, \quad t \in T_l \tag{3.1.9}$$

$$\frac{\partial Q_k^{(l)}(\{V\}, t)}{\partial t} = -\pi_k^{(l)} Q_k^{(l)}\left(\{V\}, t\right) + x_k f_k^{(l)}\left(V, t\right) + \sum_{\substack{i \neq k \\ x_i \geq 0}} Q_i^{(l)}\left(\{V\}, t\right) \pi_{ik}^{(l)},$$

$$\text{dla } x_k \geq 0, \quad t \in T_l, \tag{3.1.10}$$

$$Q_k^{(l)}\left(\{V\}, t\right) = 0, \quad \text{dla } x_k < 0, \quad t \in T_l. \tag{3.1.11}$$

Układ równań (3.1.7)-(3.1.11) przedstawia matematyczny model badanego systemu w przypadku zagregowane wejścia $w(t)$ do podsystemu M, czyli $S(za)$.

W praktyce ważne są również prostsze warianty tego modelu:

Intensywności procesu wejścia podsystemu M są stałe $\left(\pi_{ik}^{(l)} = \pi_{ik}\right)$, wtedy funkcje: $f_k^{(l)}\left(z,t\right) = f_k\left(z,t\right)$, $Q_k^{(l)}\left(\{0\}, t\right) = Q_k\left(\{0\}, t\right)$, $Q_k^{(l)}\left(\{V\}, t\right) = Q_k\left(\{V\}, t\right)$ zależą od czasu w okresie $T_1 \cup T_2 \cup ... T_m$.

Intensywności $\pi_{ik}^{(l)}$ procesu wejścia podsystemu M zależą od okresu T_l, wtedy funkcje: $f_k^{(l)}\left(z,t\right) = f_k^{(l)}\left(z\right)$, $Q_k^{(l)}\left(\{0\}, t\right) = Q_k^{(l)}\left(\{0\}\right)$, $Q_k^{(l)}\left(\{V\}, t\right) = Q_k^{(l)}\left(\{V\}\right)$ nie zależą od czasu w okresie T_l.

Intensywności $\pi_{ik}^{(l)} = \pi_{ik}$ procesu wejścia podsystemu M są stałe oraz funkcje: $f_k^{(l)}(z,t) = f_k(z)$, $Q_k^{(l)}(\{0\},t) = Q_k(\{0\})$, $Q_k^{(l)}(\{V\},t) = Q_k(\{V\})$ nie zależą od czasu w okresie $T_1 \cup T_2 \cup \dots T_m$.

Taki probabilistyczny model funkcjonowania badanego SPZ wspomagającego centrum usług (wzory (3.1.7)-(3.1.11) wraz z ich prostszymi wariantami umożliwiają zbudowanie wielkości, które mogą być wykorzystane zarówno w procesie efektywnego kierowania tym systemem, jak i fazie projektowania tego systemu.

Jeżeli w okresie T_m wystąpi zdarzenie losowe W_1 postaci: wielkość produktu $y(t)$ dostarczonego przez podsystem produkcji P, jako nadawcy do odbiorcy O, jest mniejsza od zapotrzebowania a odbiorcy O (zob. rys. 4), którego praca ma charakter ciągły (np. wytwarzanie energii elektrycznej, wody, olejów napędowych, materiałów budowlanych itp.), a zawartość $z(t)$ magazynu — zbiornika M wynosi zero, czyli zachodzi następująca sytuacja: W_1: $y(t) < a$, i $z(t)=0$, to odbiorca zmuszony jest wtedy do korzystania z innych źródeł zaopatrzenia lub do ograniczenia własnej produkcji, czy działalności. Prowadzi to do strat w rozważanym systemie (strat odbiorcy). Prawdopodobieństwo wystąpienia takiego niekorzystnego zdarzenia oznaczam przez w_1 ($w_1 = P(W_1)$); wyraża się ono wzorem następującym:

$$w_1 = P(W_1) = \sum_{y_k < a} Q_k^{(m)}(\{0\}). \tag{3.1.12}$$

Wskaźnik w_1 jest więc prawdopodobieństwem wystąpienia deficytu podaży produktu a dla odbiorcy O (zob. rys. 4).

Niekorzystny stan systemu w okresie T_m związany jest również z innych zdarzeniem losowym W_2: wielkość produktu $y(t)$ dostarczanego przez podsystem P przekracza zapotrzebowanie a odbiorcy O, a magazyn M jest zapełniony (zob. rys. 4), czyli zachodzi następująca sytuacja: W_2: $y(t) \ge a$ i $z(t)=V$. W tym przypadku podsystem produkcji (nadawca) P nie ma możliwości przesłania swojego produktu do odbiorcy O, co prowadzi również do strat w systemie (strat nadawcy). Prawdopodobieństwo w_2 tego zdarzenia ($w_1 = P(W_2)$) można wyznaczyć z następującego wzoru:

$$w_2 = P(W_2) = \sum_{y_k > a} Q_k^{(m)}(\{V\}). \tag{3.1.13}$$

Obie wielkości w_1 i w_2 są więc wskaźnikami oceny stopnia strat produkcyjnych odpowiednio odbiorcy O (wskaźnik w_1) i podsystemu produkcji P (wskaźnik w_2).

Jako wskaźnik oceny stopnia wykorzystania elementu M w badanym systemie można przyjąć prawdopodobieństwo zdarzenia losowego W_3 postaci: poziom wypełnienia magazynu jest dodatni, ale mniejszy od V, czyli: W_3: $0 < z(t) < V$. Prawdopodobieństwo w_3 zdarzenia W_3 $(w_3 = P(W_3))$ wyraża się następującym wzorem:

$$w_3 = P(W_3) = \sum_k Q_k^{(m)}(V). \tag{3.1.14}$$

Jeżeli wartość w_3 jest bliska jedności, czyli: $w_3 \to 1$, to małe jest prawdopodobieństwo wystąpienia deficytu podaży produktu dla odbiorcy O spowodowanego zerowym stanem podsystemu M lub strat podsystemu P jako nadawcy, wynikających z maksymalnego wypełnienia magazynu M. W przypadku, gdy wskaźnik w_3 przyjmuje wartość bliską zera, czyli: $w_3 \to 0$, to zjawisko strat nadawcy P lub deficytu podaży dla odbiorcy O może wystąpić z dużym prawdopodobieństwem. Sytuacje te ilustruje rys. 5.
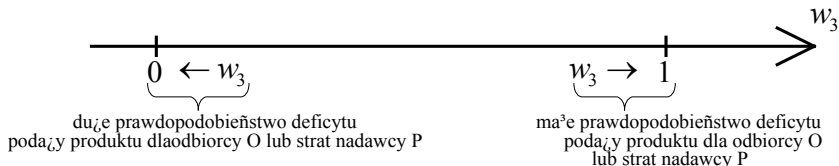
Rys. 5. Prawdopodobieństwo deficytu podaży produktu lub strat nadawcy dla S(za).

Stany graniczne podsystemu M można opisać wskaźnikami w_4 i w_5 określonymi odpowiednio następującymi wzorami:

$$w_4 = P(W_4) = \sum_{y_k \leq a} Q_k^{(m)}(\{0\}), \tag{3.1.15}$$

$$w_5 = P(W_5) = \sum_{y_k \geq a} Q_k^{(m)}(\{V\}). \tag{3.1.16}$$

Wielkość w_4 jest prawdopodobieństwem zdarzenia losowego W_4: poziom wypełnienia magazynu M wynosi zero, czyli: $z(t)=0$, zaś wskaźnik w_5 wyraża prawdopodobieństwo zdarzenia losowego W_4: magazyn M jest zapełniony, czyli: $z(t)=V$.

Zatem w celu wyznaczenia wskaźników w_s ($s = 1, 2, ...,5$), opisujących funkcjonowanie systemu $S(za)$ — patrz wzory: (3.1.12)–(3.1.1.6), należy rozwiązać układ równań (3.1.7)–(3.1.11) w uproszczonym wariancie 2). Wskaźniki te zależą więc od wielkości parametrów: $\pi_{ik}^{(m)}$, y_l, a, V, a więc są określonymi funkcjami tych parametrów, czyli:

$$w_s = r_s\left(\pi_{ik}^{(m)}, y_l, a, V\right). \tag{3.1.17}$$

Można zatem optymalizować wartości podanych wskaźników poprzez odpowiednie zmiany wielkości wymienionych parametrów. Usprawniając elementy organizacyjne działania systemu, które wpływają — jak już było zapisane wcześniej — na wartość intensywności $\pi_{ik}^{(m)}$ procesu sterującego $y(t)$, możemy oddziaływać na wartości wskaźników w_s, a tym samym zwiększać efektywność funkcjonowania systemu produkcyjno-zaopatrzeniowego wspomagającego centrum usług.

Podam teraz przykład, w którym proces wejścia do podsystemu M posiada dwa stany: $y_1 > a$, $y_2 < a$. Przedstawię postacie wskaźników w_s, a więc — konkretne postacie funkcji (3.1.17) wraz z ich analizą.

Przyjmiemy zatem w prostszym wariancie modelu (3.1.7)-(3.1.11): $n=2$; $k=1.2$, $x_k = y_k - a$, $l=m$. Po rozwiązaniu otrzymanego układu równań otrzymujemy następujące wartości prawdopodobieństwa w_1 dla $y(t) < a$:

$$w_1 = \frac{\pi_{12}^{(m)} a_1 (a - y_2)}{\left(\pi_{12}^{(m)} + \pi_{21}^{(m)}\right) d_1(V)}, \tag{3.1.18}$$

gdzie $d_1(V)$ wynosi: $d_1(V) = \pi_{12}^{(m)} \frac{y_2 - a}{a - y_1} - \pi_{21}^{(m)} \exp(-a_1 V)$.

Dalej prawdopodobieństwo w_2 dla $y(t) \geq a$ wynosi:

$$w_2 = \frac{(y_1 - a) a_1 \exp(-a_1 V)}{\left(\pi_{12}^{(m)} + \pi_{21}^{(m)}\right) d_2(V)}, \tag{3.1.19}$$

gdzie $d_2(V)$ wynosi: $d_2(V) = \frac{\pi_{12}^{(m)}}{\pi_{21}^{(m)}} - \frac{y_1 - a}{y_2 - a} \exp(-a_1 V)$.

Prawdopodobieństwo sytuacji w_3: $0 < w(t) < V$ wynosi:

$$w_3 = \frac{\frac{y_2 - y_1}{y_2 - a} \pi_{12}^{(m)} \left(1 - \exp(-a_1 V)\right)}{\left(\pi_{12}^{(m)} + \pi_{21}^{(m)}\right) d_2(V)}, \tag{3.1.20}$$

zaś w sytuacji granicznej w_4, gdy $z(t) = 0$ mamy:

$$w_4 = w_1 \tag{3.1.21}$$

a gdy $z(t)=V$, to prawdopodobieństwo w_5 jest równe:

$$w_5 = w_2, \qquad (3.1.22)$$

i wtedy współczynnik a_1 wynosi:

$$a_1 = \frac{\pi_{21}^{(m)}}{y_2-a} + \frac{\pi_{12}^{(m)}}{y_1-a} \neq 0, \qquad (3.1.23)$$

zaś $d_2(V)$ nie znika, czyli:

$$d_2(V) \neq 0. \qquad (3.1.24)$$

Niech teraz $a_1 = 0$, czyli zachodzi następująca równość:

$$\frac{a-y_2}{y_1-a} = \frac{\pi_{21}^{(m)}}{\pi_{12}^{(m)}}. \qquad (3.1.25)$$

Dla $a_1 = 0$ warunek: $d_2(V) \neq 0$ jest spełniony. W rozważanym przypadku wskaźniki $w_1,\ldots,w_5$ opisujące funkcjonowanie badanego systemu przyjmują kolejno postać:

Prawdopodobieństwo w_1 dla $y(t) < a$ jest równe:

$$w_1 = \frac{\pi_{12}^{(m)}(a-y_2)}{\pi_{21}^{(m)}\left(\pi_{12}^{(m)}+\pi_{21}^{(m)}\right)d_3(V)}, \qquad (3.1.26)$$

gdzie wielkość $d_3(V)$ wynosi: $d_3(V) = \frac{a-y_2}{\pi_{21}^{(m)}} + V$,

prawdopodobieństwo w_2 dla $y(t) \geq a$ jest równe:

$$w_2 = \frac{a-y_2}{\left(\pi_{12}^{(m)}+\pi_{21}^{(m)}\right)d_3(V)}, \qquad (3.1.27)$$

prawdopodobieństwo w_3 dla $0 < w(t) < V$ jest równe:

$$w_3 = \frac{V(y_1-y_2)\pi_{12}^{(m)}}{\left(\pi_{12}^{(m)}+\pi_{21}^{(m)}\right)(y_1-a)d_3(V)}, \qquad (3.1.28)$$

zaś w sytuacji granicznej prawdopodobieństwo w_4, czyli dla: $z(t) = 0$ spełnia poniższą równość:

$$w_4 = w_1, \qquad (3.1.29)$$

a w sytuacji granicznej $z(t)=V$ prawdopodobieństwo w_5 spełnia poniższą równość:

$$w_5 = w_2. \tag{3.1.30}$$

Otrzymane w ten sposób wzory (3.1.18)-(3.1.30) wyrażają *explicite* zależność wartości wskaźników w_s ($s = 1, \ldots, 5$) od wartości parametrów $\pi_{12}^{(m)}$, $\pi_{21}^{(m)}$, y_1, y_2, a, V (zob. wzór (3.1.17)).

Gdyby w badanym systemie produkcyjno-zaopatrzeniowym wspomagającym centrum usług nie było podsystemu M, to wskaźnik w_1 wystąpienia deficytu podaży produktu dla odbiorcy O byłby równy prawdopodobieństwu p_2 stanu y_2. Można go otrzymać przechodząc do granicy: $V \rightarrow 0$, we wzorach (3.1.18) i (3.1.26), czyli spełniona jest równość: $\lim_{V \to 0} w_1 = \frac{\pi_{12}^{(m)}}{\pi_{12}^{(m)} + \pi_{21}^{(m)}}$. Ponieważ mamy prawdziwą nierówność: $0 < \frac{a_1(a-y_2)}{d_1(V)} < 1$, gdy $V > 0$, $a_1 \neq 0$, oraz zachodzi następująca nierówność: $0 < \frac{a-y_2}{\pi_{21}^{(m)} d_3(V)} < 1$, gdy $V > 0$, $a_1 = 0$, zatem prawdziwa jest następująca zależność: $w_1 < p_2$. Stąd wynika, że podsystem M zawsze zmniejsza prawdopodobieństwo wystąpienia deficytu podaży, czyli strat odbiorcy O w centrum usług.

W wyniku przejścia do granicy: $V \rightarrow \infty$, we wzorach (3.1.18) i (3.1.26), otrzymujemy, w zależności od znaku a_1, co następuje: gdy $a_1 \leq 0$, to mamy: $\lim_{V \to \infty} w_1 = 0$, gdy $a_1 > 0$, to zachodzi równość: $\lim_{V \to \infty} w_1 = \frac{a_1(y_1-a)}{\pi_{12}^{(m)} + \pi_{21}^{(m)}}$. Z ww. relacji wynika, że: gdy $a_1 > 0$, a więc jeżeli spełniona jest nierówność: $\frac{a-y_1}{y_2-a} < \frac{\pi_{12}^{(m)}}{\pi_{21}^{(m)}}$, to nawet największa objętość V magazynu M nie może zagwarantować mniejszego prawdopodobieństwa wystąpienia deficytu podaży czyli strat odbiorcy O, niż następująca wielkość: $\frac{a_1(y_1-a)}{\pi_{12}^{(m)} + \pi_{21}^{(m)}}$.

Zatem poprawnie zaprojektowany system powinien spełniać następujący warunek:

$$\frac{a-y_1}{y_2-a} \geq \frac{\pi_{12}^{(m)}}{\pi_{21}^{(m)}}. \tag{3.1.31}$$

Jednak warunek (3.1.31) nie zależy od objętości podsystemu M, a więc jest ograniczeniem narzuconym tylko na podsystem transportowy T oraz podsystem produkcji P.

Ze wzorów (3.1.19) i (3.1.27) wynika, że prawdziwa jest następująca równość: $\lim_{V \to 0} w_2 = \frac{\pi_{21}^{(m)}}{\pi_{21}^{(m)} + \pi_{12}^{(m)}}$.

Prawa strona tej relacji wyraża prawdopodobieństwo powstania strat nadawcy, gdyby magazyn M miał objętość $V=0$. Jest ono równe prawdopodobieństwu p_1 stanu y_1. Ponieważ zachodzi następująca nierówność: $w_2 < \frac{\pi_{21}^{(m)}}{\pi_{21}^{(m)} + \pi_{12}^{(m)}}$, gdy $V>0$ więc podsystem M zawsze zmniejsza prawdopodobieństwo wystąpienia strat nadawcy P.

Wskaźnik oceny stopnia wykorzystania podsystemu M w badanym systemie, w przypadku dużej objętości V tego podsystemu, można obliczyć korzystając ze wzoru, który zależy od znaku a_1 w sposób następujący: gdy $a_1 > 0$ mamy następującą równość: $\lim_{V \to \infty} w_3 = \frac{y_1 - y_2}{y_2 - a} \frac{\pi_{21}^{(m)}}{\pi_{21}^{(m)} + \pi_{12}^{(m)}}$, gdy zaś $a_1 \leq 0$ mamy z kolei inną zależność: $\lim_{V \to \infty} w_3 = \frac{y_1 - y_2}{y_2 - a} \frac{\pi_{12}^{(m)}}{\pi_{21}^{(m)} + \pi_{12}^{(m)}}$.

Kontynuując przykład przyjmuję, że podsystem P jest kopalnią odkrywkową, a odbiorca O — elektrownią, której zapotrzebowanie na węgiel, przy odpowiednim jej obciążeniu, jest równe 2310 m³ / h (czyli $a = 2310$ m³ / h). Jest ono wyznaczone na podstawie parametrów elektrowni (moc elektrowni) i parametrów węgla (ciepło właściwe). W celu zabezpieczenia ciągłości dostaw węgla do elektrowni zbudowano w jej bezpośrednim sąsiedztwie magazyn-zbiornik M o objętości $V = 18.480$ m³. Magazyn ten zapewnia ciągłość dostawy węgla do elektrowni, przy odpowiedniej jej mocy, na okres 8 godzin ($V = 8 \cdot a = 2310 \cdot 8 = 18.480$ m³). Proces podaży produktu — węgla — przez podsystem P ma dwa stany: $y_1 = 2600$ m³ / h, $y_2 = 0$ m³ / h, a intensywności przejścia tego procesu są następujące: $\pi_{12}^{(m)} = 0.55$, $\pi_{21}^{(m)} = 6.92$. Zauważmy, że wystąpienie stanu y_2, gdy poziom zapasów w magazynie wynosi zero, prowadzi do niekorzystnego stanu dla odbiorcy, czyli do wystąpienia zdarzenia losowego W_1 związanego ze stratami odbiorcy (elektrowni).

W dalszym ciągu wyznaczę: wskaźnik w_1 — prawdopodobieństwo zaistnienia deficytu podaży produktu dla odbiorcy O (straty elektrowni), wskaźnik w_2 — prawdopodobieństwo wystąpienia strat podsystemu produkcji P (starty nadawcy) oraz wskaźnik w_3 — ocenę stopnia wykorzystania magazynu-zbiornika M w badanym systemie.

Ponieważ dla powyższych danych mamy konkretne wartości: $\frac{y_1-a}{a-y_2} = \frac{2600-2310}{2310} = 0.1255$, $\frac{\pi_{12}^{(m)}}{\pi_{21}^{(m)}} = \frac{0.55}{6.92} = 0.0795$, zatem warunek (3.1.31) jest spełniony; oznacza to, że system jest prawidłowo zaprojektowany. Biorąc pod uwagę fakt, że $a_1 < 0$ oraz wzór (3.1.18), otrzymujemy konkretne wartości: $w_1 = \frac{0.55}{0.55+6.92} \cdot \frac{2.31}{6.92\exp(18.48)-4.281} \approx 0$, $d_1(V) = 0.55 \cdot \frac{2310}{2600-2310} - 6.92\exp(18.48)$.

Zatem prawdopodobieństwo wystąpienia deficytu podaży produktu dla odbiorcy O (straty elektrowni) jest bliskie zera.

Prawdopodobieństwo wystąpienia strat podsystemu produkcji P (kopalni odkrywkowej) obliczam na podstawie wzoru: $w_2 = \frac{(-2600+2310)10^{-3}\exp(18.48)}{(0.55+6.92)d_2(V)}$, $d_2(V) = \frac{0.55}{6.92} + \frac{2600-2310}{2310}\exp(18.48)$; ostatecznie więc otrzymuję: $w_2 \approx 0.3$. Ocenę stopnia wykorzystania magazynu-zbiornika M w badanym systemie uzyskam za pomocą wzoru (3.1.20): $w_3 = \frac{\frac{2600}{2310}0.55(1-\exp(18.48))}{(0.55+6.92)d_2(V)} \approx 0.66$. Magazyn M jest więc wykorzystany w rozważanym systemie w około 66%.

Zgodnie ze wzorami (3.1.21), (3.1.22) prawdopodobieństwo sytuacji, że poziom zapasów magazynu M osiągnie barierę dolną albo barierę górną jest w przybliżeniu równe odpowiednio 0 albo 0.3.

Probabilistyczny model funkcjonowania systemu $S(za)$ wyrażony związkami (3.1.7)-(3.1.11) umożliwia również wyznaczenie prognoz wielkości charakteryzujących działanie tego systemu. Prognozy te, przekazywane są do organu zarządzania systemem i dostarczają przesłanek do zwiększenia efektywności jego funkcjonowania.

Niech $t \in T_m \cap \tilde{T}_i$, a $\tilde{T}_i$ oznacza horyzont prognozy i-tej prognozowanej wielkości. Prognozę $\hat{w}_1(t)$ prawdopodobieństwa deficytu podaży produktu dla odbiorcy O w chwili t obliczamy za pomocą wzoru:

$$\hat{w}_1(t) = \sum_{y_k < a} Q_k^{(m)}(\{0\}, t). \tag{3.1.32}$$

Prognozę $\hat{w}_2(t)$ prawdopodobieństwa strat nadawcy (podsystemu P) na skutek zapełnienia magazynu M w chwili t wyznaczamy z wykorzystaniem wzoru:

$$\hat{w}_2(t) = \sum_{y_k > a} Q_k^{(m)}(\{V\}, t). \qquad (3.1.33)$$

Prognozę $\hat{w}_3(t)$ wskaźnika oceny stopnia wykorzystania podsystemu M w badanym systemie w chwili t obliczymy na podstawie wzoru:

$$\hat{w}_3(t) = \sum_k Q_k^{(m)}(\{V\}, t). \qquad (3.1.34)$$

Jeżeli prawdopodobieństwo zapełnienia magazynu M jest z przedziału $(0, V)$, czyli $\hat{w}_3(t) \approx 1$, to w przyszłej chwili t należy oczekiwać małego prawdopodobieństwa wystąpienia deficytu podaży produktu dla odbiorcy O lub strat podsystemu P (nadawcy). W przypadku przeciwnym, a więc gdy $\hat{w}_3(t) \approx 0$, należy oczekiwać w chwili t zjawiska strat nadawcy P lub deficytu u odbiorcy O z dużym prawdopodobieństwem.

Występowanie stanów granicznych podsystemu M w przyszłej chwili t można przewidywać za pomocą wzorów:

$$\hat{w}_4(t) = \sum_{y_k \leq a} Q_k^{(m)}(\{0\}, t), \qquad (3.1.35)$$

$$\hat{w}_5(t) = \sum_{y_k \geq a} Q^{(m)}(\{V\}, t). \qquad (3.1.36)$$

Wzór (3.1.35) określa prognozę $\hat{w}_4(t)$ prawdopodobieństwa wystąpienia stanu zerowego wypełnienia magazynu M w chwili t, natomiast relacja (3.1.36) — prognozę $\hat{w}_5(t)$ prawdopodobieństwa maksymalnego wypełnienia w chwili t podsystemu M.

Prognozę prawdopodobieństwa stanu częściowego wypełnienia magazynu M lub stanu y_i procesu wejścia y podsystemu M w przyszłej chwili t można obliczyć kolejno ze wzorów:

$$\hat{w}_6(t) = P(c_1 < z(t) < c_2) = \sum_i \int_{c_1}^{c_2} f_i^{(m)}(z, t)\, dz, \quad \text{dla } 0 \leq c_1 < c_2 \leq V,$$

$$\hat{w}_7(t) = P(y(t) = y_i) = \int_0^V f_i^{(m)}(z, t)\, dz + Q_i^{(m)}(\{0\}, t) + Q_i^{(m)}(\{V\}, t).$$

W celu wyznaczenia prognozy częściowego wypełnieni podsystemu M z przedziału $(0, V)$ oraz prognozy jego bariery dolnej lub bariery górnej przy stanie y_i procesu y w przyszłej chwili t można wykorzystać kolejno następujące wzory na prognozę $\hat{w}_8(t)$ prawdopodobieństwa stanu pośredniego: $\hat{w}_8(t) = P\left(c_1 < z(t) < c_2, y(t) = y_i\right) = \int_{c_1}^{c_2} f_i^{(m)}(z,t)\,dz$, prognozę $\hat{w}_9(t)$ prawdopodobieństwa bariery dolnej: $\hat{w}_9(t) = Q_i^{(m)}(\{0\}, t)$ oraz prognozę $\hat{w}_{10}(t)$ prawdopodobieństwa bariery górnej: $\hat{w}_{10}(t) = Q_i^{(m)}(\{V\}, t)$.

Składniki tworzące powyższe prognozy wyznaczamy z układu równań (3.1.7)-(3.1.11) dla $l = m$. Jeżeli $t \notin T_m$ i $t > t_0$ dla każdego $t_0 \in T_m$ oraz $t \in \tilde{T}_s$ $(s = 1, 2, \ldots, 10)$, to w celu wyznaczenia tych prognoz należy w modelu (3.1.7)-(3.1.11) dla $l = m$ przyjąć: $\pi_{ik}^{(m)} = \hat{\pi}_{ik}$, gdzie $\hat{\pi}_{ik}$ jest prognozą wielkości π_{ik} wyznaczoną za pomocą wartości $\pi_{ik}^{(1)}, \pi_{ik}^{(2)}, \ldots, \pi_{ik}^{(m)}$. Prognozę $\hat{\pi}_{ik}$ można uzyskać wykorzystując metody przedstawione np. w pracach [4], [6], [29], [31], [40], [41], [43], [46], [47], [49], [58]-[63], [66], [71], [72], [86], [87], [92], [94], [95], [104], [113]-[115], [117].

W celu uwzględnienia *explicite* działania podsystemu transportowego T w analizie funkcjonowania badanego systemu, wprowadzimy proces $v(t)$ określony wzorem:

$$v(t) = \begin{cases} 1, & \text{gdy podsystem } T \text{ znajduje się w stanie pracy,} \\ 0, & \text{gdy podsystem } T \text{ nie pracuje (jest w stanie awarii).} \end{cases} \quad (3.2.1)$$

Wtedy poziom zapasów $z(t)$ podsystemu M sterowany jest procesem: $w(t) = y(t)v(t)$, gdzie $y(t)$ opisuje wielkość produkcji podsystemu P. Przyjmiemy, że procesy $y(t)$ i $v(t)$ są niezależne, a $v(t)$ jest ciągłym, jednorodnym i ośrodkowym procesem Markowa o intensywnościach $\pi_{10}^* = \pi_1^*$ (intensywność przejścia podsystemy T od stanu pracy do przerwy w pracy (awarii)) oraz $\pi_{01}^* = \pi_0^*$ (intensywność przejścia podsystemu T od przerwy w pracy (awarii) do stanu pracy).

Poziom wypełnienia $z(t)$ magazynu M w przedziale $[\alpha_1, \alpha_2)$ stałości realizacji procesu $w(t)$ spełnia warunek

$$z(t) = h\left[z(t_1) + (w(t_1) - a)(t - t_1)\right] \text{ dla } \alpha_1 \leq t_1 < t < \alpha_2, \quad (3.2.2)$$

gdzie h jest funkcji określoną wzorem (2.1).

Funkcjonowanie badanego systemu charakteryzuje teraz trójwymiarowy proces stochastyczny: $y(t)$, $v(t)$, $z(t)$. Działanie systemu analizowane będzie w trzech wariantach (nieekstremalny stan poziomu zapasów podsystemu M: $0<z(t)<V$, stan graniczny dolny poziomu zapasów podsystemu M: $z(t)=0$, górny stan graniczny poziomu zapasów podsystemu M: $z(t)=V$) ponieważ odpowiadają im różne warunki pracy systemu. Dla naszych celów wystarczy wyznaczyć prawdopodobieństwa (odpowiadające trzem wariantom analizy funkcjonowania rozważanego systemu) postaci (zob. wzory (3.1.1)-(3.1.3)):

$$P\big(0 < z(t) < \alpha, \ x(t) = x_k, \ v(t) = u\big) = \int_0^\alpha f_k^{(u)}(z,t)\,dz,$$

$$0 < \alpha < V\,, \tag{3.2.3}$$

$$P\big(z(t) = 0, \ x(t) = x_k, \ v(t) = u\big), \tag{3.2.4}$$

$$P\big(z(t) = V, \ x(t) = x_k, \ v(t) = u\big), \tag{3.2.5}$$

gdzie $f_k^{(u)}(z,t)$ oznacza funkcję gęstości rozkładu prawdopodobieństwa, a x_k jest k-tym stanem procesu $x(t) = y(t) - a$ $\big(x_k = y_k - a, \ k = 1,2,...,n\big)$; $u=1$ (praca) lub $u=0$ (awaria).

Prawdopodobieństwa $P\big(0 < z(t) < V, \ x(t) = x_k, \ v(t) = u\big)$ ze wzoru (3.2.3) znajdziemy ze wzoru:

$$P\big(0 < z(t) < V, \ x(t) = x_k, \ v(t) = u\big) =$$

$$\lim_{\alpha \to V} P\big(0 < z(t) < \alpha, \ x(t) = x_k, \ v(t) = u\big).$$

Aby uwzględnić zmiany w czasie parametrów π_{ij}, π_{10}^*, π_{01}^*, tj. przejścia podsystemu T — odpowiednio z i-tego do j-tego stanu oraz ze stanu pracy $u=1$ do awarii $u=0$ — i na odwrót — procesu: $w(t) = y(t)v(t)$ sterującego poziomem zapasów magazynu M, analizować będziemy funkcjonowanie rozważanego systemu w m kolejnych okresach czasu T_1, T_2, …, T_m. Niech zatem okresowi T_l odpowiadają intensywności: $\pi_{ij}^{(l)}$, $\pi_{10}^{*l} = \pi_1^{*l}$, $\pi_{01}^{*l} = \pi_0^{*l}$, $(l = 1, 2, ..., m)$.

Funkcjonowanie systemu w przypadku, gdy poziom zapasów produktu w podsystemie M spełnia warunek: $0<z(t)<V$, zostanie scharakteryzowane prawdopodobieństwem postaci:

$$Q_k^{ul}(\alpha,t) = P\big(0 < z(t) < \alpha, \ x(t) = x_k, \ v(t) = u\big) = \int_0^\alpha f_k^{ul}(z,t)\,dz,$$

$$0 < \alpha < V\,, \ t \in T_l\,.$$

Działanie badanego systemu w przypadku, gdy poziom zapasów produktu w podsystemie M spełnia warunek: $z(t)=0$, czyli osiąga stan graniczny dolny opiszemy za pomocą prawdopodobieństw postaci:

$$Q_k^{ul}\left(\{0\},t\right)=P\left(z(t)=0,\ x(t)=x_k,\ v(t)=u\right),$$

$$\text{dla } t\in T_l,\ u=1 \text{ lub } u=0. \tag{3.2.6}$$

Funkcjonowanie badanego systemu w przypadku, gdy poziom zapasów produktu w podsystemie M spełnia warunek: $z(t)=V$,czyli osiąga stan graniczny górny opiszemy za pomocą prawdopodobieństw postaci:

$$Q_k^{ul}\left(\{V\},t\right)=P\left(z(t)=V,\ x(t)=x_k,\ v(t)=u\right),$$

$$\text{dla } t\in T_l,\ u=1 \text{ lub } u=0. \tag{3.2.7}$$

Wynikiem analizy SPZ w wariancie $S(st)$ przeprowadzonej w pracy [16] jest następujący autorski probabilistyczny model działania systemu $S(st)$:

$$\frac{\partial f_k^{1l}(z,t)}{\partial t}=-x_k\frac{\partial f_k^{1l}(z,t)}{\partial z}-\left(\pi_k^{(l)}+\pi_1^{*l}\right)f_k^{1l}\left(z,t\right)+$$

$$+\sum_{i\neq k}\pi_{ik}^{(l)}f_i^{1l}\left(z,t\right)+\pi_0^{*l}f_k^{0l}\left(z,t\right),$$

$$\text{dla } 0<z<V,\ t\in T_l,\ k=1,2,\ldots,n; \tag{3.2.8}$$

$$\frac{\partial f_k^{0l}(z,t)}{\partial t}=a\frac{\partial f_k^{0l}(z,t)}{\partial z}-\left(\pi_k^{(l)}+\pi_0^{*l}\right)f_k^{0l}\left(z,t\right)+$$

$$+\sum_{i\neq k}\pi_{ik}^{(l)}f_i^{0l}\left(z,t\right)+\pi_1^{*l}f_k^{1l}\left(z,t\right),$$

$$\text{dla } 0<z<V,\ t\in T_l,\ k=1,2,\ldots,n \tag{3.2.9}$$

$$\frac{\partial Q_k^{1l}(\{0\},t)}{\partial t}=\pi_0^{*l}Q_k^{0l}\left(\{0\},t\right)-\left(\pi_k^{(l)}+\pi_1^{*l}\right)Q_k^{1l}\left(\{0\},t\right)-x_kf_k^{1l}\left(0,t\right)+$$

$$+\sum_{\substack{i\neq k \\ x_i\leq 0}}Q_i^{1l}\left(\{0\},t\right)\pi_{ik}^{(l)},\ \text{dla } x_k\leq 0,\ t\in T_l, \tag{3.2.10}$$

$$Q_k^{1l}\left(\{0\},t\right)=0,\ \text{dla } x_k>0,\ t\in T_l, \tag{3.2.11}$$

$$\frac{\partial Q_k^{0l}(\{0\},t)}{\partial t}=\pi_1^{*l}Q_k^{1l}\left(\{0\},t\right)-\left(\pi_k^{(l)}+\pi_0^{*l}\right)Q_k^{0l}\left(\{0\},t\right)+$$

$$+af_k^{0l}\left(0,t\right)+\sum_{i\neq k}Q_i^{0l}\left(\{0\},t\right)\pi_{ik}^{\{l\}},\ \text{dla } k=1,2,\ldots,n,\ t\in T_l; \tag{3.2.12}$$

$$\frac{\partial Q_k^{1l}(\{V\},t)}{\partial t} = x_k f_k^{1l}(V,t) - \left(\pi_k^{(l)} + \pi_1^{*l}\right) Q_k^{1l}(\{V\},t) +$$

$$+ \sum_{\substack{i \neq k \\ x_i \geq 0}} Q_i^{1l}(\{V\},t) \pi_{ik}^{(l)}, \text{ dla } x_k \geq 0, \ t \in T_l, \tag{3.2.13}$$

$$Q_k^{1l}(\{V\},t) = 0, \text{ dla } x_k < 0, \ t \in T_l, \tag{3.2.14}$$

$$Q_k^{0l}(\{V\},t) = 0, \text{ dla } k = 1, 2, \ldots, n. \tag{3.2.15}$$

Układ równań (3.2.8)-(3.2.15) przedstawia matematyczny model systemu w przypadku strukturalnego procesu dostawy produktu $S(st)$.

W praktyce ważne są również następujące warianty tego modelu: Intensywności $\pi_{ik}^{(l)}$, π_s^{*l} procesu wejścia podsystemu M są stałe ($\pi_{ik}^{(l)} = \pi_{ik}$, $\pi_s^{*l} = \pi_s^*$), ponadto funkcje: $f_k^{ul}(z,t) = f_k^u(z,t)$, $Q_k^{ul}(\{0\},t) = Q_k^u(\{0\},t)$, $Q_k^{ul}(\{V\},t) = Q_k^u(\{V\},t)$ zależą od czasu w okresie $T_1 \cup T_2 \cup \ldots \cup T_m$. Intensywności $\pi_{ik}^{(l)}$, π_s^{*l} procesu wejścia podsystemu M zależą od okresu T_l, ale funkcje: $f_k^{ul}(z,t) = f_k^{ul}(z)$, $Q_k^{ul}(\{0\},t) = Q_k^{ul}(\{0\})$, $Q_k^{ul}(\{V\},t) = Q_k^{ul}(\{V\})$ nie zależą od czasu w okresie T_l.

Intensywności $\pi_{ik}^{(l)} = \pi_{ik}$, $\pi_s^{*l} = \pi_s^*$ procesu wejścia podsystemu M są stałe oraz funkcje: $f_k^{ul}(z,t) = f_k^u(z)$, $Q_k^{ul}(\{0\},t) = Q_k^u(\{0\})$, $Q_k^{ul}(\{V\},t) = Q_k^u(\{V\})$ nie zależą od czasu w okresie $T_1 \cup T_2 \cup \ldots \cup T_m$.

W celu wyznaczenia prognoz charakterystyk badanego systemu przyjmiemy, że $t \in T_m \cap \tilde{T}_i$, gdzie $\tilde{T}_i$ oznacza horyzont prognozy i-tej prognozowanej wielkości.

Jeżeli w systemie $S(st)$ w chwili t wystąpi zdarzenie losowe W_1 postaci: wielkość $w(t)$ produktu dostarczanego do podsystemu M, za pomocą podsystemu transportowego T jest mniejsza od zapotrzebowania odbiorcy O: $w(t) < a$, a zawartość $z(t)$ magazynu M wynosi zero, czyli $z(t)=0$ i podsystem T pracuje: $u=1$ lub zawartość magazynu M wynosi zero: $z(t)=0$ podsystem T nie pracuje: $u=0$ (znajduje się w stanie awarii), to odbiorca zmuszony jest do korzystania z innych źródeł zaopatrzenia lub ograniczenia własnej produkcji. Prowadzi to do strat w badanym systemie (strat odbiorcy). Prawdopodobieństwo wystąpienia takiego niekorzystnego zdarzenia oznaczmy

przez w_1 ($w_1 = P(W_1)$). Prognozę $\hat{w}_1(t)$ prawdopodobieństwa deficytu podaży produktu dla odbiorcy O w chwili t obliczany za pomocą wzoru:

$$\hat{w}_1(t) = \sum_{x_k < 0} Q_k^{1m}(\{0\}, t) + \sum_k Q_k^{0m}(\{0\}, t). \qquad (3.2.16)$$

Niekorzystny stan badanego systemu $S(st)$ w chwili t związany jest również z innym zdarzeniem losowym W_2: wielkość produktu dostarczanego do podsystemu O, za pomocą podsystemu transportowego T, przekracza zapotrzebowanie a odbiorcy O, czyli $w(t) > a$ a podsystem T znajduje się w stanie pracy $u=1$ i magazyn M jest zapełniony $z(t) = V$ lub podsystem transportowy T nie pracuje ($u=0$) (znajduje się w stanie awarii) i magazyn jest pusty $z(t) = 0$. W tym przypadku podsystem produkcji P (nadawca) nie ma możliwości przesłania swojego produktu do odbiorcy O. Prowadzi to również do strat w systemie (strat nadawcy). Oznaczmy przez w_2 prawdopodobieństwo tego, także niekorzystnego, zdarzenia ($w_2 = P(W_2)$). Prognozę $\hat{w}_2(t)$ prawdopodobieństwa strat nadawcy (podsystemu P) w chwili t wyznaczamy ze wzoru

$$\hat{w}_2(t) = \sum_{x_k > 0} Q_k^{1m}(\{V\}, t) + \sum_k Q_k^{0m}(\{0\}, t). \qquad (3.2.17)$$

Wielkości (3.2.16), (3.2.17) są więc prognozami charakterystyk oceny stopnia strat produkcyjnych odpowiednio odbiorcy O (charakterystyka w_1) i nadawcy P (charakterystyka w_2).

Jako charakterystykę oceny stopnia wykorzystania magazynu M w chwili t w badanym systemie w przypadku strukturalnego procesu dostawy produktu $S(st)$ można przyjąć prawdopodobieństwo zdarzenia losowego W_3 postaci: poziom wypełnienia magazynu jest dodatni, ale mniejszy od V: $0 < z(t) < V$ i podsystem transportowy T znajduje się w stanie pracy $u=1$ lub podsystem M jest w stanie pośrednim $0 < z(t) < V$ i podsystem T nie pracuje: $u=0$. Niech, podobnie jak poprzednio, w_3 oznacza prawdopodobieństwo zdarzenia W_3 ($w_3 = P(W_3)$). Prognozę $\hat{w}_3(t)$ charakterystyki oceny stopnia wykorzystania podsystemu M w badanym systemie w przyszłej chwili t obliczymy ze wzoru:

$$\hat{w}_3(t) = \sum_k Q_k^{1m}(V, t) + \sum_k Q_k^{0m}(V, t). \qquad (3.2.18)$$

Z małym prawdopodobieństwem w przyszłej chwili t należy oczekiwać strat nadawcy (podsystemu P) lub wystąpienia deficytu podaży produktu dla

odbiorcy O, gdy wartość prognozy (3.2.18) jest bliska jedności. Jeżeli zaś wartość ta jest bliska zera, to z dużym prawdopodobieństwem w chwili t należy oczekiwać strat nadawcy P lub deficytu u odbiorcy O, co ilustruje rys. 6.

duże prawdopodobieństwo
strat nad awcy P
lub def icytu dla podaży
produktu u odbiorcy O

małe prawdopodobieństwo
strat nadawcy O lub deficytu
podaży produktu dla odbiorcy O
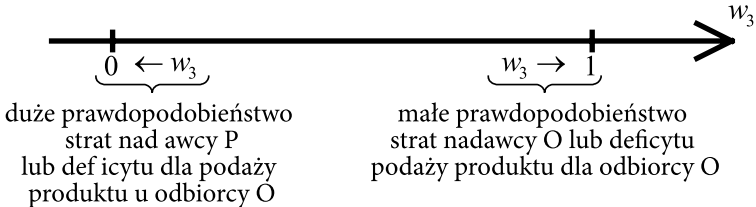
Rys. 6. Prawdopodobieństw deficytu podaży produktu lub strat nadawcy dla S(st).

Stany graniczne oraz stan pośredni poziomu zapasów w magazynie M można prognozować za pomocą wzorów:

$$\hat{w}_4(t) = \sum_{u,k} Q_k^{um}(\{0\}, t). \qquad (3.2.19)$$

$$\hat{w}_5(t) = \sum_{u,k} Q_k^{um}(\{V\}, t). \qquad (3.2.20)$$

$$\hat{w}_6(t) = \sum_{u,k} \int_{c_1}^{c_2} f_k^{um}(z, t)\, dz, \text{ dla } 0 \le c_1 < c_2 \le V. \qquad (3.2.21)$$

Wzór (3.2.19) określa prognozę $\hat{w}_4(t)$ prawdopodobieństwa wystąpienia dolnego stanu granicznego poziomu a zapasów magazynu M (stanu zerowego wypełnienia magazynu) w chwili t, czyli $w(t)=0$ natomiast relacja (3.2.20) — prognozę $\hat{w}_5(t)$ prawdopodobieństwa górnego stanu granicznego poziomu zapasów podsystemu M (stanu maksymalnego wypełnienia magazynu) w chwili t, czyli $w(t)=V$. Prawdopodobieństwo stanu nieekstremalnego poziomu zapasów magazynu M w chwili t, czyli $0 < z(t) < V$, można prognozować za pomocą wzoru (3.2.21).

Wielkość podaży produktu podsystemu P oraz stany, w których może znajdować się podsystem transportowy T można prognozować z użyciem wzorów:

$$\hat{w}_7(t) = \sum_{u} Q_k^{um}(\{0\}, t) + \sum_{u} Q_k^{um}(\{V\}, t) + \sum_{u} \int_0^V f_k^{um}(z, t)\, dz, \quad (3.2.22)$$

$$\hat{w}_8(t) = \sum_{k} \left\{ Q_k^{um}(\{0\}, t) + Q_k^{um}(\{V\}, t) + \int_0^V f_k^{um}(z, t)\, dz \right\}. \quad (3.2.23)$$

Prognozę $\hat{w}_7(t)$ prawdopodobieństwa, że poziom podaży produktu w chwili t będzie wynosił y_k obliczamy ze wzoru (3.2.22), a prognozę $\hat{w}_8(t)$ prawdopodobieństwa stanu u podsystemu transportowego T w chwili t ($u=1$, gdy podsystem T pracuje; $u=0$, gdy podsystem T nie pracuje (znajduje się w stanie awarii)) — na podstawie wzoru (3.2.23).

Dwuwymiarowy proces ($z(t)$, $v(t)$) charakteryzuje funkcjonowanie podsystemu M oraz podsystemu transportowego T. Można zatem prognozować prawdopodobieństwo zajścia w chwili t następujących zdarzeń losowych:

– stan poziomu zapasów magazynu M nie jest ekstremalny, czyli $0 < z(t) < V$ i podsystem transportowy T znajduje się w stanie u ($u=1$ — praca, $u=0$ — awaria),

– poziom zapasów podsystemu M osiąga stan graniczny dolny (magazyn jest pusty), czyli $z(t)=0$ i podsystem transportowy T znajduje się w stanie u ($u=1$ lub $u=0$),

– poziom zapasów magazynu M osiąga stan graniczny górny (magazyn jest zapełniony), czyli $z(t)=V$ i podsystem T znajduje się w stanie u ($u=1$ — praca, $u=0$ — awaria).

Prognozy te nożna wyznaczyć kolejno za pomocą następujących wzorów:

$$\hat{w}_9(t) = \sum_k \int_{c_1}^{c_2} f_k^{um}(z,t)\,dz,\ \ 0 \le c_1 < c_2 \le V,\ \ u = 0 \text{ lub } u = 1, \quad (3.2.24)$$

$$\hat{w}_{10}(t) = \sum_k Q_k^{um}(\{0\},t),\ \ u = 0 \text{ lub } u = 1, \quad (3.2.25)$$

$$\hat{w}_{11}(t) = \sum_k Q_k^{um}(\{V\},t),\ \ u = 0 \text{ lub } u = 1. \quad (3.2.26)$$

Proces ($y(t)$, $v(t)$) opisuje podaż produktu $y(t)$ podsystemu P oraz funkcjonowanie $y(t)$ podsystemu transportowego T. Prognozę prawdopodobieństwa zajścia w przyszłej chwili t zdarzenia losowego: podaż produktu podsystemu P osiąga stan y_k, a podsystem transportowy T znajduje się w stanie u ($u=1$ — praca, $u=0$ — awaria), obliczamy ze wzoru:

$$\hat{w}_{12}(t) = Q_k^{um}(\{0\},t) + Q_k^{um}(\{V\},t) + \int_0^V f_k^{um}(z,t)\,dz. \quad (3.2.27)$$

Z kolei proces ($z(t)$, $y(t)$) charakteryzuje funkcjonowanie $z(t)$ magazynu M oraz podaż $y(t)$ produktu podsystemu P. Prognozę prawdopodobieństwa zajścia w przyszłej chwili t następujących zdarzeń losowych:

– stan poziomu zapasów magazynu M nie jest ekstremalny: $0 < z(t) < V$, a podaż $y(t)$ produktu podsystemu P osiąga stan y_k, czyli $y(t)=y_k$,

– poziom zapasów podsystemu M osiąga stan graniczny dolny (magazyn jest pusty), czyli $z(t)=0$ a podaż $y(t)$ produktu podsystemu P stan y_k, czyli $y(t)=y_k$,

– poziom zapasów podsystemu M osiąga stan graniczny górny (magazyn jest zapełniony), czyli $z(t)=V$ a podaż $y(t)$ produktu podsystemu P stan y_k, czyli $y(t)=y_k$

można obliczyć kolejno za pomocą wzorów:

$$\hat{w}_{13}(t) = \int_{c_1}^{c_2} f_k^{1m}(z,t)\,dz + \int_{c_1}^{c_2} f_k^{0m}(z,t)\,dz, \qquad (3.2.28)$$

$$\hat{w}_{14}(t) = Q_k^{1m}(\{0\},t) + Q_k^{0m}(\{0\},t), \qquad (3.2.29)$$

$$\hat{w}_{15}(t) = Q_k^{1m}(\{V\},t) + Q_k^{0m}(\{V\},t). \qquad (3.2.30)$$

Funkcjonowanie $z(t)$ magazynu M, wielkości $y(t)$ podaży produktu podsystemu P oraz działanie $v(t)$ podsystemu transportowego T charakteryzuje trójwymiarowy proces: $(z(t),\ y(t),\ v(t))$. Prognozę prawdopodobieństwa zajścia w przyszłej chwili t następujących zdarzeń losowych:

– stan poziomu zapasów magazynu M nie jest ekstremalny, czyli $0 < z(t) < V$, podaż produktu podsystemu P osiąga stan y_k, czyli $y(t)=y_k$, a podsystem transportowy T znajduje się w stanie u ($u=1$ — praca, $u=0$ — awaria),

– poziom zapasów podsystemu M osiąga stan graniczny dolny (magazyn jest pusty), czyli $z(t)=0$ podaż produktu podsystemu P — stan y_k, czyli $y(t)=y_k$, a podsystem transportowy — stan u ($u=1$ lub $u=0$),

– wielkość zapasów magazynu M osiąga stan graniczny górny (magazyn jest zapełniony), czyli $z(t)=V$ podaż produktu podsystemu P — stan y_k, czyli $y(t)=y_k$, a podsystem transportowy T jest w stanie u ($u=1$ — praca, $u=0$ — awaria),

można wyznaczyć kolejno za pomocą wzorów:

$$\hat{w}_{16}(t) = \int_{c_1}^{c_2} f_k^{um}(z,t)\,dz,\ u = 0 \text{ lub } u = 1, \qquad (3.2.31)$$

$$\hat{w}_{17}(t) = Q_k^{um}(\{0\},t),\ u = 0 \text{ lub } u = 1, \qquad (3.2.32)$$

$$\hat{w}_{18}(t) = Q_k^{um}(\{V\},t),\ u = 0 \text{ lub } u = 1. \qquad (3.2.33)$$

Prognozy (3.2.16)-(3.2.33), charakterystyk opisujących funkcjonowanie badanego systemu w przypadku strukturalnego procesu dostawy produktu, obliczamy na podstawie modelu (3.2.8)-(3.2.15) dla $l=m$. Jeżeli $t \notin T_m$ i $t < T_0$ dla każdego $t_0 \in T_m$ oraz $t \in \tilde{T}_i$, to w celu wyznaczenia tych prognoz postępujemy analogicznie jak w punkcie 3.1.

Podkreślmy, że prognozy (3.2.16)-(3.2.33) budowane są tak, że ich wartości w sposób *explicite* zależą od parametrów systemu: $\pi_{ik}^{(l)}$, π_u^{*l}, V, a. Umożliwia to śledzenie zmian trajektorii wartości prognoz w zależności od zmian wartości tych parametrów, a więc i przewidywanie zmian w funkcjonowaniu badanego systemu produkcyjno-zaopatrze niowego wspomagającego centrum usług. Ponieważ na wartość parametrów $\pi_{ik}^{(l)}$, π_u^{*l} mają wpływ również czynniki organizacyjne, zatem stwarza to również możliwość prowadzenia analizy wpływu racjonalizacji elementów organizacyjnych na wartości badanych charakterystyk systemu (zarówno w aspekcie prognostycznym, jak i — nieprognostycznym), a zatem na efektywność działalności centrum usług.

Ze względu na wzrost samodzielności podmiotów gospodarczych, funkcjonujących w warunkach rosnącej konkurencji, konieczne staje się wprowadzanie istotnych zmian w sposobach zarządzania nimi. Nowoczesny proces podejmowania decyzji wymaga opracowywania obiektywnych rozwiązań, które uzyskiwane są na podstawie wyników analizy wiarygodności informacji. Rozwiązania te otrzymuje się często dzięki zastosowaniu matematycznego modelowania oraz odpowiednich metod matematycznych pozwalających na racjonalizację gospodarowania w wielu obszarach działalności. Złożoność procesu zarządzania pociąga za sobą niezbędność coraz szerszego ich stosowania; przestaje bowiem wystarczać intuicja i doświadczenie decydentów. Rozwój nowoczesnego, innowacyjnego i efektywnego zarządzania i planowania jest obecnie niemożliwy bez wykorzystania metod statystyczno-matematycznych wspieranych nowoczesną informatyką.

Niniejszy artykuł poświęcony jest badaniu systemów produkcyjno-zaopatrzeniowych wspomagających centrum usług funkcjonujących w różnych obszarach gospodarki. Dokładniej — przedmiotem badania jest system gromadzenia zapasów, którego podsystemami są: podsystem produkcji (*P*), podsystem transportowy (*T*) oraz magazyn-zbiornik (*M*) i

odbiorca (*O*) w centrum usług. Podstawowy cel artykułu, jakim było zaproponowanie narzędzi, za pomocą których można wspomagać analizę i realizację procesu efektywnego funkcjonowania badanego systemu wspomagającego centrum usług — został całkowicie osiągnięty. Wykorzystano tu podejście modelowe i prognozowanie.

W pracy przedstawiłam własne, nowe wyniki badań, dotyczące probabilistycznego opisu rozważanego produkcyjno-zaopatrzeniowego systemu wspomagającego centrum usług oraz ilościowe charakterystyki tego systemu. Na podstawie tego opisu została opracowania metodyka prognozowania charakterystyk (procesów) badanego systemu. Opis ten uzyskany jest w dwóch wariantach: zarówno w przypadku, gdy poziom zapasów podsystemu *M* sterowany jest zagregowanym procesem dostawy produktu (punkt 3.1.), jak i w przypadku, gdy poziom ten sterowany jest niezagregowanym procesem dostawy produktu (punkt 3.2.). Opisy te uwzględniają zarówno dynamikę parametrów procesu podaży produktu przez podsystem *P*, dynamikę parametrów procesu opisującego funkcjonowanie podsystemu transportowego *T*, jak i różne warianty działania podsystemu *M*.

Otrzymane stochastyczne opisy funkcjonowania systemu produkcyjno-zaopatrzeniowego wspierającego centrum usług umożliwiają wyznaczenie zdefiniowanych ilościowych charakterystyk tego systemu, np. wskaźnika oceny deficytu podaży produktu dla odbiorcy *O*, wskaźnika oceny strat produkcyjnych nadawcy *P*, wskaźnika oceny stopnia wykorzystania podsystemu *M* w badanym systemie, wskaźników dotyczących występowania barier w podsystemie *M*, wskaźnika opisującego poprawność zaprojektowania rozważanego systemu (punkty 3.1. i 3.2.).

Zaprezentowane dwa modele SPZ dają również możliwość wyznaczenia prognoz określonych charakterystyk funkcjonowania systemu (punkty 3.1. i 3.2.).

Warto podkreślić, że w przedstawionym podejściu metodologicznym zarówno podane charakterystyki ilościowe systemu, jak i ich prognozy, zależą *explicite* od parametrów systemu, co jest niewątpliwie zaletą takiego podejścia. Umożliwia ono obserwowanie zmian wartości tych wielkości w zależności od zmian wartości parametrów badanego systemu. Można więc oddziaływać na te wartości — zarówno w aspekcie prognostycznym, jak i nieprognostycznym, a tym samym zwiększać efektywność funkcjonowania systemu. Można także przeprowadzać analizę wpływu racjonalizacji

elementów organizacyjnych całego systemu, które mają wpływ na parametry procesu podaży produktu przez podsystem *P* oraz na parametry funkcjonowania podsystemu transportowego *T* i na wartości zdefiniowanych charakterystyk, co dostarcza dodatkowych przesłanek dla racjonalizacji działania systemu wspomagającego centrum usług.

Rozpatrywany system produkcyjno-zaopatrzeniowy wspomagający centrum usług jest na tyle uniwersalny, że może on być zastosowany wszechstronnie w różnych obszarach gospodarki. Przedstawione w pracy probabilistyczne opisy dynamiczne funkcjonowania analizowanego systemu, ilościowe charakterystyki działania tego systemu oraz ich prognozy są narzędziami za pomocą których można badać i optymalizować efektywność działania rozważanego systemu, a zarazem centrum usług. Tego typu narzędzia tworzą podstawy teoretyczno-metodologiczne budowanych programów komputerowych systemów informatycznych wspomagania procesu decyzyjnego. Rozwinięciem systemów wspomagania decyzji są systemy doradcze, nazywane również ekspertowymi, które są przyszłością zarządzania [43]. Systemy te, oprócz zadań związanych z przygotowaniem i opracowywaniem danych potrzebnych do podejmowania decyzji, coraz częściej zawierają zadania związane z podejmowaniem decyzji.

Uzyskane wyniki badań są zilustrowane na przykładzie dwustanowego procesu podaży produktu. Otrzymane są wzory wyrażające *explicite* zależność charakterystyk systemu od parametrów systemu oraz dokonane są ich analizy. Przedstawiony jest także przykład liczbowy, w którym dla określonych parametrów systemu wyznaczone są wskaźniki oceny strat produkcyjnych systemu (odbiorcy *O* i nadawcy *P*), wskaźnik oceny stopnia wykorzystania podsystemu *M*, wskaźniki opisujące stany graniczne (bariery) podsystemu *M* wraz ze sprawdzeniem poprawności zaprojektowania systemu.

W przypadku, gdy parametry procesu podaży produktu przez podsystem *P* oraz procesu opisującego funkcjonowanie podsystemu transportowego *T* nie są znane, należy dokonać ich oceny na podstawie próby. Zauważmy, że gdy liczba stanów procesu podaży jest mała, to wykorzystanie w praktyce uzyskanych wyników badania nie przedstawia większych trudności — można wtedy przy użyciu metod analitycznych otrzymać interesujące nas relacje wyrażające *explicite* odpowiednie wielkości bezpośrednio za pomocą parametrów badanego systemu. W przeciwnej sytuacji, a więc gdy liczba stanów procesu podaży produktu jest duża, zachodzi koniec-

zność zastosowania techniki komputerowej wspomaganej odpowiednimi metodami numerycznymi z wykorzystaniem przedstawionego w artykule postępowania.

Do opisu funkcjonowania rozważanego systemu można zastosować również prostsze podejście metodologiczne wykorzystujące pojęcie momentów zmiennych losowych (wartość oczekiwania, wariancja, kowariancja (współczynnik korelacji)) oraz nierówność Czebyszewa. Jednak efekty praktyczne i teoretyczne takiego opisu są zwykle mniejsze od rezultatów, jakie można otrzymać za pomocą wyników przedstawionych w niniejszej pracy, a ogólnie — za pomocą stochastycznego modelowania dynamicznego.

BIBLIOGRAFIA

1. *Alternatywne źródła pozyskiwania danych statystycznych Materiały Seminarium SPJS'90*, Systemy Informatyczne, nr 2, Ośrodek Badawczo-Rozwojowy Statystyki GUS, Warszawa 1990.
2. Banaszak Z., Jampolski L. S.: *Komputerowo wspomagane modelowanie elastycznych systemów produkcyjnych*, WNT, Warszawa 1991.
3. Bartkowiak A.: *Podstawowe algorytmy statystyki matematycznej*, PWN, Warszawa 1979.
4. Beer T.: *Bushfire Rate-of-Spread Forecasting: Deterministic and Statistical Approaches to Fire Modeling*, Journal of Forecasting, Vol. 10, No. 3, 1991.
5. Bielińska E. M.: *Minimum Variance Prediction of Bilinear Time Series: Direct and Adaptive Version*, Journal od Forecasting, Vol. 12, No. 6, 1993.
6. Bodo G., Cividini A., Signorini L. F.: *Forecasting the Italian Industrial Production Index in Real Time*, Journal of Forecasting, Vol. 19, No. 3, 1991.
7. Bojarski A. J.: *Matematyka dla ekonomistów*, PWE, Warszawa 1996.
8. Bołt T., Ossowski J.: *Prognozowanie na podstawie modeli logarytmiczno-liniowych*, Przegląd Statystyczny, nr 3-4, 1992.
9. Borowska M. (red. Kozaczka M.): *Przedsiębiorstwo wczoraj, dziś i jutro*, w: Przedsiębiorstwo XXI wieku Szanse i Zagrożenia, Wydawnictwo Katolickiego Uniwersytetu Lubelskiego, Lublin 2013.
10. Borowska M., Galanc T., Jaśniewicz Z.: *Własności zmian poziomów zapasów sterowanego parą procesów stochastycznych*, w: Studia Ekonomiczne AE, Katowice 2000.
11. Borowska M., Galanc T.: *Niedeterministyczna analiza funkcjonowania pewnego systemu o stochastycznym wejściu*, w: Studia Ekonomiczne AE, Katowice 2000.
12. Borowska M.: *Prognozowanie na podstawie praw funkcjonowania systemu. Analiza działania systemu w przypadku zagregowanego wejścia*, w: Społeczeństwo i rodzina Stalowowolskie Studia Katolickiego Uniwersytetu Lubelskiego, Nr 2 (1/2005).
13. Borowska M.: *Prognozowanie na podstawie praw funkcjonowania systemu. Prognozowanie procesów opisujących działanie systemu w przypadku zagregowanego wejścia*, w: Przegląd Prawno-Ekonomiczny, Katolicki Uniwersytet Lubelski Jana Pawła II, Wydział Zamiejscowy Nauk o Społeczeństwie w Stalowej Woli, Nr 2 (1/2008).

14. Borowska M.: *Prognozowanie na podstawie praw funkcjonowania systemu. Analiza funkcjonowania systemu w przypadku strukturalnego procesu dostawy produktu*, w: Przegląd Prawno-Ekonomiczny, Katolicki Uniwersytet Lubelski Jana Pawła II, Wydział Zamiejscowy Prawa i Nauk o Gospodarce w Stalowej Woli, Nr 18 (1/2012).

15. Borowska M.: *Prognozowanie na podstawie praw funkcjonowania systemu. Prognozowanie procesów opisujących działanie systemu w przypadku strukturalnego procesu dostawy produktu*, w: Przegląd Prawno-Ekonomiczny, Katolicki Uniwersytet Lubelski Jana Pawła II, Wydział Zamiejscowy Prawa i Nauk o Społeczeństwie w Stalowej Woli, Nr 29 (4/2014).

16. Borowska M.: *Prognozowanie na podstawie praw funkcjonowania systemu*, Wydawnictwo Państwowej Wyższej Szkoły Zawodowej im. prof. Stanisława Tarnowskiego w Tarnobrzegu, Tarnobrzeg 2016.

17. Botez M. E.: *Mathematical Tools in Forecasting*, Uniwersitatea Bucuresti, Bukareszt 1975.

18. Box G. E.P., Jenkins G. M.: *Analiza szeregów czasowych*, PWN, Warszawa 1983.

19. Brasil G. H., Souza R. C.: *A Bayesian Approach to Modelling Stochastic Cycles*, Journal of Forecasting, Vol. 12, No. 6, 1993.

20. Brucker P.: *Complexity Results for Shop Problems*, in: Mathematical Programming, North-Holland, Amsterdam 1984.

21. Burkard R. E., Hamacher M. W., Rothe G.: *Approximation of Convex Funkctions and Application to Separable Convex Program*, Preprint 154, 1989.

22. *Catastrophe or New Society?* A Latin American World Model, International Der. Research Center, Canada 1976.

23. Cichocki K., Wojciechowski W.: *Metoda prognozowania zmiennych w czasie współczynników inwestycyjnych*, Przegląd Statystyczny, nr 1-2, 1990.

24. Cieślak M., *Prognozowanie gospodarcze*, AE, Wrocław 1993.

25. Cieślak M.: *Demografia. Metody analizy i prognozowania*, PWN, Warszawa 1992.

26. Cieślak M.: *Nieklasyczne metody prognozowania*, PWN, Warszawa 1983.

27. Cieślak M.: *Prognozowanie w zarządzaniu przedsiębiorstwem*, AE, Wrocław 1992.

28. Czerwiński Z., Guzik B.: *Prognozowanie ekonometryczne*, PWE, Warszawa 1980.

29. Dittmann P.: *Funkcje segmentowe w prognozowaniu gospodarczym*, Badania Operacyjne i Decyzje, nr 4, 1991.

30. Dittmann P.: *O dezagregacji prognoz w sytuacji niedostatecznej informacji*, Przegląd Statystyczny, nr 1, 1992.

31. Dobrzańska I.: *Wymiar Hausdorffa jako narzędzie predykcji krokowej*, Badania Operacyjne i Decyzje, nr 2, 1991.

32. Elmaghraby S. E.: *The Determination of Optimal Activity Duration in Project Scheduling*, Ind. Eng. Vol. 19, No. 1, 1968.

33. Farnum N. R., Stanton W,: *Quantitative Forecasting Methods*, Boston, PWS-Kent Publishing Company, 1989.

34. Forrester J. W.: *Principles of System*, Cambridge 1972, Wright-Alle Press.

35. Forrester J. W.: *Urban Dynamics*, Cambridge 1970, The M. I. T. Press.

36. Forrester J. W.: *World Dynamics*, Cambridge 1971, Wright-Allen Press.

37. Galanc T., Mikuś J., Jaśniewicz Z.: *Estimate of Object's State Prediction Operator by Means if Indirect Measurements*, Amse Rev., Vol. 22, No. 2, 1992.

38. Galanc T., Mikuś J., Jaśniewicz Z.: *Ground Tank Technical Efficiency Forecasting*, Model. Simul. a. Control, Vol. 40, No. 2, 1991.

39. Galanc T., Mikuś J.: *Aggregation of Forecasts*, Adv. Model. a. Analysis, Amse Press, Vol. 32, 1992.
40. Galanc T., Mikuś J.: *Analityczne metody badania procesu innowacji technicznych*, Ośrodek Badań Prognostycznych Politechniki Wrocławskiej, Raport nr 102, Wrocław 1978.
41. Galanc T., Mikuś J.: *Matematyczny model procesu innowacji*, Przegląd Statystyczny, nr 1, 1978.
42. Galanc T., Mikuś J.: *O pewnej metodzie normatywnego prognozowania jakościowego*, Badania Operacyjne i Decyzje, nr 3, 1991.
43. Galanc T., Mikuś J.: *O pewnej metodzie prognozowania procesów niestacjonarnych*, w: Przegląd Statystyczny, nr 1, 1991.
44. Galanc T., Mikuś J.: *Remarks on the Application of Statistical Games to Technological Development Forecasting*, Technological Forecasting and Social Change, 19, 1981.
45. Galanc T., Mikuś J.: *The Method for Constructing a Combined Forecast en Bloc*, Adv. Model. a. Analysis, Vol. 35, No. 4, 1992.
46. Galanc T.: *Metody wspomagania procesu zarządzania, cz. II, Decyzyjne modele liniowe i prognozowanie ekonometryczne*, Wrocław 1993.
47. Galanc T.: *Prognozowanie trajektorii systemu cybernetycznego wyznaczonych przez cel sterowania*, w: Prace Naukowe Ośrodka Badań Prognostycznych Politechniki Wrocławskiej nr 16, seria: Monografie nr 4, Wrocław 1984.
48. Garczyński D.: *Systemy ekspertowe — przyszłość zarządzania?*, Badania Operacyjne i Decyzje, nr 1, 1993.
49. Gichman I. I., Skorochod A. W.: *Wstęp do teorii procesów stochastycznych*, PWN, Warszawa 1968.
50. Grabiński T., Wydymus S., Zeliaś A.: *Metody prognozowania rozwoju społeczno-gospodarczego*, PWE, Warszawa 1983.
51. Grabiński T., Wydymus S., Zeliaś A.: *Prognozowanie procesów społeczno-ekonomicznych*, PWN, Warszawa 1989.
52. Granger C. W.J.: *Forecasting in Business and Economics*, San Diego, California: Academic Press, 1989.
53. Hanke J. E., Reitsch A. G.: *Business Forecasting*, 4th ed. Needham Reghts: Allyn and Bacon, 1992.
54. Haustein H. D.: *Prognozy gospodarcze, zagadnienia podstawowe, modele*, PWE, Warszawa 1972.
55. Hellwig Z., Helpern S., Miszczak W.: *Zagadnienia programowania wzrostu gospodarczego*, Badania Operacyjne i Decyzje, nr 4, 1993.
56. Hellwig Z.: *Efekt katalizy w modelu ekonometrycznym, jego wykrywanie i usuwanie*, Przegląd Statystyczny, nr 1, 1977.
57. Hellwig Z.: *Problem optymalnego wyboru predykant*, w: Przegląd Statystyczny, nr 3-4, 1969.
58. Hellwig Z.: *Regresja liniowa i jej zastosowanie w ekonomii*, PWE, Warszawa 1963.
59. Hellwig Z.: *Schemat budowy prognozy statystycznej metodą wag harmonicznych*, w: Przegląd Statystyczny, nr 4, 1967.
60. Hellwig Z.: *Teoria prognozy*, Akademia Ekonomiczna we Wrocławiu 1977.
61. Hellwig Z.: *Warning Forecasts*, w: Prace Naukowe Akademii Ekonomicznej we Wrocławiu, nr 301, 1985.

62. Hellwig Z.: *Zastosowanie metody taksonomicznej do typologicznego podziału krajów ze względu na poziom ich rozwoju oraz zasoby i strukturę wykwalifikowanych kadr*, Przegląd Statystyczny, nr 4, 1968.

63. Hellwig Z.: *Zastosowanie przekształcenia ortogonalnego do wyznaczenia dopuszczalnych wartości zmiennych objaśniających w modelu ekonometrycznym*, Przegląd Statystyczny, nr 3, 1974.

64. Holden K., Peel D. A., Thompson J. L.: *Economic Forexasting. An Introduction*, Cambridge: Cambridge University Press.

65. Hovrey E. P., Haymans S. H., Donihue M. R.: *Merging Monthly and Quarterly Forecasts: Experience with MQEM*, Journal of Forecasting, Vol. 12, No. 3, 1991.

66. Jakeman A. J., Thomas G. A., Dietrich C. R.: *System Identification and Validation for Output Prediction of a Dynamic Hydrologic Proces*, Journal of Forecasting, Vol. 10, No. 3, 1991.

67. Janiak A., Grabowski J.: *Optymalizacja sekwencji operacji z rozdziałem zasobów w dyskretnych procesach produkcyjnych*, Z. Nauk. Politechniki Śląskiej, nr 54, 1980.

68. Janiak A.: *Dokładne i przybliżone algorytmy szeregowania zadań i rozdziału zasobów w dyskretnych procesach przemysłowych*, Prace Naukowe Instytutu Cybernetyki Technicznej Politechniki Wrocławskiej nr 87, seria: Monografie nr 20, Wrocław 1991.

69. Janiak A.: *Problem kolejnościowy gwiazdowy z rozdziałem zapasów*, Zeszyty Naukowe Politechniki Śląskiej, nr 63, 1982.

70. Kania-Gospodarowicz A.: *Zastosowanie technik scenariuszowych do prognozowania*, w: Prognozowanie w zarządzaniu przedsiębiorstwem, Wrocław, Wrocławska Biblioteka Współczesnego Menedżera, 1991.

71. Kendall M., Stuart A.: *Mnogomernyj statističeskij analiz i vremennye rjady*, Izd. Nauka, Moskva 1976.

72. Kildiszew G., Frenkel A.: *Analiza szeregów czasowych i pro*, PWN, Warszawa 1976.

73. Klein L. R.: *Wykłady z ekonometrii*, PWE, Warszawa 1978.

74. Klukowski L.: *Prognozowanie szeregów czasowych na podstawie markowskiego trendu segmentowego*, Przegląd Statystyczny, nr 1, 1992.

75. Krawczyk I.: *Scenariusz jako metoda prognozowania*, Wiadomości Statystyczne, nr 1, 1990.

76. Król M.: *O wskaźnikach oceny niekorzystnych zjawisk w pracy pewnego systemu gospodarki zapasami*, Badania Operacyjne i Decyzje, nr 4, 1992.

77. Król M.: *Ocena efektywnego wykorzystania magazynu-zbiornika w pewnym systemie gospodarki zapasami*, Badania Operacyjne i Decyzje, nr 3, 1992.

78. Król M.: *Praktičeskie aspekty stochastičeskogo analiza funkcionirovanija sistemy „nepreryvnyj transport-chranenie"*, Sbornik Naučnych Trudov MESI „Metody matematičeskogo modelirovanija ekonomiki", Moskva 1989.

79. Król M.: *Stochastičeskij analiz funkcionirovanija sistemy „nepreryvnyj transport-chranenie"*, sb: Proektirovanie informacionnych system, M. MESI, 1989.

80. Lam Yeh.: *Optimal Control of a Finite Dam — discounted cost case*, Kexue Tongbao 32(2), 1987.

81. Latif A., King M. L.: *Linear Regression Forecasting in the Presence of AR (1) Disturbance*, Journal of Forecasting, Vol. 12, No. 6, 1993.

82. Lee J. C., Tsao S. L.: *On Estimation and Prediction Procedures for AR (1) Models with Power Transformation*, Journal of Forecasting, Vol. 12, No. 6, 1993.

83. Löfgren K. G., Ranneby B., Sjöstedt S.: *Forecasting the Business Cycle without Using Minimum Autocorrelation Factors*, Journal Forecasting, Vol. 12, No. 6, 1993.

84. Meadows D.: *The Limits to the Growth*, Universe Books, New York 1972.

85. Mesarowic M. D., Pestel E.: *Mankind at the Turning Point*, New York 1974.

86. Mikuś J.: *Prognozowanie stanów systemu cybernetycznego w warunkach niepełnej informacji o zakłóceniach*, w: Prace Naukowe Ośrodka Badań Prognostycznych Politechniki Wrocławskiej nr 15, seria: Monografie nr 3, Wrocław 1984.

87. Mills T. C.: *Estimating Trend Growth Rates of the U. K. Monetary Aggregates*, Journal of Forecasting, Vol. 10, No. 3, 1991.

88. Milo W.: *Analiza szeregów czasowych*, UŁ, Łódź 1983.

89. Milo W.: *Szeregi czasowe*, PWE, Warszawa 1990.

90. Nowak E.: *Zarys metod ekonometrii*, PWN, Warszawa 1994.

91. Ostasiewicz S.: *Metody dyskryminacyjne w prognozowaniu dyskretnym*, Komitet Statystyki i Ekonometrii PAN, Ossolineum, Wrocław 1989.

92. Ostasiewicz S.: *Prognozowanie dyskretnej zmiennej losowej*, AE, Wrocław 1974.

93. Ostasiewicz S.: *Wykorzystanie metod dyskryminacyjnych w prognozowaniu dyskretnym*, Prace Naukowe AE, nr 232, Monografie i Opracowania nr 14, Wrocław 1983.

94. Pasik-Duncan B.: *Predykcja zagregowanego procesu autoregresji*, Przegląd Statystyczny, nr 4, 1990.

95. Pawłowski Z.: *Prognozy ekonometryczne*, PWN, Warszawa 1973.

96. Pawłowski Z.: *Zasady predykcji ekonometrycznej*, PWN, Warszawa 1982.

97. Podgórska M.: *Prognozowanie struktury za pomocą modelu odnowy*, Przegląd statystyczny, nr 2, 1989.

98. Pułaska-Turyna B.: *Statystyka dla ekonomistów*, Difin SA, Warszawa 2011.

99. Rogalska D., Tomaszewicz A. S.: *Metoda optymalizacji zapasów surowców w przypadku nieregularnych dostaw*, Przegląd Statystyczny, nr 1-2, 1990.

100. Rowecki S.: *Modelownie procesów losowych w systemach rozwoju. Studium diagnostyczno-prognostyczne, cz. I. Podstawy teoretyczne, cz. II. Diagnoza i prognoza potencjału intelektualnego Polski w perspektywie XXI stulecia*, Ośrodek Badań Prognostycznych Politechniki Wrocławskiej, Raport nr 31B, Wrocław 1979.

101. Santarek K., Strzelczyk S.: *Elastyczne systemy produkcyjne*, WNT, Warszawa 1989.

102. Sikora W.: *Metoda quasi-baz dla problemu transportowo-produkcyjnego z wypukłą funkcją kosztów*, Przegląd Statystyczny, nr 3, 1990.

103. Sikora W.: *Problem transportowy z losowym popytem odbiorców*, Przegląd Statystyczny, nr 3-4, 1992.

104. Sowiński J.: *Zastosowanie modeli MRK w prognozowaniu procesów gospodarczo-technicznych*, Badania Operacyjne i Decyzje, nr 2, 1991.

105. Tanasev W. S., Solsov J. N., Strusevič J. M.: *Teorija raspisanij*, Mnogostadnye sistemy, Nauka, Moskva 1981.

106. Tinbergm I., *Resgaping the International Order*, 1976.

107. Tomaszewicz Ł.: *Zintegrowane modele gospodarki narodowej*, PWE, Warszawa 1983.

108. Wallis K. F., Whitley J. D.: *Sources of Error in Forecasts and Expectations: U. K. Economic Models, 1984-1988*, Journal of Forecasting, Vol. 12, No. 3, 1991.

109. Welfe A.: *Rynek w warunkach inflacji. Studium ekonometryczne*, UŁ, Łódź 1990.

110. Welfe W.: *The Unbalanced Ekonometric Macromodels Exemplified by the Model W-1, Computing Equilibria — How and Why*, North-Holand — PWN, Amsterdam — Warszawa 19.
111. Woźniak M., Zeliaś A.: *O pewnych metodach budowy krótkookresowej prognozy na podstawie szeregów czasowych z wahaniami sezonowymi*, Przegląd Statystyczny, nr 1, 1971.
112. Wydymus S.: *Ekonometryczne metody budowy prognoz dla przemysłu uspołecznionego Polski*, AE, Kraków 1976.
113. Wydymus S.: Średniookresowe prognozy produkcji globalnej wybranych gałęzi przemysłu lekkiego, w: Przegląd Statystyczny, nr 3, 1973.
114. Zadora K.: *O predykcji punktów zwrotnych trendu i ustalaniu horyzontu prognozy*, Przegląd Statystyczny, nr 1, 1969.
115. Zadora K.: *O predykcji szeregów czasowych metodą wyrównywania wykładniczego*, Przegląd Statystyczny, nr 2, 1969.
116. Zawadzki J.: *Ekonometryczne metody prognozowania w przedsiębiorstwie*, Uniwersytet Szczeciński, Rozprawy i Studia, t. 58, Szczecin 1989.
117. Zeliaś A.: *Metody budowy długookresowej prognozy statystycznej*, w: Przegląd Statystyczny, nr 1, 1972.
118. Zielaś A.: *Ekonometryczne metody budowy prognoz*, WSE, Kraków 1970,
119. Zielaś A.: *Teoria prognozy*, PWE, Warszawa 1979.
120. Zielaś A.: *Z problematyki badania współliniowości w modelach ekonometrycznych*, Przegląd Statystyczny, nr 2, 1977.
121. Брітченко І. Г. Переваги застосування нових кредитних технологій // Схід. – № 3 (53). – 2003. — С. 55–58.
122. Брітченко І. Г. Маркетинг у банках: навч. посіб. /Брітченко І. Г., Бєлявцев М. І., Тягунова Н. М.// Полтава: РВЦ ПУСКУ, 2008. — 345 с.

MONOGRAPH

DEVELOPMENT OF SMALL AND MEDIUM ENTERPRISES: THE EU AND EAST-PARTNERSHIP COUNTRIES EXPERIENCE

*Edited by professors Igor Britchenko
and Yevheniia Polishchuk*