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FORECASTING ECONOMIC RESULT OF MANIPULATION USING GAME THEORY MODELING

Abstract: Manipulations are taking place widely on various capital, commodity, derivative and other markets. They are reported regularly and sometimes causing significant losses. But it doesn't mean that the efforts intended to limit this sort of activity are insignificant. Surveillance budgets, as well as applied fines, are impressing. The annual volume of manipulative attempts and the efforts, intended to deter these attempts, are growing exponentially year after year. The imperfection and low versatility of detection methods are leaving space for successful attempts, making manipulative behavior still attractive. This paper is representing the model, based on the Game Theory and aimed to fit modern requirements of surveillance. The article defines basic problems in manipulation detection and proves model's capability to solve them. However, the problem is reviewed on a general level allowing to elaborate the versatile model, but not a specific manipulative scenario. At the same time, the model allows complementing it with precise tools defining aspects related to actual manipulation. Manipulation and the shaping of it's economic results are reviewed in-depth, revealing it's core phenomenology.

Key words: manipulation, model, economic results.

Introduction

Many commonly known abstractions are very clear on a general level, while their numerical determination or modeling is a huge challenge. Prudence, lawfulness, manipulation, and others – are statements frequently used in modern economics and finances. And they are working perfectly for explaining more complex concepts or cases. However, we still missing transparent mathematical or algorithmic tools, defining prudent or imprudent out of commonly available data.

The problem stands even sharper in case if we need to apply deterring against a certain type of phenomena. Besides identification and classification, in this case, we need to prove the intense to define liability. Many domain practitioners, as well as scientists, are able to define clearly what manipulation is. However, we still challenging to detect, classify and prove the manipulative attempt. As will be shown further, technological development brings the problem to a new level.

There are two basic drivers for resolving this problem. First, manipulations are causing significant economic impact on markets and their participants.

As we know from regulation reports, it is vast and sometimes catastrophic. Second, the surveillance, related to market abuse and insider compliance regulation, demands significant costly efforts from financial institutions and authorities. Consequently, an average market participant either suffers from manipulation consequences or caries related risk ownership costs.

Problem definition

As a first approximation, the problem requires a mathematical definition. Such definition should allow analyzing manipulative attempts transparently and allow employing computation facilities. In other words, the analysis should transform from theoretical to mathematical. This paper is called to introduce the model describing manipulation as deliberate strategic interaction. The methods of Game Theory are fitting this goal perfectly.

Many models in economics are intended to describe some aspects on a general level or evaluate these aspects on a rough scale. Meanwhile, the tasks of decision making or deterring are demanding very accurate tools to be utilized. Such tooling demands a deep understanding of phenomena' mechanics. Actually, implied equations should be elaborated from mathematical descriptions of the mechanics of phenomena. Therefore, the paper highlights basic mechanisms of manipulation in their precise definition.

Another aspect of this problem is the universality of demanded tools. The backbone of this model should describe a basic logic, common for all implementations of the phenomena, while variable aspects should be introduced by complementing modules. Certainly, such architecture is possible to be elaborated only from a conscious understanding of manipulation. In other words, our understanding should clearly define common aspects and aspects impured by the context.

Last, but not least, we need to oversee the economic result of phenomena. It is very important for many implementations. As we will define in the following sections, the economic result plays important role in the evaluation as well as in the detection of manipulative intense.

The Overview of available Works

First, we should start with the state-of-the-art understanding of what manipulation is. As was highlighted in the introduction, the general meaning of manipulation is clear. But as we getting into details, trying to inspect the phenomena deeper, we are facing a versatile set of definitions. It is easy to admit that all of them are defining basically the same phenomena. However, they are focused on different points, recognizing them as root aspects for manipulations. It is reasonable to assume that the majority of these researches are right and the modern regulation should aggregate all these points in a holistic interpretation of phenomena.

It is worth starting from works, analyzing the evolution of phenomena, or bringing a reasonable classification. In accordance with [1] the earliest recognized manipulations took place at Amsterdam Stock Exchange at the beginning of the 17th century. Shortly it became a common practice. Most probably, this information was inherited from [2], also naming Amsterdam as the first recorded venue manipulations took place in. Using materials of Robert Sobel book 'The Big Board', and the Twentieth Century Fund's publication 'The security markets' (1935), investigators elaborated a coherent narration of manipulations' history up to the year of 1992.

Both papers are highlighting the intensifying over the years process of manipulations' development. Attempts, that had been tracked initially, demanded the distribution of fake news or other kinds of misleading information. Later 'bear raids' had tried to impact markets using a supply-demand ratio. Currently, manipulations can be represented by a set of complex cross-market actions, aimed to segregate an impact market and a profit market. Tom C. Lin in his paper [3] gives a detailed comparison of old and new methods of manipulations. Among other differences he highlights the widespread use of electronic tools, impressively facilitating trading as well as manipulation methods.

A deeper look at the problem of manipulations' technical reinforcement was made by Gina-Gail S. Fletcher in her work [4]. It highlights the emerging problem of deterring technically advanced methods of manipulation. The well-known in theory race of technologies between fraudsters and controlling gets feasible shape and able to be

studied case-based. Author calls AI and ML as manipulation tools already in use. More precise research of the correlation between technological growth and emerging manipulative activity was made by Douglas Cumming in the work [5]. They sequentially study the development of innovations and the consequent development of manipulative methods.

The classification of manipulative techniques is typically using either an object of manipulation or a method of manipulation to sort manipulations. The good and one of the earliest examples of the first approach can be found in [2]. Here Allen and Gale are giving the following classification:

- Action-based manipulation
- Information-based manipulation
- Trade-based manipulation

In accordance with the authors first two types were clearly outlawed by the Securities Exchange Act of 1934. This document is also dating the first appearance of the modern definition of these manipulations.

This classification is also used by [1]. However, they give a very important generalization, saying that trade-based manipulations are actually aimed to bring misleading information about a real supply-demand ratio to the market. This idea got it's detailed review in the paper [6]. The authors are coming to very interesting results. Their research shows that the stock price may have a function of information exchange between market players. They evidently highlighting that in some circumstances market participants are seeking price signals as one and only sources of information. In such a situation price signal function is not only complementing the information available but shaping it solely. This observation brings us to the conclusion that there is, actually, one type of manipulation, implying misleading trades, direct disinformation, and misleading actions as ways to bring manipulative information to a market.

The classification based on a manipulation method is widely used in the financial area and especially among domain practitioners. Such sub-domains, as market abuse regulation, are more focused on the actual ways to manipulate a market, as their core intention is deterring manipulative methods. A wide range of authors is using such classification or focused on it's part. The paper [7] gives a detailed classification of manipulations able to be generalized as insider trading. A deep study on kinds of manipulative methods was made in work [8]. A very resulting attempt to provide an impact-based classification was made in work [9]. The author defines two types of manipulations by the scale of their impact. The first type of manipulations is able to create an allocated risk at a certain instrument. The second type of manipulations is able to create a market-wide systematic risk. In other words, this type of manipulation is able to create financial volatility impacting the whole domain. The interesting aspect is that both types are closely related to the use of misleading information.

However, we need to admit that the most exhaustive classification, based on the method of manipulation, is available in regulators' public materials. FCA, ESMA, SEC, and other international or regional bodies are developing systematic materials intended to define and prevent manipulations of various nature.

Starting the times of Adam Smith economics, as well as finances, become subjects of constant research. Certainly, manipulations became a subject of researchers' attention as well. Following the emerging manipulative strategies, economic science developed it's understanding of manipulations' mechanics and methods. In the last quarter of the 20th-century science came to a more or less modern understanding of manipulations. The overviews of such works can be found in the papers of Allen and Gale [2], Rajesh Aggarwal[10], and others. However, some authors are worth to be highlighted separately, as they are focusing on specific aspects of manipulation.

Oliver Hart in his paper [11] gave some attention to manipulations' modeling, however, considered them as a type of speculation. Later Robert Jarrow [12] introduced his model of manipulations. Considering a wide range of earlier works, including [11], he elaborated an effective model. However, this model is focused on certain types of manipulations and can be scenario-dependent. In the work of Rajesh K. Aggarwal [10] the author proposes a model based on a price jump, and able to detect manipulative attempts of a certain kind. The model is used to compare 3 scenarios where different agents are employed.

This approach is very effective to highlight the difference appearing in the market where certain manipulation is applied. However, the versatility of this model is under question.

The fundamental assumption that manipulation can be a strategic step, having all attributes like intention, strategy, and expected result, was made by several authors with different levels of approximation. Jules Hedges in his blog post [13] opens a discussion around 'rule braking' as a strategic step in Game Theory. First of all, he quotes a list of scientists, that putting a classic Game Theory under the question from the perspective of limitations, emerging from the phenomena of rules. Rules are considered as common knowledge, and basically shaping the set of strategies players can apply. This attribute of any game implies not only limitations by design but discards the whole concept of rule-breaking. In the author's idea, rule-breaking should be embedded as a natural ability of any player. Certainly, it opens a myriad of discussions around the taxonomy of rule-breaking but makes equilibrium open for nominals representing the rule-breaking.

These ideas found their practical implementation in various works. The investigators used a model based on Game Theory [14] to prove that time-wasting can be a strategic step to win a soccer game. Meanwhile, it is a type of behavior, restricted by international soccer rules. Jean Luc Vila [15] introduced a simple Game Theory model, describing financial market manipulations as a strategic step.

Later, Diana Dezsi introduced her work [16] where another Game Theory model of market manipulation was introduced. This model develops the idea of manipulation as a strategic step. However, the author overrates the role of the National Securities Commission's regulation. It leads to very low attention to other aspects deterring manipulations. However, the idea of market manipulations, as strategic acts, is well proven.

Considering these papers, we can conclude that the Game Theory is an applicable mathematical instrument to be used for manipulations' modeling. Nevertheless, it's toolkit should be complemented by the strategic breaking of rules.

The significant change in manipulations' perception paradigm took place after the introduction of behavioral economics. Even earlier works admitted the role of biases and individuals' behavior. However, the new approach in the understanding of economics made manipulative behavior a core aspect of the phenomena. Chunsheng Zhou and Jianping Mei in their work [1] introduced a manipulation model intended to detect patterns of malicious behavior. But the correlation between a pattern and an intention remains doubtful in this model. This topic is examined in a paper by Cass R. Sunstein [8]. This paper covers many implementations of manipulations in a more casual form, but evidently proves the presence of a behavioral component of manipulation. In the other paper [17] an overview of early statements and basics, elaborated the current understanding of behavioral economics, is given. We can see the history of such core abstractions as bias and manipulation. Among other important aspects, he highlights that some of the widely appearing biases are shaping the tendency of people to be influenced by supposedly irrelevant factors. In his convenience, it brings the foundation for manipulations. The importance of this statement is hard to be overestimated. It turns manipulation from being a kind of 'black magic' to a plain process employing widely known economical processes.

As a keen highlight, the author quotes Amos Tversky joking about his work establishing what was long known to advertisers and used car salesmen. It is important to highlight that Tversky, working on the problematic of decision making, introduced many concepts behavioral economics is based on. This fact, as well as the employment of behavioral economics in modern manipulation analysis, brings us to the conclusion that behavioral aspects should play a key role in state-of-the-art models.

As we can learn from the works of various authors, one of the most important aspects of manipulative processes is information. It can take different ways to obtain manipulation using information, but many authors evidently highlighting the importance of information in manipulative attempts. E. g. the research [18], giving an evaluation of manipulations phenomena from the perspective of information, was made by Jean Luc Vila.

However, this and other works of Vila are focused on insider information rather than the general role of information. The paper [10] defines the exceptional role of information in manipulations. He defines a specific role of 'information seekers', who are playing an important role in a fair price formation. He evidently describes a process of manipulation as strongly related to a lack of information in a pool of traders and consequent injection of misleading information. Another important problem highlighted by the author is the detection of possible manipulations which does not occur. This aspect is very important if we want to manage risks o f manipulation proactively instead of reactive surveillance. Jean-Yves Delort and the colleagues in their paper [19] are evidently proving the concept of misleading information used to manipulate markets. The research, as well as it's core statements, is made on the basis of the vast pool of messages, quoted from the internet message board intended for professional communication of trading individuals. Roland Benabou and Guy Laroque gave a sharp focus on manipulations related to insider information [20].

Last, but not least aspect of manipulations is it's economic result. The most important details of this aspect are described in a paper [9] by Gina-Gail S. Fletcher. This article provides a general overview of manipulations' impact on financial markets. The author highlights the change of manipulations' understanding that emerged in financial regulation after the crisis of 2008. She claims to review this phenomenon from a new, macroprudential point of view. The article evidently shows that manipulations that appeared in the market are changing the vulnerability landscape, which all market participants are considering. New risks, related to vulnerabilities introduced, are contributing to the risk ownership costs of all market players. This fact brings us to the conclusion, that a very single manipulation raises costs for the entire market. It is important to highlight that understanding of risks, introduced by a manipulation, is essential for an understanding of manipulations' severity.

The problem of manipulations' economic results was examined in a panel of other works. For example, Robert W. Staiger and Alan Sykes [21] highlight that the impact of manipulation on currency exchange markets is hard to be measured. However, the paper estimates a scale of such processes as ten billion. Also, Craig Pirrong [22] examined similar effects on commodity markets.

The pool of mentioned paper shapes requirements to demanded model.

- The model should consider manipulation not as an untypical phenomenon, but as a strategic step of a market agent.
- The model should explain the behavioral phenomena of manipulation participants.
- The model should imply a conscious explanation of the information exchange processes taking place during a manipulation.
- The model should outline the economic result of manipulation for all parties.

The listed requirements are coherent with the problem definition given earlier.

Model

The requirement of versatility makes us define the model on a very high level of abstraction. It should lead us to the understanding of manipulation's essence, but not a given interpretation. Therefore, our model will review the game example, defining the basics of the process without deep diving in exchange details. The examination of all available manipulative scenarios will take plenty of time and should be a subject of a separate article.

Let’s assume we have a card deck of 3 cards. There are Ace, King, and Jack with the traditional hierarchy. After a deck is shuffled, each player gets one card to play. The remaining card is unknown to both players. Players are giving a minimal bet. Players (starting player one, further in turns) should call on of following options:

- Fall – player considers himself a losing party and refuses to play this round (losing his bet).
- Check – player suggests checking cards without raising a bet.
- Raise – player suggests raising bets. Let’s assume it’s ‘k’ times bigger than initial bet.

Getting the last proposition another player should either support a new bet or fall. It worth mentioning the additional rule able to sound naive or too abstract, however, it's going to play important role in our research. Players should behave honestly.

We can describe this game in Game Theory equations. Thus, we have a game:

$$N = \{p_1, p_2\}, \quad (1)$$

$$S = \{S_1, S_2\}. \quad (2)$$

In a step 0 each player gets his card. Let's call it a Nature's step and conclude that it has 6 combinations in total. Fig. 1 represents all possible strategies, coming out of any Nature's step as a tree-diagram. They are identical for each of step 0 combinations and creating 42 possible strategies with consequent outcomes. The sum of outcomes equal to 0 for each of players, confirms the exhaustiveness of this set of strategies (Fig. 1).

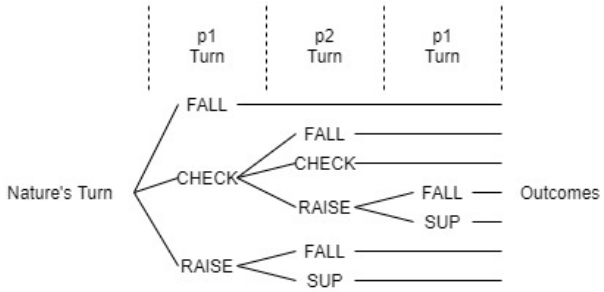

Fig. 1. Tree-diagram of possible strategies

Obviously, each of these 42 strategies consists of standard actions defined by the rules of the game. Let's bring each of actions a referring index (tabl. 1).

Table 1

Expected actions in accordance to possible strategies

Index	Action	Description
$(A;K)$, $(A;J)$, $(K;A)$, $(K;J)$, $(J;A)$, $(J;K)$	Nature turns' outcome	Any strategy starts with the outcome of nature's turn, where players are getting mentioned cards accordingly.
F_1, F_2	Fall	Player considers himself a losing party and refuses to play this round (losing his bet). Can be applied at any stage.
C_1, C_2	Check	Player suggests checking cards without raising a bet.
R_1, R_2	Raise	Player suggests raising bets
S_1, S_2	Support	Support a new bet.

The consequent set of array descriptions can be defined as:

$$S = \left\{ (A;K) \left| \begin{matrix} [F_1]; \\ [C_1, F_2]; \\ [C_1, C_2]; \\ [C_1, R_2, F_1]; \\ [C_1, R_2, S_1]; \\ [R_1, F_2]; \\ [R_1, S_2] \end{matrix} \right. \right\}; \left\{ (A;J) \left| \begin{matrix} [F_1]; \\ [C_1, F_2]; \\ [C_1, C_2]; \\ [C_1, R_2, F_1]; \\ [C_1, R_2, S_1]; \\ [R_1, F_2]; \\ [R_1, S_2] \end{matrix} \right. \right\}; \left\{ (K;A) \left| \begin{matrix} [F_1]; \\ [C_1, F_2]; \\ [C_1, C_2]; \\ [C_1, R_2, F_1]; \\ [C_1, R_2, S_1]; \\ [R_1, F_2]; \\ [R_1, S_2] \end{matrix} \right. \right\};$$

$$\left\{ (K;J) \left| \begin{matrix} [F_1]; \\ [C_1, F_2]; \\ [C_1, C_2]; \\ [C_1, R_2, F_1]; \\ [C_1, R_2, S_1]; \\ [R_1, F_2]; \\ [R_1, S_2] \end{matrix} \right. \right\}; \left\{ (J;A) \left| \begin{matrix} [F_1]; \\ [C_1, F_2]; \\ [C_1, C_2]; \\ [C_1, R_2, F_1]; \\ [C_1, R_2, S_1]; \\ [R_1, F_2]; \\ [R_1, S_2] \end{matrix} \right. \right\}; \left\{ (J;K) \left| \begin{matrix} [F_1]; \\ [C_1, F_2]; \\ [C_1, C_2]; \\ [C_1, R_2, F_1]; \\ [C_1, R_2, S_1]; \\ [R_1, F_2]; \\ [R_1, S_2] \end{matrix} \right. \right\}. \quad (3)$$

However, from the very first glance, we can spot several strongly dominated strategies. Consequently, the tree-diagram, as well as array representation are able to be shorted using the Carmell rule as follows:

$$\begin{matrix} (A;K) \\ (A;J) \end{matrix} \Rightarrow U_1(s[R_1, \dots]) > U_1(s[F_1]); \quad (4)$$

$$\begin{matrix} (A;K) \\ (A;J) \end{matrix} \Rightarrow U_1(s[C_1, R_2, S_1]) > U_1(s[C_1, R_2, F_1]); \quad (5)$$

$$\begin{matrix} (K;A) \\ (J;A) \end{matrix} \Rightarrow U_2(s[R_1, S_2]) > U_2(s[R_1, F_2]); \quad (6)$$

$$\begin{matrix} (K;A) \\ (J;A) \end{matrix} \Rightarrow U_2(s[C_1, C_2]) > U_2(s[C_1, F_2]); \quad (7)$$

$$\begin{matrix}(A;J)\\(K;J)\end{matrix} \Rightarrow U_2(s[R_1,F_2]) > U_2(s[R_1,S_2]); \quad (8)$$

$$\begin{matrix}(J;A)\\(J;K)\end{matrix} \Rightarrow U_1(s[C_1,R_2,F_1]) > > U_1(s[C_1,R_2,S_1]). \quad (9)$$

Following strategies are able to be dismissed as weakly dominated:

$$\begin{matrix}(K;A)\\(K;J)\end{matrix} \Rightarrow U_1(s[C_1,\dots]) \geq U_1(s[F_1]); \quad (10)$$

$$\begin{matrix}(A;K)\\(J;K)\end{matrix} \Rightarrow U_2(s[C_1,C_2]) \geq U_2(s[C_1,F_2]). \quad (11)$$

This stage is very important. Dominations defined in (4)–(11) are agnostic to further conclusions as well as to honesty rule, mentioned during the game definition. We are going to return to this highlight in some of further stages.

Being rational, and obeying rules, p_1 will not apply $[R_1,\dots]$ strategy if he got Jack. The expectation of $[R_1,S_2]$ in this case will be irrational, while the expectation of $[R_1,F_2]$ will contradict with the honesty rule. Consequently, whole branch $[R_1,\dots]$ is strongly dominated. And symmetrically, p_2, being rational, and obeying rules, will not apply $[C_1,R_2,\dots]$ strategy if he got Jack. Moreover, assuming that the value of time for both of players is not equal to zero, the most rational strategy having Jack is to fall as soon as possible. Because any other actions are not able to bring any better result without breaking the rule of honesty. However, they will always utilize larger or the same amount of time. Assuming that each turn of trades takes τ amount of time, we can come to following conclusion:

$$(J;\dots) \Rightarrow U_1(s[F_1]) = -1 - f(\tau). \quad (12)$$

While any other branch, having more turns of trade, will lead to lower outcome. Therefore, for player 1, having Jack, any strategy other than falling from the very beginning are strongly dominated.

$$\begin{matrix}(J;A)\\(J;K)\end{matrix} \Rightarrow U_1(s[F_1]) > U_1(\forall s \neq s[F_1]). \quad (13)$$

On the other hand, having Ace, player 1 will always try to maximize his outcome and therefore applies the shortest strategy able to give biggest outcome.

$$\begin{matrix}(A;J)\\(A;K)\end{matrix} \Rightarrow U_1(s[R_1,\dots]) > U_1(\forall s \neq s[R_1,\dots]). \quad (14)$$

It is interesting to admit that 13 and 14, being a part of common knowledge about the game, are taking a role of signals between players. This aspect is extremely important. In situations when one and only strategy can be performed by a prudent player, the recognition of this strategy by other players leads to the identification of this situation without being actually disclosed. As was discovered in [6] on the example of stock quotations, and as it obviously recognized in a given model, strategic actions of players in certain conditions may have a signal function. Consequently, this function should be recognized where needed and taken into consideration.

Knowing that $s[R_1,\dots]$ is rational only in case if p_1 got Ace, p_2 will apply $s[R_1,F_2]$ as one and only reasonable strategy. Consequently, having King, $p_1$will apply $[C_1,\dots]$, demanding explicit actions from p_2. Any other strategy in this case will break either honesty or rationality.

Out of the context of information exchange, conducted by signal functions of strategies, previous conclusions may seem irrational. Evaluating this game from the perspective of bare Game theory, we can face the situation when we are unable to discard dominated strategies any longer, but the real players are easily shrinking to a single strategy. It leads us to a very important conclusion, that consideration of information exchange makes prudent behavior able to be modeled where it was impossible earlier.

Finally, (3) is collapsing to:

$$S = \begin{matrix}\{(A;K)|[R_1,F_2]\};\\ \{(A;J)|[R_1,F_2]\};\\ \{(K;A)|[C_1,R_2,F_1]\};\\ \{(K;J)|[C_1,F_2]\};\\ \{(J;A)|[F_1]\};\\ \{(J;K)|[F_1]\}.\end{matrix} \quad (15)$$

We need to summaries few important results.

· For each Nature's step there is one and only dominating strategy.

· (15) is the Nash equilibrium.

· The probability of each strategy is equal to probability of referring Nature's step ($\sigma = \frac{1}{6}$).

· The sum of outcomes for each player is equal to zero.

$$\sum_{i=1} U_{1,i} = \sum_{i=1} U_{2,i} = 0. \quad (16)$$

· The sum of outcomes for each player weighted by their probabilities is equal to zero.

$$\sum_{i=1} U_{1,i} \cdot \sigma_{1,i} = \sum_{i=1} U_{2,i} \cdot \sigma_{2,i} = 0. \quad (17)$$

· In ⅔ of rounds a taken player clearly understands his expected outcome. The remaining ⅓ of rounds represents uncertainty with the risk of minimal bet.

Let's briefly review the same game excluding the honesty rule. However, let's highlight that it is absent for both players and both are aware of it's absence.

$$N^U = \{p_1, p_2\}, \quad (18)$$

$$S^U = \{S_1^U, S_2^U\}. \quad (19)$$

The expressions (4)–(11) are going to remain valid, as their definition not uses the honesty rule. Remaining strategies can be examined using Bayesian games equilibriums or by introducing values of risks for both players, as factors impacting outcomes for 'unfair' strategies. This game scenario completely correlates with the conclusions of [9]. Both players are going to own additional risks related to the threat of the non-honest game. From the perspective of strategies' set, players will not dismiss $[R_1, \dots]$ and $[C_1, R_2, \dots]$ as dominated due to the risk of the unfair game. So during a share of rounds, their risks will be k times more.

However, both approaches are going to lead to use of $\sigma = \frac{1}{6}$ as a core argument defining Bayesian probabilities as well as values of risks. Consequently, p_1 and p_2 are going to form $S^U > S$ (meaning number of strategies bigger than represented in (15)). The final set of strategies of S^U is not important for us. We need only the understanding that, this game will have the following properties:

$$S^U = \{S_1^U, S_2^U\}. \quad (20)$$

· S^U is the Nash equilibrium in mixed strategies.

· The probability of each strategy derivates to probability of referring Nature's step ($\sigma = \frac{1}{6}$).

· The sum of outcomes for each player is equal to zero.

$$\sum_{i=1} U_{1,i}^U = \sum_{i=1} U_{2,i}^U = 0. \quad (21)$$

· The sum of outcomes for each player weighted by their probabilities is equal to zero.

$$\sum_{i=1} U_{1,i}^U \cdot \sigma_{1,i} = \sum_{i=1} U_{2,i}^U \cdot \sigma_{2,i} = 0. \quad (22)$$

· Only in ⅓ of rounds a taken player clearly understands his expected outcome (he has an Ace). The remaining ⅔ of rounds represents uncertainty with the risk of minimal bet k times.

As will be explicitly shown further, (22) is very important. It shows that the end results of both games are equal in a long run. It is important to understand that honest game and mutual ignoring of honesty leads to the very same outcome in statistically significant series of games. Also, the last point represents statements of [9]. We may conclude that (18)–(22) represent a market condition after the very first manipulation was conducted.

For the reviewing the core of this paper, let's assume that p_1 and p_2 are running the game defined in (1) and (2). However, the p_2 decided to break the honesty rule solely. Earlier we identified that strategies (15) are able to act as signals between players. Consequently, in the situation $(K; \dots)$ p_1 will apply $s[C_1, \dots]$, flagging to p_2 his strategic position. In a case of honest game p_2 should apply $s[C_1, R_2, \dots]$ or $s[C_1, F_2]$ depending on a card he has. And what is important, his action will be a signal to p_1 as well. Therefore, having King and being rational, p_1 will never apply $s[C_1, R_2, S_1]$ as he believes that p_2 got Ace.

Considering this signal interaction p_2 will apply manipulation, trying to convince p_1 that he is in a different game situation than he actually is. He will not apply any other strategies different from S_2 to not discover himself being not honest. Consequently, the game will not transform into form, defined in (18), (19). Let's define this game formally to examine the difference with (1) and (18).

$$N^M = \{p_1, p_2\}, \quad (23)$$

$$S^M = \{S_1, S_2^M\}. \quad (24)$$

Where S_1 is identical to (2) and S_2^M can be defined as:

$$S_2^M = S_2 - s[C_1, F_2] + s\left[C_1, \overbrace{M_2\langle R_2\rangle}^{(K,J)\to(K,A)}, \dots\right]. \quad (25)$$

Where $\overbrace{M_2\langle R_2\rangle}^{(K,J)\to(K,A)}$, is the manipulation performed by p_2 intended to convince $p_1$that he is in a game position (K, A) but not (K, J), as actually is. Certainly, such a strategy is strongly dominating the honest strategy.

$$(K;J) \Rightarrow U_2\left(s\left[C_1, \overbrace{M_2\langle R_2\rangle}^{(K,J)\rightarrow(K,A)}, \dots\right]\right) > U_2(s[C_1, F_2]). \quad (26)$$

Being rational and manipulated p_1 will apply strategy $s[C_1, R_2, F_1]$. As far as behavior of p_1 gives him a signal that he is in game situation of (K, A), the strategy $[C_1, R_2, S_1]$ will never take place, being strongly dominated.

Consequently, (15) will transform to:

$$S^M = \begin{Bmatrix} \{(A;K)|[R_1, F_2]\}; \\ \{(A;J)|[R_1, F_2]\}; \\ \{(K;A)|[C_1, R_2, F_1]\}; \\ \left\{(K;J)\middle|\left[C_1, \overbrace{M_2\langle R_2\rangle}^{(K,J)\rightarrow(K,A)}, F_1\right]\right\}; \\ \{(J;A)|[F_1]\}; \\ \{(J;K)|[F_1]\}. \end{Bmatrix} \quad (27)$$

And as in the previous models let's list results.

· For each Nature's step there is one and only dominating strategy.

· (27) is the Nash equilibrium. Here we need to highlight that the status of Nash equilibrium is applicable only in case if p_1 is manipulated and the fact of single or repetitive manipulation is not discovered.

· The probability of each strategy is equal to probability of referring Nature's step ($\sigma = \frac{1}{6}$).

· The sum of outcomes for player two is bigger than the sum of outcomes for player one.

$$\sum_{i=1} U_{2,i} > \sum_{i=1} U_{1,i}. \quad (28)$$

The precise value of difference can be defined as:

$$\sum_{i=1} U_{2,i} - \sum_{i=1} U_{1,i} = 2U_2\left(s\left[C_1, \overbrace{M_2\langle R_2\rangle}^{(K,J)\rightarrow(K,A)}, F_1\right]\right). \quad (29)$$

· The sum of outcomes for player two weighted by their probabilities is bigger than the sum of outcomes weighted by their probabilities for player one.

$$\sum_{i=1} U_{2,i} \cdot \sigma_{2,i} > \sum_{i=1} U_{1,i} \cdot \sigma_{1,i}. \quad (30)$$

The precise value of difference can be defined as:

$$\sum_{i=1} U_{2,i} \cdot \sigma_{2,i} - \sum_{i=1} U_{1,i} \cdot \sigma_{1,i} = 2U_2\left(s\left[C_1, \overbrace{M_2\langle R_2\rangle}^{(K,J)\rightarrow(K,A)}, F_1\right]\right) \cdot \sigma_{2,i}. \quad (31)$$

Analysis

The example of three card poker evidently showed that the proposed model is capable to analyze strategic interactions employing manipulation. For elaborating more general regularities and providing analysis of results gained, we need to generalize proposed method. Being more abstract, it can be applied for various strategic interactions. Accordingly, the game should be defined as:

$$N = \{p_1, \dots, p_n\}, \quad (32)$$

$$S = \{S_1, \dots, S_n\}, \quad (33)$$

Let's assume that this game has Nash equilibrium

$$\bar{\bar{S}} \in S \Rightarrow \bar{\bar{S}} = \{\bar{\bar{S}}_1, \dots, \bar{\bar{S}}_n\}, \quad (34)$$

It has no difference rather it is in mixed strategies or not. The core aspect is that any of $p_1 - p_n$ are not going to apply any better strategy, what is practically the definition of Nash equilibrium· The same aspect is important for $\bar{\bar{S}}$ in mixed strategies.

As abstract game could have any sum, but not only a zero sum, the sum of outcomes for each player is equal to certain value.

$$\sum_{i=1} U_{1,i} = const_1, \dots, \sum_{i=1} U_{n,i} = const_n. \quad (35)$$

Accordingly, the sum of outcomes for each player weighted by their probabilities is equal to certain constants as well.

$$\sum_{i=1} U_{1,i} \cdot \sigma_{1,i} = const_1, \dots, \sum_{i=1} U_{n,i} \cdot \sigma_{n,i} = const_n \quad (36)$$

Where actual values of U can be defined with various formulas in accordance with a precise case of strategic interaction.

Let's assume that p_n has a strategy $s[\dots, X, \dots]$.

And we can state that it is a dominating strategy in condition (B), but not in any other condition, so:

$$(B) \Rightarrow s[\dots, X, \dots] \in S, s[\dots, X, \dots] \in \bar{\bar{S}}, \quad (37)$$

$$(\forall \neq B) \Rightarrow s[\dots, X, \dots] \in S, s[\dots, X, \dots] \notin \bar{\bar{S}}. \quad (38)$$

Consequently, if it is possible that actions of p_n are having an effect of signal to other players, we can assume a game:

$$N^M = \{p_1, \dots, p_n\}, \quad (39)$$

$$S^M = \{S_1, \dots, S_n\}, \quad (40)$$

With referring Nash equilibrium:

$$\overline{\overline{S^M}} \in S^M \Rightarrow \overline{\overline{S^M}} = \left\{\overline{\overline{S_1}}, \dots, \overline{\overline{S_n^M}}\right\}, \quad (41)$$

Where some of the strategies is replaced with the manipulative strategy

$$s\left[\dots, \overbrace{M\langle X\rangle}^{\forall \neq B \to B}, \dots\right] \in S^M. \quad (42)$$

(26) is very important to understand the motivation, pushing p_2 to manipulation. The manipulation brings value in this strategy. In a generalized view (26) will appear as:

$$(\forall \neq B) \Rightarrow U_n\left(s\left[\dots, \overbrace{M\langle X\rangle}^{\forall \neq B \to B}, \dots\right]\right) > \\ > U_n(s[\dots, Z, \dots]). \quad (43)$$

As explicitly shown in (31), p_2 has strategic advantage by applying the manipulative strategy. Manipulation is risky and depends on many factors. Any intentional participant of manipulation must have a practical reason to perform it. Consequently, in practical tasks we need to identify an outcome of honest game in observable period versus an outcome of manipulation. In generalized view (30) will transform to:

$$\sum_{i=1} U_{n,i}^M \cdot \sigma_{n,i} > \sum_{i=1} U_{n,i} \cdot \sigma_{n,i}. \quad (44)$$

Even not knowing the outcome of manipulation (f. e. in case we don't know a manipulative strategy), we can spot a deviation from expected outcome. The aspect of manipulation's profitability was highlighted in [4] one of the core factors in recognition of manipulative attempt. The same idea was introduced by [19].

It is very easy to observe that in a long run the strategy $s[\dots, X, \dots]$ will appear with different probabilities for N and N^M. As shown in (37) – (38), it is result of manipulation, but the statistical deviation is able to be detected by not acknowledged observer. And symmetrically, the probability of $s[\dots, Z, \dots]$ in N and N^M will be different. This factor is very important as sum of strategies represents the behavioral preferences of each player. Analyzing these preferences, we can identify a type of a game we are observing. As was highlighted in [17] and [1], the behavioral approach to understanding of manipulation is very promising.

Another important outcome is that $s\left[C_1, \overbrace{M_2\langle R_2\rangle}^{(K,J)\to(K,A)}, \dots\right]$ is generally described by (3) as $\{(K;J)|[C_1, R_2, \dots]\}$. Considered strongly dominated (8), it was excluded out of S and we can not find it in (15). It means that for any given game the manipulative action is technically possible and an initial list of strategies should contain this strategy, as it shown in (37). However, this strategy is typically strongly dominated without a manipulative component, as respectively shown in (38). This idea becomes more understandable if we will imagine that we, as an observer, can see only a card of p_2. In such case, we can not evaluate a game in general, but we can spot rational and irrational steps. Practically, having Jack p_2 should not raise a bet. Consequently, in a given conditions the use of strategy $\{(K;J)|[C_1, R_2, \dots]\}$ implies manipulative intense. In a more general meaning actions, being not coherent with available disposition, are most likely caused by manipulative attempt. It can be observed basing on example of (3) and (15), where any actions, listed in (3) other than listed in (15) are not adequate in application to a given conditions.

It also brings us to the problem first mentioned in [10]. The problem highlighted by the author is the detection of possible manipulations, which do not occur. This aspect is very important if we want to manage risks of manipulation proactively instead of reactive surveillance. From this perspective, a dominated strategy with a potential signal function can be considered as potential manipulation. Consequently, any opportunist, stepping in such a position, can be recognized before the effect on a market.

This situation can be revised from an alternative angle. As was indicated in [19] and the list of other works, uncertainty plays a strong role in setting up manipulation and it's actual effect. Therefore, market authorities can deter manipulative opportunities, detected as described above, by disclosing market evaluation information. Being able to aggregate market data and having unquestionable authority, market regulation bodies can compensate an information vacuum eliminating manipulative opportunities.

Economic Result of Manipulation

The economic effect of manipulation is studied in a works ([21, 22]). The common idea of market-wide losses strongly related to the appearance of new risks at a given market. After the very first manipulation, all market participants are starting o own a risk to be manipulated. The ownership cost for this risk will depend on a size of possible manipulation, it's probability, and costs of measures aimed to deter this risk. The final expression for these costs is very case-based and should be elaborated on by risk management specialists. For the matter of this study, we can define it as a function $f(R)$.

This process has it's reversal effect. The emergence of related risks pushes a share of market players to lower their activity or to exit a market at all. This and other aspects, changing the supply-demand ratio, are able to lower the asset's price for a sufficient period. In such circumstances, all asset holders are incurring losses proportional to a price drop. It can be defined as $(P_A^1 - P_A^2)V_A$, where V_A is a volume of affected assets. As a basic market can affect related derivatives, we need to apply the same ratio to its derivatives. Summing up the outcomes above, we can come to the expression defining market's economic effect as follows.

$$E_{market} = N_{market} f(R) + (P_A^1 - P_A^2)V_A + \sum_{j=1}^{d} \left(P_j^1 - P_j^2\right)V_j. \quad (45)$$

Where N_{market} is a number of active market players (actually the pool of participants who considers the risk $f(R)$), P is a price of an asset or it's derivative, V is a volume of a given market or a market of it's derivative, d is a number of affected derivatives.

Works [21], [22] and other authors (f. e. [19]) are highlighting the personal profit as a main driver of malicious behavior. (26) and (43) are explicitly showing this phenomenon. Therefore, these equations can be taken as a basis for defining of manipulators economic result.

However, we need to keep in mind that in some conditions a player, who's tried to be manipulated, can ignore a signal function and apply in response a strategy breaking the course of manipulation. In this case, with a probability γ_X of such an event, he will incur losses (the outcome of normally dominated strategy). This aspect has a bit recursive nature but introduces one very important aspect of real implementations. In our early assumptions, we took that a player, accepting a signal function, is solidly leaded by rationality and selects one and only strategy. However, in practice, he will have rather a panel of strategies, implying a strategy to ignore a signal function. Again, this concept may seam recursive, but it still operates in an initial set of strategies (before applying the Carmel rule). Most probably, in a real application, we will clearly see a concurrent strategy, which will be even more common for Nesh equilibrium in mixed strategies.

In addition, if the market is regulated, his activity may draw a regulator's attention, causing fines and prosecution. As we can learn from the practice of modern regulators, such impact will depend on the manipulation scale and other parameters. Let's assume it as a function of E_{market} with a probability of ρ_{Reg}.

$$E_M = U_M\left(s\left[\dots, \overbrace{M\langle X\rangle}^{\forall \neq B \to B}, \dots\right]\right)\cdot\sigma_M + U_X\left(s\left[\dots, \overbrace{X}^{\forall \neq B}, \dots\right]\right)\cdot\gamma_X + f(E_{market})\cdot\rho_{Reg}. \quad (46)$$

The $f(E_{market})\cdot\rho_{Reg}$ component may appear artificial. However, if we will consider manipulation itself, as a subgame in a bigger game, this new game will perfectly match the game described by Diana Dezsi in her work [16], where results of regulators' actions are shaping the outcome of a manipulator's strategy.

Despite some uncovered operational losses, this equation describes the outcome of manipulation. It is important to admit that it appears naturally from the outcome of referring strategy. Other components are appearing from alternative strategies or from a higher-scale game.

Conclusions and perspectives of further studies

A list of works mentioned here already are evidently proving the potential of Game Theory for modeling interactions assuming an opportunity for manipulation. The proposed model uses this

potential completely, proposing an efficient and versatile mathematical mechanism. The model defines a high-level canvas explaining the mechanics of manipulation, while the precise market processes can be embedded in the model to define outcomes of strategies. It allows understanding a manipulation concept-wise but analyzing a precise case employing a deep understanding of it's mechanisms and numeric outcomes.

The model considers manipulation as a strategic step. This approach leads to the identification of opportunistic nature of manipulations. It appears due to the fact that manipulation, evaluated as a strategy, demands a prudential basis for it's implementation and it's dominance to be selected. The malicious prudentiality of a manipulator gets it's definition and explanation. This is a key step to interpret malicious behavior.

Another important behavioral aspect is introduced by a wide utilization of signal function in the proposed model. The many of earlier quoted articles are identifying the importance of information in market operations and in the implementation of manipulative attempts. In the given model the signal function of a certain behavior is effectively embedded in strategic interaction.

Last but not the least, the model elaborates conscious equilibriums of economic results for the market as well as for manipulating individual.

Further development of this model can expand in two main directions. Practical use of this model demands a toolkit of equations, introducing outcomes of market activities to the model. In the perfect case, this toolkit should be optimized for program implementation, considering modern volumes of trades. Second, the risk component of market's economic result of manipulation demands a special study, proposing effective numerical methods. These numeric methods are important in the evaluation of manipulation severity, being a cornerstone in regulation.

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THEORETICAL FUNDAMENTALS OF ACCOUNTING AND REPORTING INFORMATION CONSTRUCTION IN THE DIGITAL ECONOMY ENVIRONMENT

Annotation. Modern theoretical and applied principles of digitalization and its impact on the information security of enterprises are revealed. The main digital trends that determine the directions of development of accounting and financial reporting. Peculiarities of the Ukrainian economic environment and possibilities of introduction of the means of informatization developed in the world theory are analyzed. The mechanisms of large-format automation of financial reporting processes and the use of document flow in the activities of Ukrainian enterprises are studied. The hypothesis of this study is the assumption of the positive impact of digital technologies in the reporting of socially significant Ukrainian enterprises. The study used general and specific research methods, namely: the method of systematic analysis of domestic and foreign experience in the digital economy to justify a systematic approach to the study of phenomena and processes of building a new paradigm of interaction of economic agents; dialectical method for studying the genesis of the digital economy as a defining trend of modern global socio-economic development; method of induction to determine the factors influencing the environment of digitization of accounting information; the grouping method provided systematization of factors influencing the development of digitization processes, etc. It is substantiated that digitalization as an environment for economic processes and operations will lead to changes in methodological tools of accounting and virtualization of accounting processes.

Key words: digital economy, digitalization of financial statements, QR-code, automation, electronic document management, accounting.

Introduction

Objective changes in the growing role of information and information technology as factors of public life have led to the transition to the information society and the formation of the digital economy as a defining trend of global socio-economic development. Its latest post-industrial stage is characterized by constant technological innovations, increasing informatization of social and economic relations, increasing employment in IT, production of information products and services and increasing their share in gross product, use of computer networks and global information space for effective communication, access to global information resources and meeting the needs for information products and services, etc.

Digitalization is a prerequisite for global social transformations that determine the trajectory of modern business, provides unprecedented opportunities to create value based on its virtualization. Increasingly, the strategic plans of countries mention the need to build a digital society, the development of the digital economy, which is characterized by the virtualization of all

socio-economic, educational, social and political processes.

The challenges posed by the globalized economic environment to the strategies of modern companies, necessitate their involvement in the processes of digitalization of society, which is manifested in a change in the paradigm of interaction of economic agents. The leaders of globalization processes are international companies that are actively implementing digital technologies in business processes. Digitalization of business processes permeates all existing communication relationships between business entities and stakeholders. It creates a new virtual environment for them, offering new forms of information relations between them. At the same time, it transforms the organizational and methodological principles of the accounting system as an information system of the company, which determines the relevance of the subject of this study.

Research analysis and problem statement

Problems of introduction of digital technologies in the sphere of Ukrainian economy are covered in works of domestic scientists and researchers [1–11]. In particular, the study of one group of scientists, among which we note Lavrynenko A. A. and Shulga O. M. substantiate the development of modern information technologies in the economy as a systemic element of digitalization [1].

Another group of scientists, in particular, Novikova O. F. and Ostafiychuk Ya. V., Rudenko M. V. emphasize that the key to transformations in the social and labor sphere will be the digitalization of society [2; 3]. Scientists Kraus N. M., Kraus K. M., Goloborodko O. P. in their works they summarize the characteristic special trends of the digital economy and argue that the digital age is changing the approach to doing business [4]. Another group of scientists, including Guley A. I., Guley S. A., Yazlyuk B. O. synthesize the main approaches to the formation of a new digital era on the border of real and virtual socio-economic space of interaction [5]. In general, summarizing their work, it can be noted that their works consider the general principles of digital processes in the economic and social development of Ukraine.

Paying tribute to these scientists, we note that the construction of accounting information they paid insufficient attention. In our opinion, it is the field of accounting that will undergo the largest changes in the direction of digitalization of accounting, analytical and control processes, which emphasizes the importance of research at the present stage of this sector of the economy.

To study these issues, we also studied the approaches of foreign scholars and practitioners on public perception and the importance of electronic services for the development of civil society and improving the socio-economic living conditions of the population. Thus, these issues were investigated in their works: the prerequisites for the transformation of organizational and methodological principles of the accounting system were studied by P. Dunleavy [6], H. Margetts,G. Jansson [7], M. Gustafsson, G. Goldkuhl.

Summarizing their research, it can be argued that their work focuses on the priority of changes in the processes of formation of accounting information. Given the importance of the further evolution of accounting science, it is appropriate to study the further development of accounting methodology and financial reporting on the basis of deepening its digitization and compliance with user requests.

The purpose of the article is to reveal the theoretical foundations of the construction of accounting information in the digital economy and highlight the prospects of a new accounting paradigm.

The methodological basis is the application in the process of scientific research of the historical method of cognition and general scientific principles, which include empirical (observation, comparison, description) and general logical (analysis, synthesis, generalization, induction, deduction, analogy, system approach) methods.

Research results

The concept of “digitization” is relevant and new for both practitioners and theorists of economics, in particular the science of accounting. In this regard, there is sometimes a substitution of concepts that are often mistaken for synonyms – “informatization” and “digitalization”. And if the first of them has long been common in the theory and practice of accounting, the second was introduced into scientific interpretation relatively recently. In particular, informatization does not modify the principles of interaction between economic agents,

but only creates additional channels for data dissemination, duplicating (and sometimes simply reproducing) its analog form in digital form. In addition, changing the format of data generation and transmission in the computerized accounting system creates only a number of other, other than paper, means of information interaction of economic agents. However, the digitalization of the accounting system defines a new concept of data generation and use, allows you to digitize and parameterize a number of objects that are not classically objects of accounting. Therefore, qualitatively new databases on business processes of the enterprise contribute to the formation of prognostic functions of the accounting system that can be used by all subsystems of enterprise management.

Accounting is part of a general information system that converts the primary data recorded in documents into a management product. Such a product is processed information that has the properties of the product. From this point of view, accounting is a means of producing a special kind of information – information that has value, cost, price and other categories of commodity production [5]. In a digital economy, accounting, while maintaining its relevance and demand for the product created, should become a clear component of the system of obtaining, processing and transmission of economic information. Otherwise, it is subject to a significant risk of "dissolving" in modern electronic information systems, which are dynamically evolving and expanding the scope of its application [8].

In this regard, there is a need to introduce electronic document management (hereinafter – EDI), which is based on an electronic document. Digitization in accounting is impossible without EDI, the advantage of which is accelerated cash flow and resource savings. Documentation in accounting is a way of primary registration of information.

The final generalizing stage is the formation of reporting. Therefore on the basis of primary electronic documents the document of the highest level – the electronic reporting is formed, and as Minkovskaya AA notes "The final product of accounting goes to a fundamentally new and higher level, which significantly expands the range of its" consumers "– internal and external users of information". According to the author, "integrated reporting is also based on the digitization of documents and reporting, as the submission of reports in paper form is devoid of systematic perception" [9].

An important achievement of the digital economy is the use of contactless information identification technology, namely biometric, card technology, radio identification, machine vision, speech data entry, it is necessary to separate QR-codes and devices for their reading. QR codes are a convenient, simple and interactive way to receive and disseminate information. The advantage of this code is that a large amount of information can be encoded and can be quickly accessed by recognition and scanning by digital devices. The term "QR-code" is an abbreviation of the English "Quick Response code" – (quick response code). For the first time these graphic codes were researched and applied in Japan. They are used to transfer information from media to device and can contain information such as phone numbers, reminders, text messages, product descriptions, and more. The code can be used on packaging, bulletin boards, storefronts and to track products, goods and identify objects.

The advantages and disadvantages of QR-codes are described in Table 1.

Table 1

The advantages and disadvantages of QR-codes

The advantages of QR-codes	The disadvantages of QR-codes
storage of large amounts of digital and textual information in any language	low public understanding of new QR-coding technologies (low coverage of the target audience)
the printing size of the code can be quite small and at the same time it is characterized by high recognition speed	technical shortcomings (for example, incorrectly installed device on the phone)
ability to read in any direction (omnidirectional or 360 °scan)	–
almost any surface is suitable for placement, which is also very important	–
damage resistance, even if part of the code is damaged (to 30 %), it can still be read	–

An important area of control, analytical and accounting work of the company is to report about the status and availability of non-current assets, as tangible assets are interrelated with investments. The unfitness and loss of assets can lead to a loss of income, and the need to restore them or replace them with new investments.

Collecting data on the availability, condition and complete information about objects is quite a laborious process, especially for large enterprises. Usually this procedure is carried out by different departments within the given powers, so it partially complicates the process of generalization of data obtained from different sources. To simplify the above data collection system, which is typical for many companies, it is possible to use QR-coding of objects with a special code for a particular enterprise at each object. Of course, for the QR-coding system you need to order a large number of codes and have special equipment, in particular, mobile devices (smartphones, tablets), as well as appropriate software for direct use, but after the introduction of this system it is possible to quickly collect data. responsible persons will be able to have access to data on objects that previously belonged to the competence of another unit. All data that will be provided to management will be displayed in one database, which is created by the unit, which will facilitate rapid decision-making.

During the inventory, the use of QR-codes will speed up the process of verifying existing non-current assets, because in QR-codes all data about these objects are encrypted. When reading the code, information about a specific object is revealed, which is indicated in the inventory card of the non-current asset. In the QR code, the image of the object can be encoded and updated during the next inventory. The image of the object provides an opportunity to assess the status and replace the asset between the periods of inventory. In case of introduction of QR-coding the process of work of the inventory commission will be simplified that will lead to acceleration of data aggregation and will allow to make the decision quickly.

Mobile inventory management with QR codes means that employees will be able to record transactions, even if they are at remote sites. Record operations at the very moment when they are performed, by scanning the QR code with a mobile device. This reduces the likelihood of wasting exactly what is needed to upgrade equipment in a timely manner, as well as helping to reduce lost inventory and non-current assets and avoid accounting and reporting errors. To create an effective asset tracking and inventory system using QR codes and smartphones, you need quality software and applications to work.

Asset management with tracking software and QR code inventory tags will help prevent loss and damage to the company's equipment, upgrade equipment in a timely manner, and reduce repair costs. In addition, saving time compared to manually performing the required reconciliation of assets will save a lot of hours of work for employees who may be devoted to other activities. And although such an innovation requires an initial investment of time and money, but it is justified and appropriate, as it will have a positive impact on the level of organization of accounting work of the enterprise, improving the efficiency of accounting staff [11, p. 320].

For the institute of accounting, a clear manifestation today is the use in practice of the software package “Technological Revolution 4.0”, which fully automates production, in which the management of all processes is carried out in real time and taking into account changing external conditions. Digital, electronic or IT-oriented structured version of financial reporting promotes accounting and ensures its development in accordance with the latest technologies of transmission and provision of information on the one hand and the growing volume, complexity and importance of financial information on the other.

Digital financial reporting is financial reporting using a structured computer-based form as opposed to the traditional paper financial reporting format, electronic versions of paper reports such as HTML, PDF, or as a readable text editor document. only by man [13].

Systems based on the XBRL standard (eXtensible Business Reporting Markup Language) are widespread in the world and are standardized representations of electronic business information selected by Ukraine. The advantages of using this system for the formation of financial statements are automaticity and speed, as well as consolidated reporting. The advantages of the system are also

the simplification of searching for financial reporting data on the Internet, data processing and analysis, more efficient regulatory process. The XBRL format is convenient for submitting mandatory reporting to regulatory authorities and for downloading reports on the websites of organizations.

The "taxonomy", which is expressed as a list of items and indicators of financial statements and its elements to be disclosed, as well as the relationships between them and other elements of the taxonomy, is also important for the construction of the new system. Pursuant to Article 1 of the Law of Ukraine "On Accounting and Financial Reporting in Ukraine", the Ministry of Finance of Ukraine adopted an order dated 07.12.2018 No. 983 "On approval of translation of taxonomy of financial statements according to international financial reporting standards", which comprehensively implements the approach to digitization of financial statements.

Digital financial reporting is recognized by both humans and machine processes. The essence is in the appropriate use of intelligent technologies and computer technology for the contextual content of financial statements, which has traditionally been considered the most complex, time-consuming and responsible area of work of a professional accountant. Digital financial reporting, available to its users through the electronic distribution of modern means of communication and the global electronic network the Internet at any time, anywhere. Such information does not require decoding, and regulators, financial and government agencies, business systems receive the same understanding of financial facts and the relationships between registered facts. The machine's perception of a digital financial report is ensured by the structured nature of the information presented in the electronic financial report, metadata explaining the business rules associated with the creation of a computerized financial report, and metadata that helps other users of financial statements, such as investors and analysts who use financial reporting information interact with these machine-readable documents to efficiently and successfully exchange values between businesses and processes.

Knowledge of the mechanism of the financial report and how to create a financial report is carefully expressed by people in a machine-readable form. This does not mean that all knowledge can be expressed; first of all, only objective knowledge that makes a computer program capable of reproducing the formalization of logical and mathematical operations described by a person. Subjective knowledge, such as the judgment of a professional accountant, can never be expressed in terms that are understandable to the technician.

Automation of financial statements can be achieved to the extent that data and metadata, as well as software algorithms allow. The advantage of digital financial reporting is the transfer to computer technology of routine mechanical tasks related to the preparation of financial statements. We are not talking about all tasks, but only those that can be effectively achieved through technology. This, in turn, changes the nature of the professional activity of an accountant, who is given an active role, which involves the possession of expert and consulting skills, requires high competence of the manager associated with the creation and verification of financial statements.

According to research by Spilnyk I., Palyukh M. "digital financial reporting frees both professional accountants who create these reports and financial analysts and regulators who use information from these reports from such tasks as assessing the quality of information on the merits and providing formal objective aspects, such as logical and mathematical consistency of the report, which will allow professional accountants and users to focus on professional judgments and other subjective aspects that can not be automated" [16, p. 117].

Research results

Thus, the operation of international enterprises in different countries, the volume of their market coverage, etc. require the computerization of tasks performed by people. This will also reduce the labor costs associated with the preparation of financial statements, eliminate human error, improve quality and reduce the risk of non-compliance, reduce the time to prepare financial report. It is expected that the digital reporting system will eliminate duplication when submitting information to different authorities for identical or similar forms of reporting, depending

on the requirements of regulators or regulatory authorities, as it provides for a single window for electronic reporting, which will be accessible to all supervisors. enterprise.

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DETERMINATION OF THE INFLUENCE OF THE ECONOMIC CYCLE STAGES ON THE INNOVATIVE POTENTIAL OF SMALL ENTREPRENEURSHIP

Annotation. The small business sector is studied. It is hypothesized that the small business sector has a significant innovative potential, the possibilities of which depend on the economic cycle of market conjuncture. It has been hypothesized that innovation investment in the small business sector depends significantly on economic cycles, and that the structure / directions of innovation investment are determined by the global market conjuncture.

This is done in order to interpret the systemic / unsystematic development of small business in the context of public policy on the basis of appropriate calculations and the obtained results, as well as provides an understanding of the possibilities of realizing the innovative potential of small business. The peculiarity of this study is its complementarity "innovative potential of small business – technology transfer – economic cycles".

It has been established that investment in innovation and technology transfer in the small business sector depend on market conjuncture and stages of the economic cycle that occur in a certain period (growth or recession). The identification of economic cycles allowed to form the directions of state regulation and reveal the possible risks associated with finding the innovative potential of small business.

The conducted research creates a basis for the implementation of the cluster policy program; contributes to the formation of appropriate tools for creating clusters; reveals favorable periods of labor involvement in the realization of innovation potential; helps to identify the periods of economic cycles in which it is appropriate to invest in their own self-education and modern technology. This approach will help increase the level of balance of the small business system on an innovative basis.

Key words: innovation potential, small business, transfer of technological solutions, investment of innovations, economic cycles, information systems.

Formulation of the problem

Small business is a type of activity that plays an important role in the socio-economic development of any other country. Its development demonstrates the entrepreneurs' abilities to adapt to the rapidly changing economic environment.

In the modern realities effective entrepreneurial activity is possible only under certain socio-economic conditions that will encourage citizens to conduct it. That is why the state should consider small business as a basis for social restructuring of society, which will be aimed at a socially oriented market economy. However, the state's insufficient attention to the creation of a favourable environment for the development of small business reduces the opportunities for the implementation of this type of activity at the level that is peculiar for economically developed countries.

The innovative potential of technologies is the possibility and prospects of investing innovations in the field of technology to strengthen the enterprise economic system. The potential for innovation by the small business is an indicator of the ability and readiness for the society transformation. Entrepreneur must not only have opportunities for improvement, but also be able to identify conditions as opportunities for innovation, be ready for their implementation. Despite the various components of the innovation potential of the small business, such as market, personnel, intellectual, technical and technological, it is necessary to single out information that reflects the degree of completeness and accuracy of information needed to make effective innovative decisions.

Thus, the peculiarity of this study will be the disclosure of complementarity "innovative potential of small business – technology transfer – economic cycles".

Purpose of the article is to identify the impact of the economic cycle of market conjuncture of the small business sector on its innovation potential, which will help solve such problems:

– to identify the main trends in the development of the small business sector to determine the relationship between the structure / directions of investment innovations and the global market conjuncture;

– to determine the significance of the impact of the stages of the economic cycle on the investment of innovations in the small business sector;

– to identify whether the small business sector has significant innovation potential, the size of which and the possibilities of using depend on the economic cycle of market conjuncture.

Analysis of recent research

In order to identify the parameters of the economic cycle of the small business system and assess the nature of its development, it is necessary to consider cyclicality as a form of economic activity from one cycle to another. As [1] noted, cyclicality is a form of evolution of economic activity. The source [1] states that cyclicity is a form of evolution of economic activity (activity).

Researching the opinions of scientists, we can argue about the genesis of cyclical activity, in which the law of the market prevails and each product creates it for itself and requires the involvement of appropriate resources to avoid economic imbalances. Cyclic activity is unstable and, according to [2] can both intensify and become depressed. [3–5]. Cyclic activity is unstable and may become more active or depressed [2]. Cyclical fluctuations occur in moments of economic crisis with a certain regularity [3] and cause a corresponding reaction of entrepreneurs, which depends on their experience, education, availability of innovative technologies and the reliability of the information obtained [4, 5]. The ability of entrepreneurs to make non-standard (risky) management decisions within the limits allowed by law is also important [6]. Risk management is based on management theory and practical experience of the manager as a single logical and intersectoral chain, which aims at the process of personnel management in relation to economic cycles [7, 8]. Namely, education and experience of staff contribute to reducing risks in the process of economic cycles [9].

In the state [10] noted, that problems of small business formation are connected with political and

legal regulation from the philosophical standpoint of postpositivism. Whereas in the article [11] are considered as a model that is based on economic analysis of political behavior. Scientists argue that political decisions are not always altruistic or ideological, and as a result, those who are less protected suffer more. Therefore, we can talk about the lack of protection of small businesses in relation to big ones.

The reason for such insecurity may be objective difficulties. Thus, in times of financial and economic crises, political and legal regulation should be aimed at making anti-crisis decisions to implement the mechanisms of antidepressant economic policy; however, they are adopted, as a rule, late [12]. In [13], the authors expand such research because the financial crisis poses not only threats but also new opportunities for the development of small businesses in the Czech Republic and Slovakia. Other authors [14] deepen this statement by emphasizing that new technologies and their improvements bring not only a wide range of opportunities but also threats. That is, in different countries there are not only similar problems of business development but also there is a problem of implementation of experience in the conditions of economic dissonance.

Economic dissonance is particularly perceptible in times of crisis and has diametrically opposite consequences (eg, unstable economic business environment, inefficient business decisions) to those that would be expected in a different economic context [15]. This statement is supported by other scientists [16] and deepened by corporate social responsibility, which also depends on economic cycles and is most noticeable at a time of rising unemployment, inflation, decline investment activity. The authors note that small businesses are particularly dependent on economic cycles due to the fact that their activities often do not have a system for building cooperation with stakeholders. In the article [17] the author also describes the factors that can have consequences for entrepreneurs and emphasizes the structure of the economy and human capital, drawing attention to their role in the economic development of the state. Therefore, small business is becoming increasingly important in the economic development of the state [18] and, as noted in the article [19] they can be considered the main engine of economic growth because contribute to employment and changes in GDP (gross domestic product) by creating an intense competitive environment that requires strategic planning in a turbulent economic environment [20].

Researchers did not ignore the issue of financing economic activities taking into account economic cycles. [21] and [22] In the other researches [21, 22] the scientists reveal the impact of credit risk and its relationship with different groups of entrepreneurs depending on their size, period of existence and offer the development of internal rating systems with significant equity savings. Whereas other researchers [23, 24] consider the critical problem of entrepreneurial financing is the lack of long-term policy planning tools.

The changes that occur at the peak of economic cycles as potential benefits for achieving economic balance through the creation of non-standard strategies and values with significant benefits for both small businesses and society [25]. An option to overcome the relevant difficulties may be the realization of innovation potential, which is expressed by the degree of implementation of innovative projects [26]. This approach is used in articles [27, 28]. The authors argue that the transfer of technologies and their commercialization, as well as the cooperation of business representatives with scientists and representatives of big business play a special role in the realization of the potential of small business representatives.

Methodology of research

The bibliographic method was used for the analysis of literary sources. The application of analysis and synthesis of actual material, the combination of induction and deduction in the study of deep processes of the domestic business system formed the basis for identifying the problem

of reducing business activity. The index method was used in the calculation of base indices. The use of empirical methods, such as measurement, comparison and description allowed identifying empirical rules of structural change in the field of entrepreneurship. Regression analysis, cluster analysis and graphical method were used for situational analysis. The graphical method is used to visualize the levels of operational and economic activities of enterprises.

The main results of the research

Applying method of analysis and synthesis, monographic method, index method, economic-mathematical modelling, cluster and regression analysis, graphical method will create an opportunity achieving the purpose of the article. The identification of the economic cycle stages of small business development will based on the results of cluster analysis using the statistical package SPSS 21.0 (USA).

In the process of this research, we will understand whether small businesses are able to respond to changes quickly in the external environment in conditions of limited access to financial resources, as well as determine the systemic/non-systematic development of small business. Identifying the presence of entropy will further generate recommendations for small business development. The parameters for identifying the economic cycle and assessing the systematic development of small business are the profitability of operating activities, the number of business entities, the number of employees, the volume of sales for 2010–2018.

Identifying the presence of entropy will further generate recommendations for small business development.

The activity of small business is based on scientific principles of interaction between the state and the market at the micro level, where the determinants of market organization of small business include freedom of action, possible risks, innovation and market efficiency to make a profit and meet entrepreneur's social and personal needs. While the determinants of public economic management includes economic orderliness, stability of decisions, social justice and economic growth.

It should be noted that the development of small business is influenced by a number of factors arising from the negative dynamics of key macroeconomic indicators. For example, a decline in GDP caused the reduction of working capital of small businesses. While due to the reduction of real incomes of the population there was a sharp decline in their purchasing power and a change in purchasing behavior, the period of use of purchased goods became longer, there was a reduction in domestic demand, etc. Under such conditions, large market players apply marketing measures, such as seasonal discounts, and, as a result, become monopolists of certain market segments. Such actions do not only have negative consequences for small businesses but also negatively affect their investment activity. The investment activity itself can be intensified by obtaining loans, however, limited access of small businesses to loan sources due to high lending rates, which are 24–36 % annually, cause a crisis of liquidity and defaults.

Despite the growing trend in the development of the small business sector, i.e. the number of newly registered entities, the level of profitability of operating and economic activities of these enterprises indicates the presence of a medium-term economic cycle covering the period from 2010 to 2018 (Fig. 1, 2).

All four types of enterprises showed a minimum level of operating activity in 2014 (entities of microbusiness – –30.1%; small – –7.9; medium-sized – –3.6; big – 0.7) and reached a maximum in 2017 medium-sized –7.3; big –11.2) and 2018 (microenterprises –4.7%; small –8.3) during the research period.

Two types of enterprises showed a minimum level of profitability of economic activity in 2014 (micro-entrepreneurs – –40.2%; small – –26.5) and reached a maximum in 2018 (micro-enterprises – –1.8 %; small – 2.7) during the study period. The highest inflation index change was in 2014 – 23.9, the lowest level of real wage growth was in 2015 – 79.8.

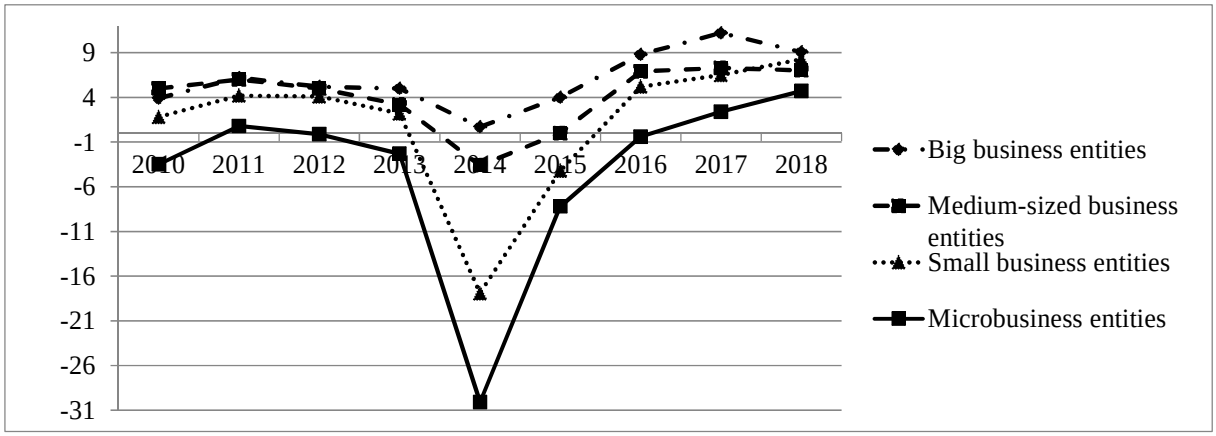


Fig. 1. The profitability level of operating activities of economic entities, %

Note: own research based on the materials of the State Statistics Service of Ukraine

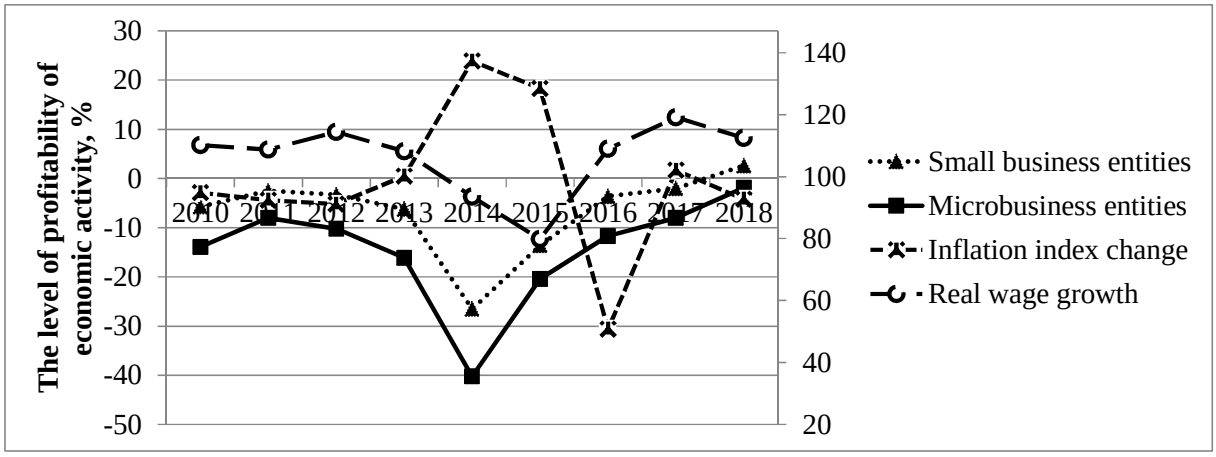


Fig. 2. The level of profitability of economic activity, %

Note: own research based on the materials of the State Statistics Service of Ukraine

Researching economic cycles that slow down or accelerate economic development, scientists have put forward various ideas about the nature of their origin, which has a history of more than 200 years and is associated with the first industrial crisis in England (1825), USA (1836 and 1841), in France and Germany (1847). Scientists have put forward various ideas about the nature of their origin.

Some scientists considered economic cycles due to three levels with different durations (55 years, 10 years, 3 years, 4 months), which depend on technological innovation and institutional changes. That is they are a process creative destruction [29].

Therefore, the movement that occurs in the process of change is cyclical and involves recovery, recession, depression, recovery [30]. At the same time, there is an opinion that economic cycles are introduction (technological time), aggressive investment (financial time), synergy (production time), maturity (self-satisfaction time) [31]. Or uses the division: expansion, boom, recession, depression. As we see, scientists have different approaches to economic cycles, but everyone recognizes them. However, insufficient research has been conducted on the impact of economic cycles on small business development [32].

Typically, the economic cycle is divided into five stages or phases. The economy reaches the first phase shortly before the economic problems

begin and the growth curve has a downward trajectory. For all four groups of enterprises and individual person-entrepreneurs, this phase covered the years 2010–2011.

The second stage is a decline in the activity of economic entities, characterized by a decrease in real household incomes, loss of public confidence in the banking sector, an increase in the number of enterprises with liquidity problems and financial stability. In the research, the second stage covered 2011–2013. Chain indices of some indicators of economic entities in the table 1 indicate that the second phase primarily affected big and medium-sized enterprises. It has led to a reduction in their economic activity while increasing the number of small enterprises characterized by greater mobility and flexibility in conditions of unstable market conjuncture.

Table 1

Chain indices of some economic entities indicators *

Amount	Years	big business entities	medium-sized business entities	small business entities	microbusiness share
Enterprises and individual persons-entrepreneurs	2010	x	x	x	x
	2011	1.125	0.987	0.777	0.768
	2012	1.059	0.976	0.940	0.939
	2013	0.944	0.935	1.078	1.084
	2014	0.754	0.865	1.125	1.136
	2015	0.851	0.933	1.023	1.027
	2016	0.905	0.974	0.945	0.942
	2017	1.042	1.009	0.967	0.965
	2018	1.118	1.080	1.019	1.016
Employees in enterprises and individual persons-entrepreneurs (thousand people)	2010	x	x	x	x
	2011	1.020	0.959	0.896	0.856
	2012	1.014	0.974	0.965	0.941
	2013	0.960	0.958	1.001	1.022
	2014	0.803	0.906	0.959	1.021
	2015	0.892	0.952	0.933	0.967
	2016	0.929	1.007	1.009	0.978
	2017	0.984	0.990	1.022	1.021
	2018	1.009	1.061	1.055	1.055
Employees in enterprises and individual persons-entrepreneurs by their size and type of economic activity	2010	x	x	x	x
	2011	1.020	0.959	1.001	1.005
	2012	1.014	0.973	0.972	0.934
	2013	0.960	0.958	0.964	0.975
	2014	0.803	0.906	0.851	0.846
	2015	0.892	0.952	0.867	0.884
	2016	0.929	1.007	1.061	1.031
	2017	0.984	0.990	1.075	1.120
	2018	1.009	1.061	1.088	1.115

** Note: own calculations based on the materials of the State Statistics Service of Ukraine*

The analysis of three indicators (number of enterprises; number of employees and hired workers) of chain indices shows the presence of feedback between big and medium-sized enterprises on the one hand and small ones on the other. Medium-sized and small enterprises responded

to the deteriorating economic conditions of doing business in 2011, and big ones – since 2013.

As for small enterprises, during this period most citizens were registered as individual persons-entrepreneurs without hiring employees. Instead, the Cabinet of Ministers of Ukraine during this period did not take effective decisions to simplify the registration procedure and taxation for small enterprises and individual persons-entrepreneurs.

The World Bank's Rating Doing Business [33] assesses the business climate through the prism of indices of such business parts as starting a business, working with building permits, property registration, investor protection, taxes and other. According to the Rating, for an example, Ukraine in 2012 year took 152nd place out of 183. However, in 2019 this figure was 71st among 190 countries. This change became possible due to significant changes in such categories as "international trade" and "fulfilment of contractual commitments" as a result of relevant government decisions.

The third phase is the "lowest drop point". Without a doubt, we can say that Ukraine's economy performed the worst in 2014. The range of reasons, taking into account military, political, economic, social, demographic factors, is quite wide, but their consideration and analysis are not the subject of this article.

The fourth phase occurs when the contraction of the economy stops and the trajectory takes an upward direction. For the studied groups of enterprises and individual persons-entrepreneurs, this phase covered the years of 2015–2016. This is evidenced by the profitability of operating activities, chain indices of the number of entities, and employees.

The fifth stage is the "phase of economic recovery" (2017–2018). Operating index exceeds the previous maximum (in 2011) in all four groups of entities. The increase and expansion of production lead to an increase in the purchase of raw materials and hiring additional workers. One of the options for models of economic system development is the implementation of cluster policy. Depending on the development goals, there are four variants of cluster policy models that are formed at different levels of the economy, namely the model of national preferences, regional development, support for small and medium-sized businesses, establishing links between science and industry [34]. Significant domestic intellectual potential generates interest in the last two models mentioned above. The implementation of these models is aimed at creating a system of institutions that manage knowledge transfer, establishing links between science, industry, finance, services sector, public organizations, etc. To support small and medium-sized businesses, the main measures are to strengthen the interaction between knowledge sources for studying and compensation for the lack of innovative opportunities. The creation of a "critical mass" in emerging technologies, through the involvement of scientific potential, investors, and enterprises are characteristics of the fourth model.

The results of cluster analysis with the help of software statistical package SPSS 21.0 (USA). Two variables were used to build the cluster model: the number of employees in enterprises and at individual persons-entrepreneurs (thousands of people) and their volume of sold products (goods, services) (million UAH).

The Chebyshev distance was chosen as the method of determining the distances between the clusters, because the studied observations are "different" largely by one indicator, namely the volume of sold products (Table 2).

Within the cluster analysis, the Chebyshev distance was used to determine the distance between the objects of the population, which is calculated as the maximum difference modulus of the components of numerical vectors formula (1).

$$l_{¥}\left(x,y\right)=\max_{i=1,¼n}\left|x_i - y_i\right|. \quad (1)$$

The application of Ward's method involves the use of analysis of variance to estimate the distances between clusters, when the sum of squares (SS) is minimized for two hypothetical clusters that can be formed at each step of the clustering process. This method is considered effective and forms small clusters, which correlates with the subject of our study and the time interval that is analyzed.

Table 2

Proximity matrix

Years	The Chebyshev distance								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
2010	0.000	1.497	1.951	1.933	2.443	3.244	3.149	2.904	2.788
2011	1.497	0.000	0.454	0.437	0.947	1.748	1.652	2.045	2.742
2012	1.951	0.454	0.000	0.028	0.492	1.294	1.198	1.869	2.566
2013	1.933	0.437	0.028	0.000	0.510	1.311	1.215	1.841	2.538
2014	2.443	0.947	0.492	0.510	0.000	0.801	1.089	1.764	2.460
2015	3.244	1.748	1.294	1.311	0.801	0.000	0.541	1.216	1.912
2016	3.149	1.652	1.198	1.215	1.089	0.541	0.000	0.675	1.372
2017	2.904	2.045	1.869	1.841	1.764	1.216	0.675	0.000	0.697
2018	2.788	2.742	2.566	2.538	2.4600	1.912	1.372	0.697	0.000

Note: own calculations

The proximity matrix allows identifying the similarity (according to certain variables) of such observation periods as 2011–2013, 2015–2016 and 2017–2018. The analysis of the Chebyshev distance in terms of sales volume and number of employees confirms the previously conclusion made that the economic downturn in 2014 was a logical result of the business sector development over the past three years.

Since the number of observations is not significant, the hierarchical Ward's clustering method was used (Fig. 3), which generated identical results.

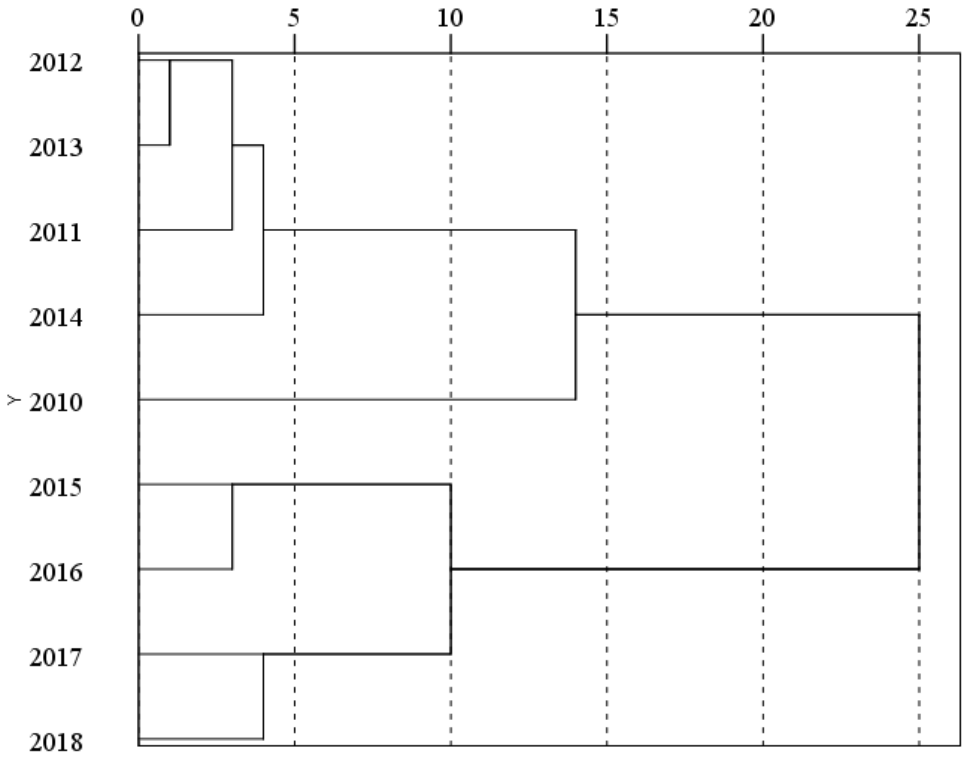


Fig. 3. Dendrogram using the Ward's method

Note: own research

The first cluster includes the observations of 2010, the second – 2011, 2012 and 2013, the third – 2014, the fourth – 2015–2016, the observations of 2017–2018 formed a separate fifth cluster.

Cluster models are designed for big, medium-sized, small and microenterprises. The results of cluster analysis are presented only based on data on small enterprises, as the models of the other three groups are similar.

Econometric trend models (polynomial function) of the number of small enterprises and the volume of sales of goods (formula (1)) have been developed. When constructing the model, the values of the correlation coefficients (r_{xy}) and the coefficient of determination (R^2) formulas (2), (3) were analyzed.

$$Y = a_0 + a_1 x_1 + a_2 x^2 + ... + a_n x^n + u, \qquad (1)$$

$$r_{xy} = \frac{\frac{1}{n}\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}\sqrt{\frac{\sum (y_i - \bar{y})^2}{n}}} = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}, \qquad (2)$$

$$R^2 = \frac{\sum (\hat{y}_i - \bar{y})^2}{\sum (y_i - \bar{y})^2}. \qquad (3)$$

Peculiarities of the economic cycle of 2010–2018 in terms of business implementation could cause such following negative phenomena in the socio-economic development of Ukraine. Such processes are emigration, increase of the shadow sector of the economy, the growth of social benefits, reduction of the share of consumer loans, which led to accumulation of inventories in supply chains (Fig. 4).

The polynomial function of the fourth and second degree describes the trend in the number of enterprises and the volume of sold products, respectively. The high values of the coefficients of determination of 0.9796 and 0.9914 indicate a significant determination of the variation of the dependent variable from the variation of the independent ones.

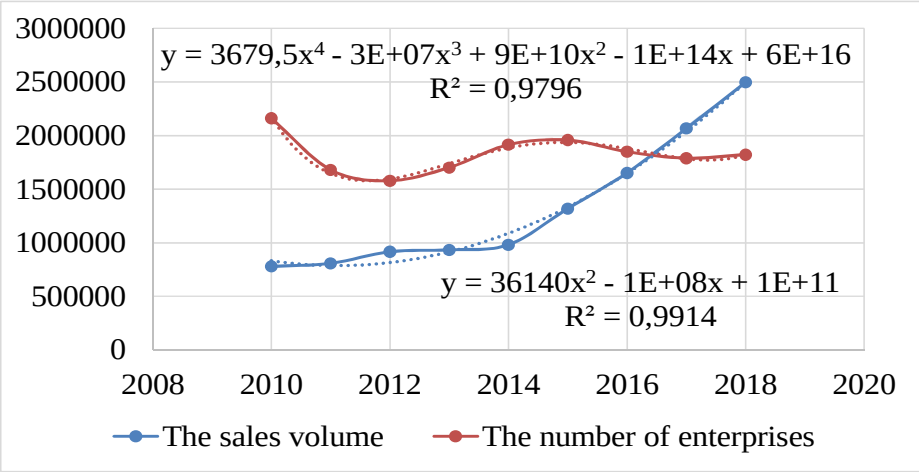


Fig. 4. Comparison of the dynamics of macroeconomic indicators of small enterprises

Note: own research based on the materials of the State Statistics Service of Ukraine

The subject of system analysis is a variety of characteristics of the system, such as composition, structure, organization, operation and development of the system. Instead, the study of the system position in the environment has a significant interest in terms of determining the economic cycle (in our case, the subsystems of small business among other components of the business system). The basis for effective transformations and / or improvements in accordance with the phases of the economic cycle is ensuring the stabilization, balance of the business system. Creating a flexible interaction of the small business subsystem and the environment, which will better adapt to market changes.

To determine the relationship between the development of different types of businesses, we calculated the correlation coefficients formula (1) (Table 3).

Table 3

Correlation coefficients between small and other enterprises

Indicator	Big entities	Medium-sized entities
№ 1. Number of business entities	–0.444008665	–0.14987056
Chain indices of the indicator No. 1	–0.82538211	–0.759233828
№ 2. Number of employees	0.790719586	0.929220324
Chain indices of the indicator No.2	–0.029185047	0.48682695
№ 3. Staff costs	0.967490965	0.966085817
Chain indices of the indicator No. 3	0.980101181	0.993622089
№ 4. Volume of sold products	0.976959972	0.994816109
Chain indices of the indicator No. 4	0.449585043	0.873060997
№ 5. The level of profitability of operating activities	0.928826227	0.861177773

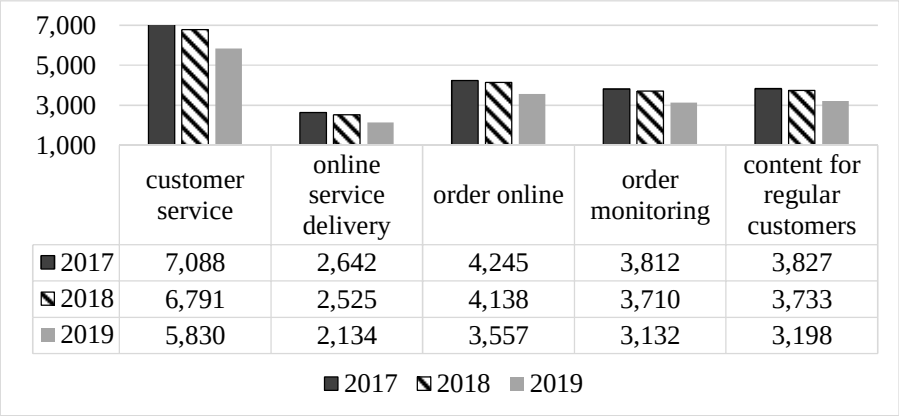
Note: own calculations

Interpretation of these indicators suggests the existence of disparities in the development of entities of small, and big and medium-sized businesses. The disproportion appears in as a strong inverse relationship between the growth rate of the number of enterprises. And, conversely, direct in terms of personnel costs and sales. The reasons for this phenomenon may be the difficulty in obtaining permits and approvals, the weak level of protection of property rights and a significant tax burden for small businesses.

Potential sources of innovation in the small business sector can be information technology and the development of strengths, especially in times of economic growth (will be a factor in safeguarding the negative effects of the economic downturn). In the process of implementing an information system, the company must not only get a corporate system (ERP, MRP), but also have professionally trained employees who are able to use it independently. The introduction of ERP-system is always accompanied by a certain optimization of both the organizational and staffing structure of the enterprise and the processes of its activities. The main criterion for the need of changes should be considered their feasibility in terms of ensuring the effectiveness of the management process of the enterprise as a whole.

In the market of management information systems there is a significant offer of software such as SaaS (software as a service) (USA) for small businesses, which is implemented in a cloud environment. When using such a model, the service and the interface (intended for the user or the program) are obtained without reference to the method of its implementation. The use of such types of RM-systems is widespread in Ukraine as CRM (customer relationship management) and HRM (human resource management). The supply function for small businesses has not yet become strategic in business, so far there is a demand for SRM-systems only from big entities. In developed countries, such as the USA, Germany, Great Britain, such technology transfer has already taken place (if we talk only about RM-systems): large ones used CRM, small ones did not use complex MIS (management information systems) due to high cost, inability to apply or lack of such need. Technological change is related not only to the specialized technology sector. It is related to all economic entities and requires not only private investment, but also public [35]. The next stage was the emergence of a proposal for customer interaction systems for the small business sector using the cloud environment, and the trend in the information technology market was the using of big entities SRM-systems (USA). The third stage (but not the last one) is the possibility of using SRM by small businesses (affordability is evidenced by the cost of using, such as the cost of using one module, such as sales, purchases, of Odoo Enterprise is 6 euros per month). In this case, it is necessary to mention the technological convergence, which requires constant monitoring and spatial measurement of applied innovation processes [36].

The using of information technology can be fragmentary (one or more functions) and systemic. Fig. 5 shows the ratio of the number of companies that have websites with a certain set of functions for working with customers on the one hand and companies that have implemented and those, which use a customer relationship management system on the other hand.



	customer service	online service delivery	order online	order monitoring	content for regular customers
2017	7,088	2,642	4,245	3,812	3,827
2018	6,791	2,525	4,138	3,710	3,733
2019	5,830	2,134	3,557	3,132	3,198

Fig. 5. The ratio of the number of companies that use the website to work with customers to the number of those who use the CRM-system

Note: own research based on the materials of the State Statistics Service of Ukraine

The positive changes in technology transfer are the reduction in the number of entities that use customer service functions separately, manage orders through their own sites, rather than those that implement information systems to work with customers. That is, the number of business entities implementing the management system, rather than its individual elements, is growing. This testifies to the significant innovative potential of small business, as each company tries every year to approach more and more comprehensively and systematically to the management of their business processes, in this case to the organization of work with clients.

During 2013–2019 (except 2015) value added by production costs as a percentage of the total number of different types of enterprises of small and micro enterprises increases. The trend may indicate a decrease in the efficiency of cost management, as well as increasing the role of such entities in the supply chain [28].

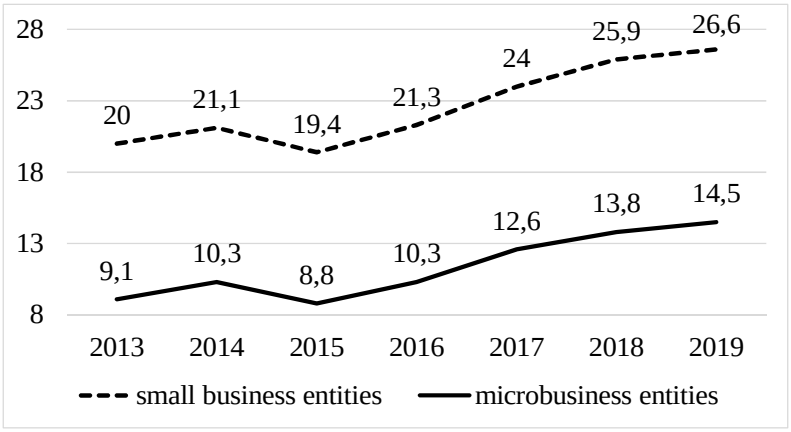


Fig. 6. Value added at production costs to the total of all types of enterprises, %

Note: own research based on the materials of the State Statistics Service of Ukraine

The dynamics of socio-economic development of the small business sector of the economy, the growth of its weight in supply chains, the use of information systems in economic activity – these

are signs that may indicate a susceptibility to the transfer of digital technologies of this type of enterprise.

One of the areas of state balancing stagnation and innovation opportunities is to simplify and expand access to management information systems. For the small business sector that is ERP (enterprise resource planning), modules for marketing: CRM (customer relationship management), PLM (product lifecycle management), SPM (sales performance management). Modules for logistics are SRM (supplier relationship management), WMS (warehouse management system), TMS (transport management system), SCM (supply chain management), FRP (financial resource planning). Except for the first, all others can be both separate information systems and ERP-system modules.

Limited access to financial resources, high vulnerability to adverse economic factors such as inflation, tax pressure, political cyclicality, etc., big business pressure, administrative barriers, lack of effective state support affect the low activity of small business and its instability. The hypothesis of the existence of a medium-term economic cycle of small business is confirmed by the results of cluster analysis using two variables (number of employees and sales). Another result of such a research is the possibility of applying the hierarchical Ward's clustering method with the calculation of the Chebyshev distance to identify stages of small business development.

After analyzing the level of profitability of economic entities operating activities and the level of profitability of economic activity, the existence of an economic cycle was established. As practice has shown, there is a high probability that the phases of the economic cycle of small business are synchronous with the phases of the national economy and create a basis for the development of strategies that take into account asynchronous phenomena. That is, small businesses are interested in acting responsibly and promoting a progressive environment. The calculation of the chain index of some indicators of economic entities showed that in the period 2010–2018, small businesses were created without the involvement of employees.

Thus, we can conclude that there is a somewhat paradoxical relationship: in a period of economic downturn, the attractiveness and need for innovation increases, and investment opportunities decrease, in a period of growth – vice versa. Given this, the role of the state is important for balancing economic development and investment in innovation.

Such conclusions can be considered appropriate from a practical point of view, because they allow a reasonable approach to the formation of state policy on socio-economic development of the small business sector. From a theoretical point of view, the obtained conclusions allow us to aver the possibility of identifying the stages of the economic cycle through the using of cluster analysis in combination with the index method. However, it should be noted that the results of determining the stages of the cycle indicate the ambiguous impact of technology transfer of economic entities in different sectors of the economy. Such uncertainty imposes certain restrictions on the using of the obtained results, which can be interpreted as shortcomings of this research. The inability to remove such restrictions in this research raises a potentially interesting area for further research. Future research may focus on identifying the readiness of small businesses to innovate and on the appropriate actions of public authorities to support such a process.

Conclusions

1. The small business sector is an important part of the socio-economic system of Ukraine as due to its own flexibility it is able to respond to changes quickly in the external environment. Creation of sufficient number of jobs deals with the negative effects of structural and frictional unemployment. Indicators of increasing the use of information systems indicate significant innovation potential of small business, rather than their separate functions (Pic. 5) and the growth of value added in the supply chain (Pic. 6).

2. Investing innovations in the small business sector significantly depends on the cycle: during the downturn, business opportunities reduce, so the influence of the state should increase through budget incentives, budget financing, at the stage of growth on the contrary – a growing source of financing innovation in small business from big business. Based on the obtained information, an econometric

trend model (polynomial function) was developed, due to which the values of the correlation coefficient (r_{xy}) and the determination coefficient (R^2) were analyzed. Interpretation of the obtained calculations indicates a disproportion in the development of small business compared to big and medium-sized ones. Such data testifies to the unsystematic development of small business and its non-priority in the state policy of the country.

3. The structure / directions of investment innovations in the small business sector are determined by the global market situation: in the period of economic growth, the emphasis is on sales, thus the stimulation of technological innovation decreases, in the period of economic downturn, stagnation – the emphasis shifts to cost–, material–, energy-saving innovations, which leads to interest in technology transfer.

The identification of the economic cycle and the research of the balance in small business subsystem of the whole business system allowed forming the directions of state regulation and deregulation in this area by:

– creation of favourable conditions for attracting labour in the industry, which should be "grown" (information technology, agriculture, gas-extraction, transport);

– implementation of the state program of cluster policy in Ukraine;

– information (methodological, consulting), financial (although a system of incentives, rather than direct funding should be the priority) assistance and the formation of tax instruments to assist in the formation of clusters, both intra-regional and regional;

– lending to small businesses to take educational express courses in the direction of implementing innovative approaches to business development and using in practice of management information systems. Higher education institutions would provide such courses.

Further research is planned to model a possible scenario for improving the situation of the small business subsystem as a factor in improving the balance level of the domestic business system using innovative approaches and modern technologies.

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VULNERABILITY OF VIRTUAL ASSETS TO ILLICIT FINANCIAL FLOWS

Abstract. Over the last few years, virtual assets have become more widespread in the market, which has manifested itself both in the growth of transactions with them and in the rapid growth of the capitalization of the cryptocurrency market. The international community and individual governments have introduced regulations for the virtual asset market, but the degree of transparency remains low. This poses risks of using virtual assets as a tool for various schemes of money laundering or terrorist financing. The purpose of the article is to identify potential vulnerabilities of virtual currencies to the impact of shadow cash flows, as well as to assess existing approaches to regulating their circulation and prevent the use of these assets for money laundering purposes. The article highlights the standards developed in world practice for determining the legal status of virtual currencies and their state regulation, assesses the process of introducing regulation of the circulation of virtual assets in Ukraine. Imperfect regulation and insufficient experience in market monitoring lead to the vulnerability of virtual assets to their use in the movement of illicit cash flows, in particular in the schemes of money laundering. The authors identified some other vulnerabilities in virtual currencies, including the possibility of their use for financial fraud, tax evasion, instability of virtual currencies, limited control over their circulation, as well as the low level of protection of the rights of market participants. Overcoming these vulnerabilities requires a combination of public and private sector efforts, which should be aimed at creating safeguards for criminal capital to enter the virtual asset market, as well as to ensure market transparency and protect the interests of participants from potential losses and possible fraud. The virtual asset market is an innovative and promising segment of the financial market, so we consider the important task of its effective regulation to stimulate legal transactions and clearly separate them from illegal transactions.

Key words: virtual assets, virtual currencies, cryptocurrency, risks, vulnerability, illicit financial flows, regulation, financial market.

Introduction

In the 21st century, we may observe the rapid development of innovative technologies, which has an impact on the economic and financial systems of different countries. One of the financial innovations is the emergence of virtual digital currency. At the present moment, there is no exact definition of virtual currency and its functions. Moreover, in some countries, there is no legal regulation or determination of the legal status of virtual currencies. Because virtual currencies can be used to legalize (launder) proceeds of crime, terrorist financing, and tax evasion, the Financial Action Task Force (FATF) warns of a threat to national security. Recommendation 15 highlights, that financial institutions have to identify and evaluate the money laundering or terrorist financing risks. Those risks may emerge due to the

evolution of financial products and business practices, in particular those that provide the newest methods of distribution, and the application of new technologies for both existing and promising products and services. Therefore, virtual asset service providers should be regulated for anti-money laundering and counter-terrorist financing matters, which require licensing and registration, as well as the implementation of effective monitoring and compliance systems [FATF, 2020]. These requirements of the FATF were considered in the process of adoption of the new Law of Ukraine "On Prevention and Counteraction to Legalization (Laundering) of Proceeds from Crime, Financing of Terrorism and Financing of the Proliferation of Weapons of Mass Destruction", which entered into force in April 2020 [Verkhovna Rada of Ukraine, 2019]. However, at present, the requirements of this law cannot be fully met, as there is no basic law defining the status of virtual assets and the status of service providers related to the circulation of virtual assets. This situation determines the semi-shadow functioning of the market, which may result in a violation of FATF requirements and Ukraine's blacklisting of this organization.

Given the intense increase of illicit cash flows nowadays due to the high level of shadow economy and corruption, the probability of virtual assets use in these financial flows circulation can be assessed as extremely high. Therefore, there is a need to evaluate the vulnerability of virtual assets to money laundering/terrorist financing risks.

Literature review

The lack of the regulatory focus of theoretical and empirical research on cryptocurrencies has been highlighted in the early foundational papers in the field [Dwyer, 2015]. Recent systematic analyses of cryptocurrency-related academic sources still concede that the existing literature, particularly on regulatory issues, is rather limited, inconclusive, and immature [Corbet et al., 2019].

To discuss the impact of regulation on cryptocurrency value one should understand to which extent government action can influence the blockchain payment systems in the first place. As cryptocurrencies implement various security solutions to make transaction tracking and the association between physical, legal, and digital persons prohibitively hard, the question of whether state regulation can if desired so, effectively restrain blockchain payment systems is a valid and a non-trivial topic to investigate. It is also a relevant issue given the fact that while regulation is a predominantly national matter, cryptocurrencies are necessarily exterritorial [Auer and Claessens, 2018]. Besides, the balance between law and regulation of the cryptocurrency market is also important to keep up with the staggering worldwide growth in the usage of virtual currencies [Trautman, 2018].

Theoretical approaches to defining the essence of virtual currency and analysis of illicit flows into digital currency services have been described by Fanusie & Robinson [Fanusie & Robinson, 2018]. There is plenty of research concerning the role of virtual currencies in the modern payment system. Virtual currencies are considered as different from traditional currencies and electronic money, and main innovations related to the development of virtual currency are interconnected with two key aspects: the asset-aspect and payment-aspect [Kochergin, 2017]. To understand how virtual assets could be used in the informal economy it is necessary to investigate links between technology and illicit financial flows [Tropina, 2016].

The determinants of implementation of the efficient regulation approach to the cryptocurrencies' transactions and the ways of legislative base formation in Ukraine are described in the authors' earlier papers [Rysin, 2018].

The purpose of the article

The main purposes are to identify potential vulnerabilities of virtual currencies to shadow cash flows, as well as to assess existing approaches to regulating their circulation and preventing the use of these assets for money laundering purposes. The objectives of the article are to determine the impact of illicit financial flows on the virtual assets market, compare the approaches to state regulation of virtual currencies, and find the prevention mechanisms to the penetration of criminal proceeds into the virtual assets market.

Results

The world economy is developing rapidly, there is a transformation of its key principles of operation, as well as objective laws of development, which in turn transforms it into a qualitatively new type of economy based on innovation, intellectual property, information, knowledge, and digitalization of society. In terms of the technological method of making payments, digital currencies are convenient and cheap. That is why today millions of people around the world use virtual currencies as a means of payment, which serves as an additional incentive for the development of payment systems. At present, there are two points of view in the financial system regarding this innovation. On the one hand, virtual currencies will promote the development of payment systems, and on the other hand – their use may pose risks of illegal transactions, terrorist financing in the hands of criminal elements, which seek to evade regulatory control and sanctions. This issue requires clarification of possible risks of virtual assets using in illicit schemes.

Legal regulation of transactions with virtual currencies in EU law is seen as the implementation of a policy to combat money laundering. In June of 2018, the European Parliament and Council published an updated version of the anti-money laundering directive, known as AMLD5 [European Parliament, 2018]. Due to the new requirements, all cryptocurrency exchanges and wallet keepers in Europe have to introduce a relevant know-your-customer (KYC) policy. In addition, these institutions must be registered with local regulators, they are obliged to oversee all the transactions and to report suspicious activity to the relevant bodies. Moreover, national authorities, involving tax collectors, will have a right to require information from the crypto exchanges about users and their transactions [Acheson, 2019]. At the same time, a detailed analysis of the provisions of the AMLD5 shows that they do not cover the activities of a significant proportion of key players in the crypto market, leaving weak points in the combat against money laundering, terrorist financing, and tax evasion. such institutions should include crypto miners, coin offerors, exchanges that are not custodian wallet providers, hardware and software wallet providers, trading platforms, etc. In general, EU member states implement legal regulation of cryptocurrency business by introducing AMLD5 norms.

Ukraine nowadays belongs to the countries with a large number of virtual currency users. Therefore, the issue of regulating transactions with virtual assets for our country is extremely relevant. Without proper regulation, those assets risk becoming a virtual haven for the financial transactions of criminals and terrorists.

In Ukraine, the determination of the legal status of virtual currencies, as well as the taxation of transactions with them have repeatedly tried to settle. Some bills did not receive the support of the parliament, finally, in December 2020 the Parliament adopted in the first reading the Law “On Virtual Assets” [The Ministry of Digital Transformation of Ukraine, 2020]. It should be noted that it contains a number of fairly progressive provisions regarding the identification and separation of pure cryptocurrency from that involved in money laundering or terrorist financing operations. In addition, there are prerequisites for the legal protection of users of virtual assets and market participants, which will reduce the risks for business in the field of cryptocurrency, in particular, to protect it from fraud and pressure from law enforcement agencies. In our opinion, the creation of a proper regulatory environment and transparent rules of the game in the market of virtual assets is a prerequisite for attracting investment and stable operation of financial institutions. Establishing rules for the taxation of transactions with cryptocurrencies will create opportunities for the legalization of capital currently circulating in the market, and will be an important factor in the development of one of the most innovative segments of the financial market.

The active distribution of virtual assets necessitates the study of their impact on economic processes. This impact has both positive and negative aspects. The advantages are the speed of transactions, low costs, technical security, anonymity, as well as the ability to make cross-border transfers. At the same time, due to imperfect regulation and insufficient experience in market monitoring, it is necessary to state the vulnerabilities of virtual assets to their use in the movement of

shadow cash flows, in particular in criminal money laundering schemes.

Overall, virtual assets can be used by criminal structures to remove dirty money from its source. An approximate scheme of such operations is shown in Fig. 1.

Assessing the specifics of the use of virtual assets in money laundering schemes, it should be noted that such tools currently generate several risks for the national anti-money laundering and anti-terrorist financing system, as well as for many financial market participants. Understanding the nature of such risks and identifying the vulnerabilities of virtual assets is an important prerequisite for the application of regulations and the creation of transparent and clear rules of the market. Altogether, the vulnerabilities of virtual assets are related to the possibility of their use for financial fraud, money laundering, tax evasion. Simultaneously, attention should be paid to the instability of virtual currencies, limited control over their circulation, as well as the low level of protection of the rights of market participants (Fig. 2).

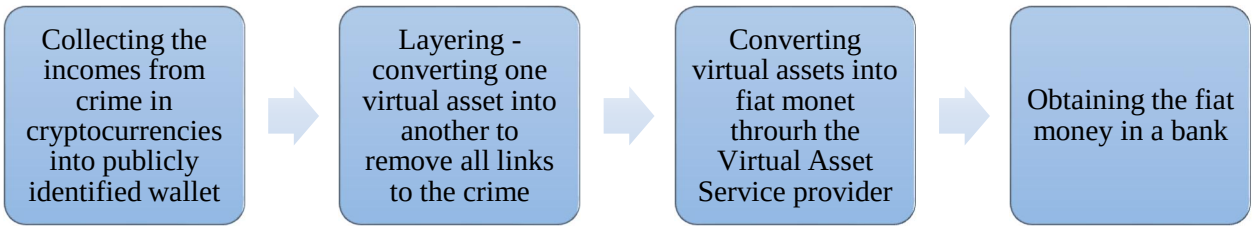

Fig. 1. Scheme of using virtual assets in money laundering operations

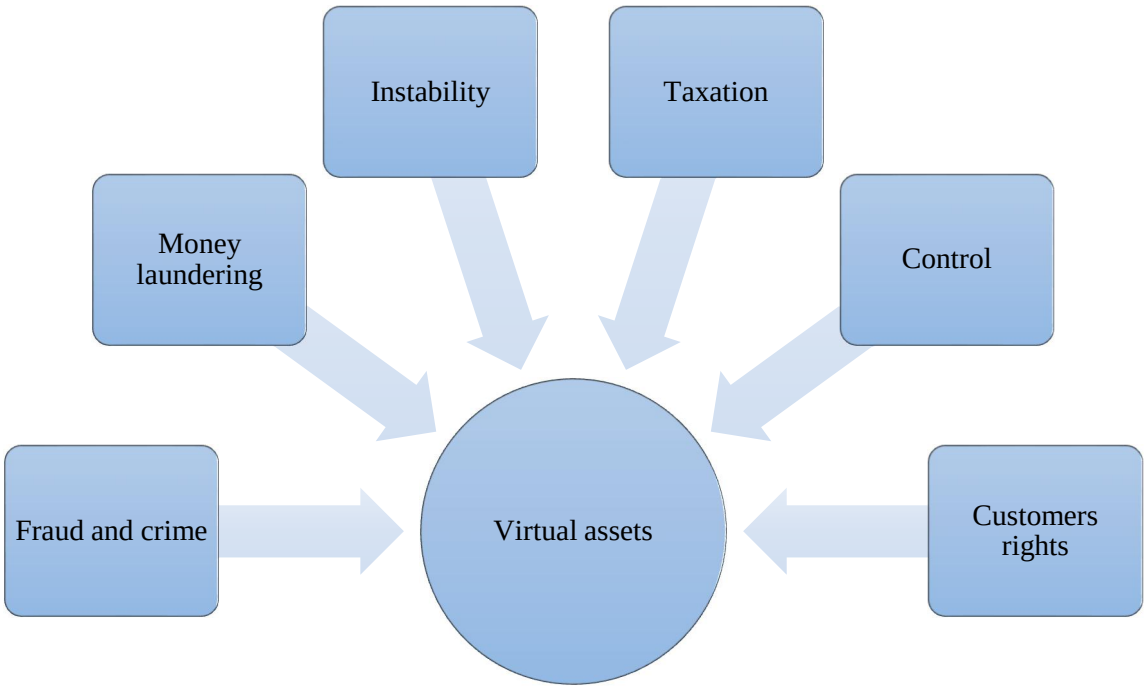

Fig. 2. The vulnerability of virtual assets

The risks of fraud and cybercrime are key to virtual currencies. Due to their specifics, the probability of using cryptocurrencies for fraudulent schemes or creating financial pyramids is quite high. In the context of cybercrime, virtual currencies have become one of the most popular tools for hackers to use to anonymously receive payments and make payments. For example, in 2017 the “Wannacry” ransomware attack held thousands of computer systems hostage until the victims paid

hackers a ransom in bitcoin. The cost of the attack went far beyond the ransom payments, it resulted in an estimated USD 8 billion in damages to hospitals, banks and businesses across the world [FATF, 2021].

The issue of money laundering and terrorist financing has traditionally been associated with the expansion of the scope of virtual assets. Virtual currencies, having an anonymous and cross-border nature, can be used to conceal the illegal origin or true purpose of funds, used in the stages of stratification and integration of criminal proceeds into the official economy. The possibility of using virtual assets to avoid sanctions imposed by international organizations or individual countries, as well as the acquisition and trade in illicit goods and weapons, nor should be ruled out. The implementation of anti-money laundering policies in the field of virtual assets is difficult due to the limited opportunities for proper verification of users, as well as the identification of the list of market participants that fall under the control measures. Along with that, it is essential to clearly identify the measures of influence that could be applied by the competent authority in the field of supervision. The FATF estimates that the most significant risks of money laundering/terrorist financing are concentrated at the intersection of virtual and fiat money, which necessitates the regulation of virtual currency exchanges, including compliance by service providers with customer identification and notification of suspicious transactions [FATF, 2019]. At the same time, the FATF recommendations do not provide specific guidance on how to regulate transactions using virtual currencies to purchase and pay for goods or services. To our mind, regulation cannot be overly tight, as virtual currencies give the user freedom of choice and stimulate international payment activity. However, these currencies can also be used to buy and sell illegal (prohibited) goods/services, cybercrime, avoid sanctions, money laundering, and terrorist financing, which requires increased application of existing procedures for controlling the circulation of financial instruments.

It is noteworthy that virtual currencies are not easily adaptable to regulatory models. The procedure of their issuance and circulation practically eliminates the role of the central intermediary (issuer or regulatory center). In such circumstances, it is appropriate to find the object of regulatory policy – whether it is a virtual currency user, Virtual Asset Service Providers, or another member of the system. Simultaneously, it is currently difficult to predict how global the changes caused by the spread of the use of virtual currencies may become for the financial market.

The issue of the impact of the virtual assets market on financial stability is not in the spotlight today, given the relatively small share of cryptocurrency transactions in the overall structure of global financial market operations. Researchers generally do not consider virtual assets as a source of systemic risk for the financial sector, due to the limited connection of these assets with the traditional financial system. However, the capitalization of the cryptocurrency market is growing rapidly (Fig. 3), more and more countries recognize virtual assets as financial instruments, so there is every reason to predict the growing role of these assets in the financial market.

As of March 1, 2021, the capitalization of the cryptocurrency market exceeded 1.5 trillion US dollars. Undoubtedly, the market is volatile and is influenced by speculative factors, but to ignore its impact on the processes taking place in the financial market in modern conditions is unjustified.

For individual owners and users, virtual currencies can be the source of financial risks. The development of relationships and the wider use of virtual currencies can be a trigger for risks for individual private owners, which may ultimately extend to the entire financial sector.

According to experts, there is a straight relationship between the grade of the shadow economy and the spread of transactions with virtual currencies. This fact is typical for Ukraine as well. Therefore, the deteriorating situation in the cryptocurrency market may lead to imbalances and the spread of crises in the country's financial market. This further confirms the need to create effective regulatory mechanisms in the virtual asset market.

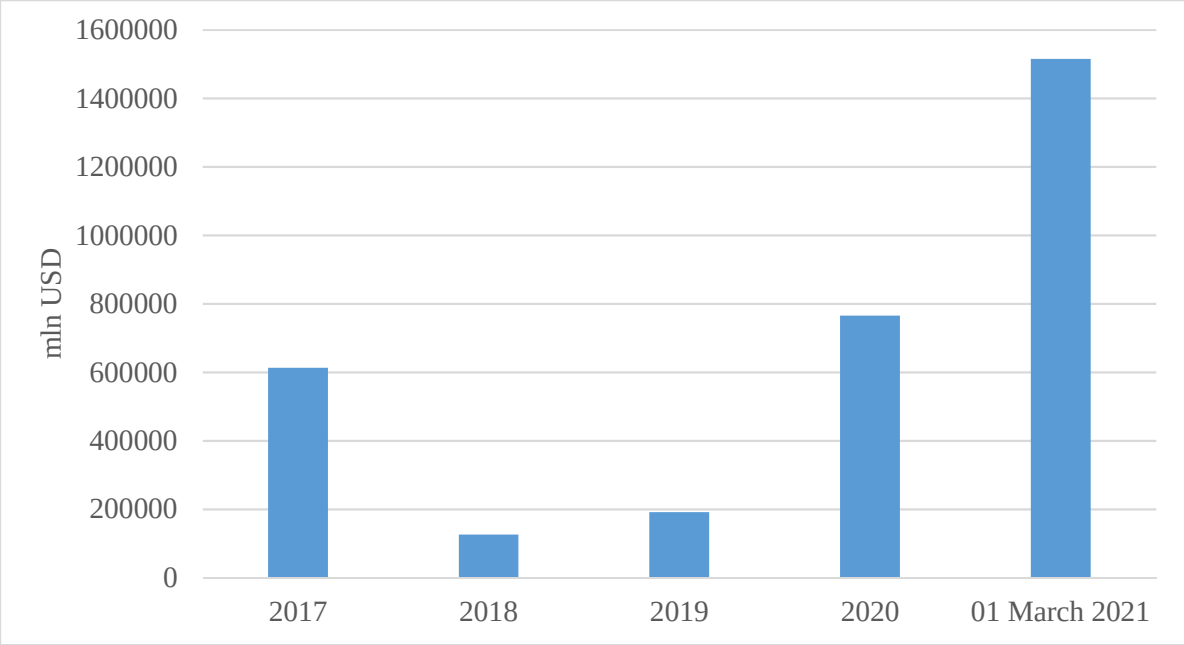

Fig. 3. Global cryptocurrency market capitalization

Data: Coinmarketcap, 2021

The development of such mechanisms is complicated by the virtual status of assets and the cross-border nature of transactions with them. The norms and rules of individual countries have significant differences, which reduces the effectiveness of international cooperation. Therefore, the issue of regulating the circulation of virtual assets has long been the subject of consideration by many international institutions, such as FATF, the United Nations Office on Drugs and Crime (UNODC), The Committee on Payments and Market Infrastructures (CPMI), OECD, European Banking Authority (EBA).

Most countries around the world that regulate transactions with virtual assets have developed their own approaches to the taxation of such transactions. However, it should be stressed that the risk of tax evasion is quite high, as participants in transactions with virtual assets do not disclose their identification data, and transactions can often be cross-border. Accordingly, there is a problem with developing effective measures to ensure compliance with tax requirements. Moreover, such measures should take into account the specifics of transactions with virtual assets, provide effective mechanisms to control the volume of such transactions, the procedure for identifying beneficiaries.

The opaque nature of virtual currencies is a factor that complicates the control of the schemes used, the collection of information, obtaining statistics, monitoring the direction of financial flows. Virtual currencies can be used quite effectively to avoid currency restrictions in countries where such restrictions are imposed. Virtual currency transactions do not involve cross-border transfers using traditional payment systems, so the use of standard methods of currency control will not be effective. On the one hand, it eliminates barriers to capital movements and creates equal possibilities for different market participants, and on the other hand, it creates opportunities to avoid control over the sources of capital. Market participants could purchase currency on the Internet, use it for quasi-currency transactions or make capital transfers for amounts much larger than allowed by regulations of individual countries.

Another vulnerability of virtual assets is the low level of consumer protection. As the virtual foreign exchange market is not sufficiently transparent, it is impossible to have certain guarantees for participants. Errors and inaccuracies that occur in transactions cannot be corrected or canceled. As a result, it is quite difficult for market participants to prove their ownership of assets in the event of controversial situations.

Conclusions and prospects for future research

Virtual currencies are the latest innovative financial tool that gives users a lot of significant benefits. Such benefits include both reducing the cost of transactions and reducing the time to complete them. Due to the absence of any barriers to market access, the volume of trading in virtual currencies and the number of participants in trading operations is growing rapidly. At the same time, the issuance and use of these currencies are often out of reach for regulatory policy, given what has become a challenge for government financial market regulators. The functioning of virtual assets outside the official financial system makes it difficult to determine their real impact on the economic processes of an individual country and the global market. Given the specific nature of virtual assets, they have a high level of vulnerability to use as a tool for money laundering and terrorist financing. This vulnerability is largely due to the lack or imperfection of regulatory procedures for transactions with this type of asset in a number of countries.

The findings concerning the approaches to crypto markets regulation are mixed. It is undoubtedly that regulators should give more attention to the risk appearing in cryptocurrency transactions. This means that regulating authorities should define the periodicity and intensity of assessments according to the level of money laundering/terrorist financing risks and prioritize the probable areas of upper risk. At the same time, the important issue of such activity is to separate criminal (or illegal) transactions from legal ones to not interfere the digital currency development.

To our mind, cybercrime law enforcement should acquire the technological expertise to combat the illicit use of cryptocurrencies, and regulators should understand the risks posed by this emerging class of more anonymous digital financial assets. Financial institutions need to focus their anti-money laundering procedures on the money flows generated by crypto exchanges, as well as provide efficient transaction monitoring to identify behavior that indicates money laundering/terrorist financing schemes.

The assessment of the vulnerabilities of virtual assets showed that, in addition to the risks of their use for money laundering, financial fraud, or tax evasion, attention should also be paid to the instability of virtual currencies, limited control over their circulation, and low protection of market participants. Overcoming these vulnerabilities requires a combination of public and private sector efforts. The virtual asset market is likely to remain volatile in the medium-term perspective and will attract a large number of small investors. Due to the lack of sufficient information on the state of the market and experience in trading financial assets, the risks of loss of investment by such investors should be considered quite high. Therefore, an important task is to ensure market transparency and create certain guarantee mechanisms to protect the interests of participants from potential losses and possible fraud. Further research into the functioning of virtual assets may involve developing these mechanisms and finding ways to reduce the risks of using cryptocurrencies to move shadow cash flows.

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ANALYSIS OF THE ENTERPRISE OPERATING EXPENSES AND WAYS OF IMPROVEMENT OF THEIR ACCOUNTING

Abstract. Activities of industrial enterprises are associated with continuous consumption of certain types of resources, so expense accounting plays a crucial role in determining the enterprise efficiency. Accounting procedures occupy a key place in information support system of any enterprise, since the original information on the enterprise activities in the form of financial statements and internal documentation (source documents, journals and ledgers) is essential in order to meet the needs of internal and external users. It is particularly important to account for operating expenses, which forms information about the use of materials, labor and other resources involved in the production process. Properly organized accounting and analytical information on operating expense ensures fair and accurate assessment of the enterprise production process and provide effective management decision-making. The purpose of the scientific paper is to analyze operating expenses, organization and methodology of the accounting process at the enterprise and to develop practical recommendations for improving the accounting for operating activity.This goal necessitates the solution of the following tasks: determine the nature and classification of operating expenses; analyze the dynamics and structure of operating expenses; develop the suggestions concerning the improvement of registration-analytical information of operating expenses. The used research methods and general characteristics of paper. The authors applied the method of literature review to justify the relevance of the chosen research topic. On the basis of the comparative method the main economic indicators of activity, in particular dynamics and structure of operating expenses according economic elements and according items of calculation were defined. On the basis of system analysis and synthesis, proposals on the composition of items of production costing and on the introduction of classification of expenses by groups in terms of relevant items of general production expenses, administrative, marketing expenses and other operating expenses were formed.

Key words: operating expenses, revenue, financial result, analysis, accounting.

Introduction

One of the most important objects in the enterprise management system is the process of accounting for operating expenses in general and in the context of their types, purposes, periods during which they were incurred. Regardless of the enterprise industry, ownership and other factors expenses could be considered as key elements in the enterprise operation, as they directly affect its profitability and further development.

Analysis of recent research and publications

Scholars have paid significant attention to the impact of accounting policies on the accounting and financial reporting of the enterprise. Analysis of recent research and publications allows us to conclude that the extent to which the enterprise will have information about its operating expenses depends on its development and success. However, in most cases, researches are aimed at solving problematic issues of cost management in general (Deriy, V. [1], Didorenko, T. [2], Ovcharuk, V. [3], Kostyrko, R. [4], Milash, I. [5]) or only the expenses of the subject of a particular type of economic activity (Denisyuk O.M. [6], Pavelko O. V. [7], Hnylytska, L. [8], Shatalkin, I. [9]). Accounting for enterprise operating expenses, which have a direct impact on determining the financial results of the reporting period, needs further improvement.

The objectives of the research are to study the essence of operating expenses, to analyze their dynamics and structure on the example of a particular enterprise, as well as provide suggestions for improving the accounting and analytical information of the studied expenses.

Presentation of basic material of the research

The expenses of the enterprise are classified depending on the type of activity: operating, financial and investment. Operating activities are the core activities of an enterprise that include transactions related to the production, sales and management of the enterprise.

Considering the production process in value terms, "at the entrance" to the system the elements of production consumption are reflected, i.e. expenses, and "at the exit" – the finished products.

Thus, operating expenses are the resources used in connection with the main activity of the enterprise aimed at the production and sale of products (goods, works, services), which is the key purpose of the enterprise and constitute the main share of its revenue), as well as transactions that provide it or caused by this activity [1 Denisyuk O. M.].

Operating expenses are usually continuous, ongoing and are necessary to support the production process and business administration.

To analyze operating expenses, the organization and methodology of their accounting process and develop practical recommendations for improving the accounting for operating expenses, LLC "Lviv Center for Development and Protection of Economic Entities" was selected. It is an enterprise that engages in making brick from burnt clay. For such type of operation, an enterprise is equipped with modern domestic equipment that provides smooth running production.

The preparation of enterprise financial reporting is the final stage, which forms a system of indicators characterizing the changes in assets and liabilities for a certain period and the economic activity of the enterprise in general [6]. That is, reporting is a source of information about the state of the entity in terms of final results.

It is worth considering where exactly in the reporting the information about the enterprise operating expenses is accumulated (Table 1).

Table 1

Information about operating expenses in the enterprise financial reporting

Name of the form	Code and line name	Information
1	2	3
"Statement of financial results" ("Statement of comprehensive income")	2050 "Cost of goods sold (goods, works, services)"	The production cost of sold products (works and services) for the reporting period, which consists of the production cost and unallocated overhead fixed expenses.
	2130 "Administrative expenses"	Expenses related to the management and maintenance of the enterprise are presented: payroll of employees of the administration, communication expenses, utilities and other administrative expenses.

Continuation of Table 1

1	2	3
	2150 “Selling expenses”	Reflects information on expenses associated with the sale of products, expenses of sales department, marketing services, advertising.
	2180 “Other operating expenses”	Information about other expenses arising in the operating activities of the enterprise is displayed.
	2500 “Material expenses”	Information about the movement of materials for production, overhead expenses, administrative and sales needs of the enterprise is displayed.
	2505 “Labor expenses”	Information on the amounts of accrued payroll of employees engaged operating activities of the enterprise is indicated.
	2510 “Deductions for social measures”	The amounts of the accrued single social contribution of production, management and sales employees are displayed.
	2515 “Amortization”	Information on the amounts of accrued depreciation for the reporting period is disclosed.
	2520 “Other operating expenses”	The amount of operating expenses that were not indicated in other lines of the report is indicated.
“Notes to the annual financial statements”	440 “Operating lease of assets”	Reflects information about expenses incurred in connection with the operating lease and which is accumulated in account 949 “Other operating expenses”.
	450 “Operating exchange rate difference”	Indicates information about the expenses associated with the operating exchange rate difference.
	460 “Sale of other current assets”	Information on the expenses of sales of inventories is disclosed.
	470 “Fines, penalties, forfeits”	Information on expenses, fines, penalties and forfeits incurred is accumulated.
	490 “Other operating expenses”	Information on the expenses of changes in the value of assets at fair value, research and development expenses, and expenses of buying and selling foreign currency is displayed.
	491 “Deductions to the provision for doubtful debts”	Indicates information on the expenses of doubtful and bad debts of the enterprise.
	492 “Unproductive expenses and losses”	The expenses of depreciation of inventories, as well as shortages and losses from damage to property are reflected.

Source: compiled by the authors on the material [10, 11, 12, 13]

Small business entities reflect information on operating expenses in the Statement of financial results (second form):

– line 2050 “Cost of goods sold (goods, works, services)” indicates information on the production cost of goods sold for the reporting period.

– line 2180 “Other operating expenses” displays information on the amounts of administrative expenses incurred, selling expenses, deductions for the creation of provision for doubtful debts, other operating expenses.

Therefore, financial statements are an important element of accounting that reflects financial condition and performance of the enterprise. Also, a wide range of stakeholders is interested in receiving such information.

The tax reporting also reflects the elements of operating expenses: wages, deductions for wages, as well as other tax payments that are accounted for as operating expenses.

1) The corporate income tax return reflects the pre-tax financial result, which is reduced by the amount of expenses incurred, including the cost of goods, works, services, overhead expenses, administrative expenses, marketing and other operating expenses. Also, in the event of tax

differences, the amounts of expenses for the formation of the provision for doubtful debts are reflected, which will increase the pre-tax financial result.

2) In the form No. 1DF "Tax calculation of the amounts of income accrued (paid) in favor of taxpayers, and the amounts of tax withheld from them" information about the accrued income of the employee is reflected. The form is filled in on the basis of the credit balance of account 661 "Payroll Settlements", which reflects the accrual of wages and other payments to the employee. The tax (reporting) period for the Tax calculation in the form of No. 1DF is a quarter.

3) The report on the amounts of accrued payroll (income, cash and other benefits, allowances, compensation) of insured persons and the amount of accrued single contribution to the obligatory state social insurance presents the information on the accrual of single social contribution of different categories. The Report reflects information on the expenses incurred in relation to the accrued single social contribution. The reporting period of the Report is a month and (or) a year. The report is based on accounting documents with calculation of payments on which a single social contribution is accrued.

4) The ecological tax return is prepared by taxpayers defined in the Tax code of Ukraine. The tax return reflects the amounts of ecological tax liabilities. Also, depending on the type and method of emissions of pollutants, calculations of tax liabilities are formed.

Another type is management reporting, which is confidential, optional and intended for internal users. It satisfies the interests of owners, its purpose is to ensure effective management of internal departments, operational decisions at the level of structural units and so on. This is achieved by creating a system of additional internal or management accounting [5]. Management reporting is not regulated by law and is made, as a rule, by the chief accountant of the enterprise. It often details financial reporting and discloses information depending on the needs of internal users. This reporting is designed for effective management and elaboration of tactics and strategies for enterprise development.

According to the legislation of Ukraine, each business entity prepares financial statements as part of financial, tax and statistical reports. Forms of reporting are different for each of the entities, due to different forms of ownership, activities and industry specifics.

Thus, operating expenses are expenses that reflect the amount of resources used related to the production activities of the enterprise, as well as the expenses of management and marketing. The classification of such expenses is set at the enterprise according to the needs of users. Operating expenses are classified by economic elements and by items of calculation.

During difficult economic situation even more acute problem of cost management companies, information which is data analysis of various aspects of the cost [1].

To assess the financial condition of LLC "Lviv Center for Development and Protection of Economic Entities" it is necessary to analyze the dynamics of the enterprise's main economic indicators (Table 2) using financial reporting for 2018–2020.

Table 2

Dynamics of the main economic indicators of the LLC "Lviv Center for Development and Protection of Economic Entities" for 2018-2019

Indicators	2018	2019	2020	Deviation 2020/2018	
				absolute, (+;-)	relative, %
1	2	3	4	5	6
Net revenue from sales of products (goods, works, services), thousand UAH	12 179.70	15683.00	17 889.00	+5709.30	+46.86
Operating expenses, thousand UAH, in particular:	9612.96	11643.6	12494.95	+2881.99	+29.98
– cost of goods sold (goods, works, services)	8 654.90	10375.2	10 980.60	+2325.70	+26.87

Continuation of Table 2

1	2	3	4	5	6
– Administrative expenses	505.20	572.3	620.10	+114.90	+22.74
– Selling expenses	195.60	476.5	716.80	+521.20	+266.46
– Other operating expenses	257.26	219.6	177.42	-79.84	-31.03
Expenses per hryvnia of sold products, kopecks / UAH	79	70	70	-9.00	-11.39
Average number of employees, persons	38	43	43	+5	+13.16
Average annual output per employee, thousand UAH	320.50	416	416.00	+95.50	+29.80
Remuneration fund, thousand UAH	1903.67	2171.12	2386.06	+482.39	+25.34
Average monthly payroll of one employee, UAH	4174.71	4307.78	4624.15	+449.44	+10.77
Average annual value of fixed assets, thousand UAH	3918.40	3698.22	2788.45	-1129.95	-28.84
Return on fixed assets, UAH / UAH	3.11	2.81	6.42	3.31	106.39
Materials, thousand UAH	6228.59	6337.16	6928.09	+699.5	+11.23
Material efficiency, UAH / UAH	1.96	1.64	2.58	+0.62	+31.63
Average annual value of assets, thousand UAH	11087.75	12598.52	15170.35	+4082.60	+36.82
Average balances of current assets, thousand UAH	6933.95	8900.3	11939.00	+5005.05	+72.18
The average value of equity, thousand UAH	9685.20	11239.15	13463.35	+3778.15	+39.01
Turnover ratio of current assets	1.76	1.24	1.50	-0.26	x
Coefficient of autonomy	0.87	0.89	0.89	+0.01	x
Current liabilities and provisions, thousand UAH	1286.85	1359.37	1565.95	+279.10	+21.69
Total liquidity ratio	5.39	6.55	7.62	+2.24	x
Net profit, thousand UAH	2457	4298.2	5172.3	+2715.3	+100.51
Net profitability of product sales,%	20.18	27.41	28.91	+8.73	x
Net return on assets (capital),%	22.16	34.11	34.09	+11.93	x

After analyzing the dynamics of the main economic indicators of LLC "Lviv Center for Development and Protection of Economic Entities" for 2018–2020 it is observed that the company operates efficiently, because the net profitability of sales in the reporting year compared to the previous year increased by 8.73 %, which was caused by an increase in net revenue from sales by 5709.3 thousand UAH. Also, net return on assets increased by 11.93 %, due to growth in net income by 2715.3 thousand UAH or 100.51 %.

Expenses per one hryvnia of operating income for the reporting year are 70 kopecks/UAH, and in the previous year – 79 kopecks/UAH, which indicates a reduction in expenses of the enterprise. There is a significant increase in salling expenses – by 266.46 % or 521.2 thousand UAH, as well as an increase in the cost of goods sold (goods, works, services) – by 26.87 % and administrative expenses by 22.74 % (114.9 thousand UAH).

Given the fact that at the LLC "Lviv Center for Development and Protection of Economic Entities" the average number of employees in the reporting year increased for 5 people, the average monthly payroll of one employee also increased by 10.77 % or UAH 449.44. During the analyzed period, the return on fixed assets increased rapidly by UAH 3.31 / UAH or 106.39 %.

Material costs in 2020 increased by 11.23 %, respectively, and material efficiency increases by 31.63 %. The growth of material efficiency is a positive phenomenon, as it indicates an increase in the number of manufactured products for each hryvnia used materials. The turnover ratio of current assets decreased by 0.26, which indicates a decrease in the number of turnovers of assets for the analyzed period.

The coefficient of autonomy in the reporting year, compared to the previous year, increased by 0.01. This is due to the fact that the growth rate of the average value of equity is much faster than the growth rate of current liabilities and provisions. Namely, the average value of equity increased by UAH 3,778.15 thousand. or 39.01 % and a slight

increase in current liabilities and provisions by UAH 279.10 thousand. or at 21.69 %.

Also, the total liquidity ratio indicates that the company has a liquid balance sheet because in the reporting year it is 7.62. The increase in the total liquidity ratio by 2.24 is due to an increase in current assets and current liabilities. This is a positive trend for the enterprise, as it has a significant amount of free resources, which were formed due to its own sources. At first glance, we see that a significant part of current assets are stocks, as raw materials are the primary cost element for production.

Thus, LLC "Lviv Center for Development and Protection of Economic Entities" operates effectively, as evidenced by the above indicators. The enterprise increases its production, increases the number of employees in the reporting year compared to the previous one, which is a positive trend.

The analysis of the main economic indicators of the enterprise showed a decrease in expenses per hryvnia of revenue, and profitability indicators tend to increase, which characterizes the efficiency of the enterprise.

The main type of expenses at the enterprise is operating expenses. Their analysis involves assessing the dynamics, composition and structure. The basis of internal production planning is the analysis of operating expenses by items of calculation [1]. This allows you to determine the amount of expenses by type of product and place of origin, as well as the share of expenses accounted for by production, management, marketing and more.

It is advisable to analyze expenses of operating activities on these grounds, as well as to determine expenses for one hryvnia of production that will allow to track changes in operating expenses for a certain period. At LLC "Lviv Center for Development and Protection of Economic Entities" operating expenses are classified according to economic elements and calculation items, which allows to clearly define the purpose of expenses and their relationship with the production process, to assess them by place of origin.

Analysis of operating expenses by economic elements gives the possibility to determine the total cost of materials, labor and other production resources used, as well as allows to organize relevant control over the consumption of these expenses. Dynamics and structure of operating expenses of LLC "Lviv Center for Development and Protection of Economic Entities" for 2018–2020 is analyzed in Table 3.

Analysis of the dynamics of operating expenses by economic elements of LLC "Lviv Center for Development and Protection of Economic Entities" for 2018–2020 showed that overall operating expenses increased by 2283.32 thousand UAH or 21.67 % due to growth of material expenses by UAH 693.59 thousand or 11.07 %, labor expenses by UAH 468.14 thousand, deductions for social measures by UAH 99.93 thousand and other operating expenses by 1056.39 thousand UAH or 126.23 %. However, amortization (depreciation) expenses decreased by UAH 34.73 thousand or 2.91 %.

Analysis of the structure of operating expenses by economic elements of LLC "Lviv Center for Development and Protection of Economic Entities" for 2018–2020 showed that the largest share is occupied by material expenses (59.43 % and 54.26 %, respectively, in the previous and reporting years), and the lowest – deductions for social measures (3.67 % in the previous and 3.80 % in the reporting years). There is a tendency to reduce the share of material expenses (by 5.17 %) and amortization (depreciation) (by 2.29 %), as well as a significant increase in other operating expenses (by 6.82 %). Labor expenses also increased the share in the structure of operating expenses by economic elements, namely by 0.13 %.

The analysis of operating expenses of the enterprise by items of calculation allows to determine the target function of expenses, their relationship directly with the production process, as well as to estimate expenses by the type of product and place of use. The result of the dynamics and structure of operating expenses analysis by the items of calculation of LLC "Lviv Center for Development and Protection of Economic Entities" for 2018–2020 are presented in Table 4.

Table 3

Dynamics and structure of operating expenses by economic elements LLC "Lviv Center for Development and Protection of Economic Entities" for 2018–2020

Indicators	2018		2019		2020		Deviation 2020/2018		
	amount, thousand UAH	structure, %	amount, thousand UAH	structure, %	amount, thousand UAH	structure, %	absolute, thousand UAH	relative, %	structure,, %
Material expenses	6263.79	59.43	6482.07	57.61	6957.38	54.26	+693.59	+11.07	-5.17
Labor expenses	1855.91	17.61	1972.46	17.53	2324.05	18.12	+468.14	+25.22	+0.52
Deductions for social measures	386.99	3.67	408.74	3.63	486.92	3.80	+99.93	+25.82	+0.13
Amortization	1195.57	11.34	1187.35	10.55	1160.84	9.05	-34.73	-2.91	-2.29
Other operating expenses	836.86	7.94	1201.23	10.68	1893.25	14.77	+1056.39	+126.23	+6.82
Total operating expenses	10539.13	100.00	11251.85	100	12822.44	100.00	+2283.32	+21.67	0.00

Table 4

Dynamics and structure of operating expenses by costing items LLC "Lviv Center for Development and Protection of Economic Entities" for 2018–2020

Indicators	2018		2019		2020		Deviation 2020-2018 (+,-)		
	amount, thousand UAH	structure, %	amount, thousand UAH	structure, %	amount, thousand UAH	structure, %	absolute, thousand UAH	relative, %	structure, %
1	2	3	4	5	6	7	8	9	10
Cost of goods sold (goods, works, services) (thousand UAH), in particular:	8654.91	90.03	10375.2	89.11	10980.62	87.88	+2325.71	+26.87	-2.15
– brick M-100	665.13	6.92	602.98	5.18	499.37	3.99	-165.76	-24.92	-2.93
– brick M-125	6069.31	63.14	5879.98	50.50	5859.43	46.90	-209.88	-3.46	-16.24
– brick M-150	1920.47	19.98	3892.24	33.43	4621.82	36.99	+2701.35	+140.66	+17.01
Administrative expenses (thousand UAH), in particular:	505.25	5.26	572.3	4.92	620.08	4.96	+114.83	+22.73	-0.29
– payroll of employees and accruals	345.35	3.59	412.68	3.54	461.66	3.69	+116.31	+33.68	+0.10
– amortization	4.58	0.05	4.02	0.03	3.91	0.03	-0.67	-14.63	-0.02

Continuation of Table 4

1	2	3	4	5	6	7	8	9	10
– communication services	3.34	0.03	3.13	0.03	3.03	0.02	-0.31	-9.28	-0.01
– Other expenses	151.98	1.58	152.47	1.31	151.48	1.21	-0.50	-0.33	-0.37
Selling expenses (thousand UAH), in particular:	195.54	2.03	476.5	4.09	716.83	5.74	+521.29	+266.59	+3.70
– payroll of employees and accruals	33.74	0.35	124.18	1.07	186.38	1.49	+152.64	+452.40	+1.14
– warehouse maintenance	55.15	0.57	108.2	0.93	193.54	1.55	+138.39	+250.93	+0.98
– transportation expenses	103.45	1.08	230.16	1.98	330.56	2.65	+227.11	+219.54	+1.57
– other expenses	3.20	0.03	13.96	0.12	6.35	0.05	+3.15	+98.44	+0.02
Other operating expenses (thousand UAH), in particular:	257.26	2.68	219.6	1.89	177.42	1.42	-79.84	-31.03	-1.26
– taxes, fees and other mandatory payments	167.27	1.74	143.26	1.23	121.64	0.97	-45.63	-27.28	-0.77
– consulting fees	3.34	0.03	3.1	0.03	2.28	0.02	-1.06	-31.74	-0.02
– expenses of information support	6.09	0.06	5.6	0.05	4.04	0.03	-2.05	-33.66	-0.03
– other expenses	80.56	0.84	67.64	0.58	49.46	0.40	-31.10	-38.60	-0.44
Total operating expenses	9612.96	100.00	11643.6	100	12494.95	100.00	+2881.99	+29.98	0.00

Analysis of the dynamics of operating expenses on the items of calculation of LLC "Lviv Center for Development and Protection of Economic Entities" for 2018–2020 showed that overall expenses increased by 29.98 % or at 2881.99 thousand UAH. There is a significant increase in the cost of goods sold, including bricks M-150 by 2608.31 thousand UAH or 156.65 %. Administrative expenses increased in 2020 compared to 2018 by 22.73 % due to an increase in labor expenses for employees of the administration by 116.31 thousand UAH. The tendency to increase is also observed for selling expenses (labor expenses and related charges, expenses of transportation of products, expenses associated with the maintenance of the warehouse) in the amount of 521.29 thousand UAH or 266.59 %. Other operating expenses decreased in the reporting year compared to the previous year by 31.03 % or by UAH 79.84 thousand.

The result of the analysis of the structure of operating expenses by cost items of LLC "Lviv Center for Development and Protection of Economic Entities" for 2020 is shown in Fig. 1.

Analysis of the structure of operating expenses of LLC "Lviv Center for Development and Protection of Economic Entities" for 2018–2020 allowed us to see that the largest share is occupied by the cost of goods sold (goods, works, services). Administrative expenses in the analyzed period increased only due to payroll growth. Sales expenses increased significantly, which indicates that the analyzed company began to increase attention in this area.

The generalizing stage of the analysis of operating expenses is to determine the effectiveness of expenses per hryvnia of products value. The analysis is carried out on such basic indicators as operating expenses per one hryvnia of revenue

from operating activities (performance indicator of the enterprise), cost of goods sold per one hryvnia of net revenue from sales, as well as the profitability of operating activity.

Analysis of the expenses of operating activities effectiveness of LLC "Lviv Center for Development and Protection of Economic Entities" for 2018–2020 is given in the form of Table 5.

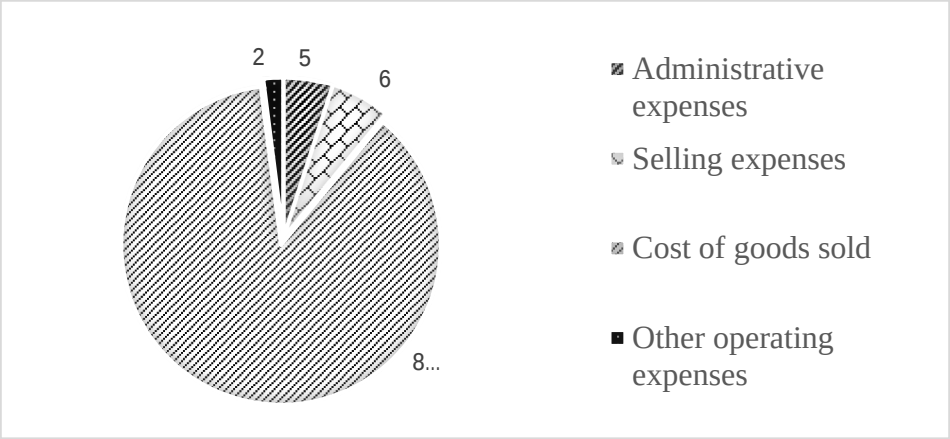

Fig. 1. Structure of operating expenses of LLC "Lviv Center for Development and Protection of Economic Entities" for 2020

Table 5

Dynamics of cost indicators per hryvnia of product cost LLC "Lviv Center for Development and Protection of Economic Entities" for 2018–2020

Indicators	2018	2019	2020	Deviation 2020/2018	
				absolute, (+,-)	relative, %
Initial indicators					
Other operating revenue, thousand UAH	-	-	0,10	+0,10	x
Operating expenses, thousand UAH	9612.96	11643.6	12494.95	+2881.99	+29.98
in particular: – cost of goods sold (goods, works, services);	8654.90	10375.2	10980.62	+2325.72	+26.87
– Administrative expenses	505.20	572.3	620.08	+114,88	+22.74
– Selling expenses	195.60	476.5	716.83	+521.23	+266.48
– Other operating expenses	257.26	219.6	177.42	-79.84	-31.03
Net revenue from sales of products, thousand UAH	12179.70	15683.00	17889.00	+5709.30	+46.88
Profit from operating activities, thousand UAH	2566.74	4039.4	5394.05	+2827.31	+110.15
Analytical indicators					
Operating expenses per one hryvnia of revenue from operating activities, kopecks / UAH	79	74	70	-9	-11.50
Cost of goods sold per one hryvnia of net revenue from sales, kopecks / UAH	71	66	61	-10	-13.62
Profitability of operating activity,%	21.07	25.76	30.15	+9.08	x

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Table 5 shows that for 2018–2020 there is a decrease in the cost of goods sold per one hryvnia of net revenue from sales by 10 kopecks/UAH or 14.08 %, which is a positive phenomenon, as the capacity of the enterprise has increased. There is also a reduction in operating expenses per one hryvnia of revenue from operating activities by 9 kopecks/UAH. Such changes are due to the growth rate of net revenue from sales (46.88 %) over operating expenses (26.87 %).

At the same time, the profitability of operating activities increased by 9.08 %, which indicates a positive trend in changes in the operating activities of LLC "Lviv Center for Development and Protection of Economic Entities". This is due to an increase in net revenue from sales of products by 5709.6 thousand UAH, as well as an increase in operating profit by 2827.14 thousand UAH or 110.15 %.

LLC "Lviv Center for Development and Protection of Economic Entities" uses only the 9th class of accounts "Business expenses" to reflect expenses.

The system of cost calculation at the enterprise involves the use of the process method with the elements of standard costing, and for individual orders – job-order method also with the elements of standard costing. The list of processes is determined depending on the technology and taking into account the feasibility of planning, accounting and calculating production cost for each object. Direct material costs are served as the basis for distribution of variable and distributed fixed manufacturing overheads for each cost object.

The enterprise does not have approved in the accounting policy calculation items. Therefore, it is necessary to introduce changes and establish such list and structure of calculation items (Table 6).

Table 6

Proposals on the composition of the items of production costs calculation

Costs	Title of articles	Composition of articles
Direct production costs	Direct material costs	– Raw materials. – Spare parts. – Recyclable waste. – Semi-finished products of own production. – Auxiliary materials.
	Direct labor costs	– Wage (salary). – Compensation and other payments to employees.
	Other direct costs	– Deductions for social measures. – Depreciation of fixed assets. – Amortization of intangible assets. – Other direct costs
Overhead costs	Variable overhead costs	– Training costs. – The cost of maintaining the production process. – Work in progress shortage. – Shortages and losses from damage of property in the shops within the norms of natural loss. – Repair of fixed assets.
	Fixed overhead costs	– The cost of improving technology and organization of production. – Salary of the shop management staff. – Deductions for social measures and medical insurance of the management of shops, sections. – Expenses for business trips of shop staff. – Expenses for labor protection, safety. – Depreciation of fixed assets. – Amortization of intangible assets. – Costs for heating, lighting, water supply. – Repair of fixed assets for general production purposes.

Source: compiled by the authors on the material [1, 13, 14]

Also in the accounting policy of LLC "Lviv Center for Development and Protection of Economic Entities", it is necessary to provide information on the accounting for transport and procurement expenses. For example, it is advisable to separate sub-account 2011 "Transport and procurement expenses for raw materials and supplies", if such raw materials and supplies are purchased. Therefore, it is necessary to distinguish relevant accounts for transport and procurement expenses for each homogeneous group of inventories that the enterprise buys. Such expenses, defined using the average interest method, will be attributed to the value of inventories that have been disposed of. These costs will be written off later, in the correspondence of disposal of the relevant tangible assets.

It is also established that the current accounting policy does not fully disclose and regulate the accounting for operating expenses. To avoid negative results associated with the unspecified organization of accounting for operating expenses, it is proposed to introduce a list of direct production and overhead costs to the cost calculation items. In addition, the suggestions regarding the accounting for transport and procurement expenses were presented.

LLC "Lviv Center for Development and Protection of Economic Entities", in compliance with the Instruction for the Chart of Accounts application, has developed current chart of accounts with disclosed analytics to accounts related to production, as well as expense accounts in general. The enterprise has no secondary production and therefore account 231 "Main production" is the only account, which reflects all types of expenses that are included in the cost of production. Sub-account 901 "Cost of finished products sold" records the production cost of sold finished products. The formation of the cost in terms of expenses is shown in Fig. 2.

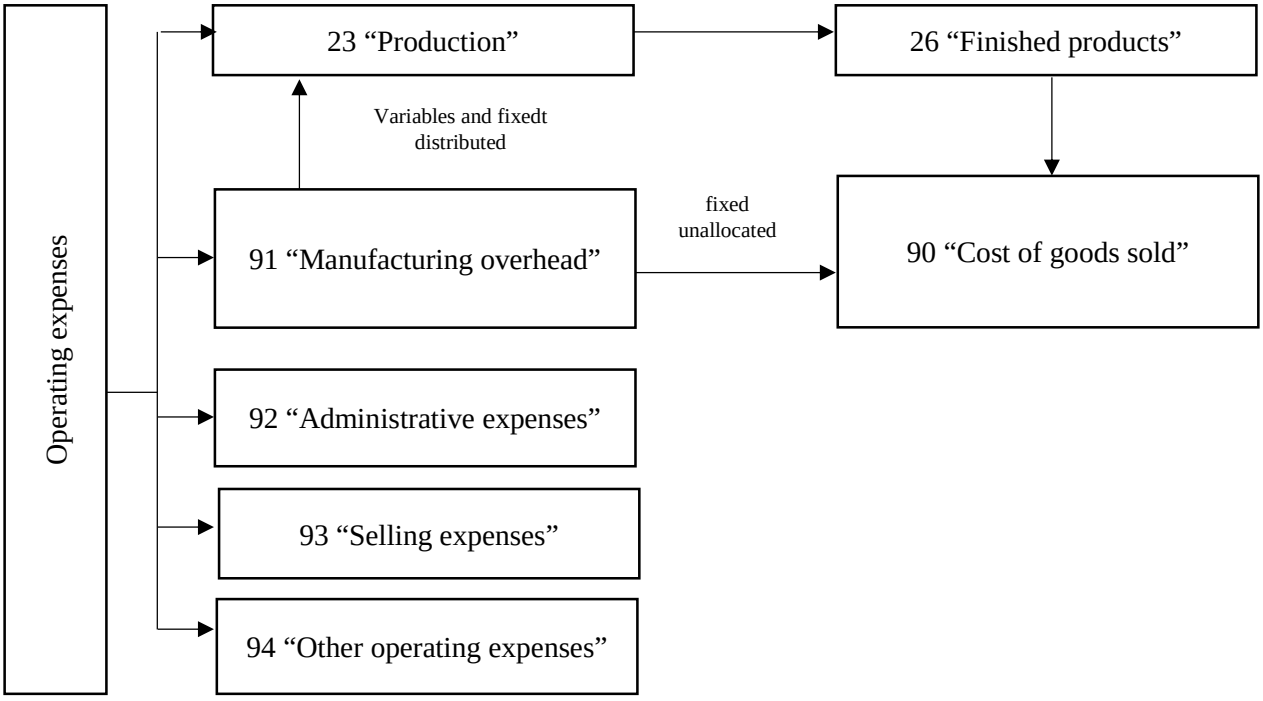

Fig. 2. Accounting for operating expenses at LLC "Lviv Center for Development and Protection of Economic Entities"

Source: compiled by the authors

It is proposed to reflect enterprise operating expenses in accounts 231 "Brick production unit", 901 "Cost of finished products sold", 91 "Manufacturing overhead", 92 "Administrative expenses", 93 "Selling expenses", 949 "Other operating expenses".

The enterprise uses standard forms of source documents for accounting for operating expenses, as well as develops and approves its self-developed forms of source documentation. Analytical accounting at the enterprise is imperfect that determines the need to open subsidiary accounts to accounts 91 "Manufacturing overhead", 93 "Selling expenses", 94 "Other operating expenses". This would enable the enterprise management to make effective decisions aimed at operating expense optimization.

Analytical accounting on account 231 "Brick production unit" at LLC "Lviv Center for Development and Protection of Economic Formations" is conducted in order to accumulate information about the expenses of brick production unit by expense items.

Account 91 "Manufacturing overhead" has no sub-accounts. The debit of the account reflects the increase in expenses and the credit – their write-off to the financial result. Manufacturing overhead costs associated with the organization of production are accumulated on the relevant account and then are distributed to account 231 "Brick production unit" and account 90 "Cost of goods sold".

The basis of distribution at analyzed enterprise is direct material costs. Reflection in the accounting of overhead costs without analytical grouping complicates the perception of information about costs and hampers effective in decision-making.

For the purposes of internal (management) accounting it is necessary to introduce appropriate changes in the Order on the accounting policy that imply the introduction of expense grouping in the context of relevant items. The proposals of such grouping on the example of account 91 "Manufacturing overhead" is given in Table 7.

Table 7

Proposals for manufacturing overhead grouping for LLC "Lviv Center for Development and Protection of Economic Entities"

Financial Accounting				Internal accounting	
Code of account	Account name	Sub-account number	Name of the group by types of expenses	Cost item code	Name of cost item
91	Manufacturing overhead	911	The object of main production	9111	Manufacturing overhead costs of clay storage
				9112	Manufacturing overhead costs of forming department
				9113	Manufacturing overhead costs of tunnel dryers
				9114	Manufacturing overhead costs of batch department
				9115	Manufacturing overhead costs of the tunnel furnace
		912	Maintenance and operation of machinery and equipment	9121	Depreciation of fixed assets for general production purposes
				9122	Other equipment maintenance costs
		913	Other manufacturing overhead	…	

Source: compiled by the authors

The dependence of economic security on qualitatively-formed accounting and analytical support for such purposes is substantiated [8, 15–18]. The authors prove that nowadays, there are inconsistencies of the current accounting with the enterprise economic security requirements.

Account 92 "Administrative expenses" reflects operating expenses that are not taken into account for determining the cost of production. It has

analytical (subsidiary) accounts that specify the origin of expenses. Sub-account 921 "Administrative expenses of the enterprise" reflects the salary and charges of administration departments' staff, depreciation of fixed assets used for administrative purposes, etc.

The expenses for economic security of the enterprise is a type of expenses that fully corresponds to the essence of administrative expenses, because they are aimed at supporting the main enterprise activities, are permanent and in no way related to the volume of production [17]. It is important to take into accuont the nature and origin of expenses associated with the activities that ensure the enterprise security. Therefore, the use of sub-account 923 "Expenses on economic security of the enterprise" to account 92 "Administrative expenses" with analytics would enhance convenience and speed of retrieval of information, in particular:

– 923.1 – Expenses associated with the establishment of economic security system;

– 923.2 – Expenses for maintaining the staff of economic security service;

– 923.3 – Expenses for creating the information base of economic security;

– 923.4 – Other expenses related to the activity of economic security service.

It is worth considering how the increase in economic security expenses occurs by presenting the correspondence of accounts (Table 8).

Table 8

Correspondence of accounts of economic security expenses accounting for LLC "Lviv Center for Development and Protection of Economic Entities"

The content of business transaction	Correspondence of accounts		Source documents
	Debit	Credit	
Expenses for maintaining the staff of economic security service			
The basic and additional salaries of the staff are accrued	923.2	661	Timesheet, Letters for a fee
Single social contribution has been accrued	923.2	651	Summary statement of deductions
Expenses related to staff training to improve skills are reflected	923.2	685	Act of work performed
Depreciation of technical means of ensuring economic and personnel security is accrued	923.2	131	Statement of depreciation of fixed assets
Expenses associated with advisory recommendations for staff skills are reflected	923.2	685	Act of work performed
Expenses on maintaining general-purpose vehicles in relation to the activities of the security service	923.2	205, 131	Check, Act of work performed, Route list

Source: compiled by the authors on the material [8, 15, 16, 17]

Today, in the post-industrial economy, the crucial condition for obtaining a financial result is not only to ensure the production process, but its selling, in particular, bringing it to the consumer.

Under such conditions, enterprises increase the expenses incurred for the development of management systems that support the main production. Such systems include enterprise management, marketing, research and development, logistics and more. One of the most important roles in improving the efficiency of the enterprise is played by marketing expenses.

The main purpose of marketing expenses is to create and maintain a positive image of the organization, maximize the use of its resources to determine the direction of movement and meet market needs for products and services.

Therefore, there is a need to develop effective approaches to managing marketing expenses in the enterprise based on the use of appropriate accounting and analytical support.

Such approaches should allow to manage these expenses, to draw conclusions about the effectiveness and efficiency of their incurrence to achieve the objectives of the activity, given the

specifics and characteristics of marketing expenses, the factors influencing the level and behavior of such expenses.

The requirements for current accounting provided by the current legislation do not ensure the conditions for thorough accounting for any marketing expenses on one control account. Marketing expenses are the element of current operating expenses, in particular selling expenses. The proposed classification of marketing expenses should form the basis for nomenclature of accounts construction, which will allow to move from the description of retrospective facts of economic life to forecasting the situation in the market [19].

At present, LLC "Lviv Center for Development and Protection of Economic Entities" reflects in account 93 "Sales expenses" only the expenses of transportation of finished products, as well as the cost of maintenance of finished product warehouse.

Selling expenses do not have specific details, so the company should divide the expenses according to the following analytics:

– 931 "Expenses of transportation of finished products";

– 932 "Expenses for maintenance of finished product warehouse";

– 933 "Other selling expenses".

Account 931 should take into account the expenses associated with the calculation of payroll for employees engaged in the transportation of products, repair of cars, trucks, by means of which the products are delivered, and other expenses associated with the transportation of finished products.

Sub-account 932 will be used to reflect expenses of the warehouse where the products are stored: payroll of the employee of such warehouse, write-off of materials used for the warehouse and more.

Sub-account 933 will take into account the expenses of creating and operating a marketing service (for remuneration and bonuses for staff, for logistics and information support of marketing services, training of marketing staff), expenses for market research, advertising expenses and more.

Account 94 "Other operating expenses" is also often used at the LLC "Lviv Center for Development and Protection of Economic Entities" and has subsidiary account 949 "Other operating expenses".

LLC "Lviv Center for Development and Protection of Economic Entities" widely uses expense account 949 "Other operating expenses" in which it is also proposed to indicate the following analytics:

– 949.1 "Expenses related to information, consulting, auditing services";

– 949.2 "Expenses for information support, Internet services, periodicals";

– 949.3 "Expenses for preferential pensions";

– 949.4 "Expenses for taxes, fees";

– 949.5 "Other operating expenses".

Thus, the task of analytical subsidiary accounts is to disclose detailed information on the occurrence of expenses by structural units, by the type of activity, by usage. They enable the collecting of necessary information for enterprise performance analysis. In the process of accounting LLC "Lviv Center for Development and Protection of Economic Entities" uses subsidiary accounts that satisfy the requirements of internal users.

Conclusions and prospects for further research

The paper presents the results of analysis of accounting and analytical information on the operating expenses at LLC "Lviv Center for Development and Protection of Economic Entities". Operating expenses are an important economic category considering that they account for the largest share of the total enterprise expenses. It is investigated that parameters of classification and accounting for enterprise expenses are determined by economic, organizational, technological conditions, as well as the competence of managers and, accordingly, their needs for management information. Relevant classification of expenses contributes to the effectiveness of expense management and accounting for that supports achieving target business objectives.

The considered characteristic of LLC "Lviv Center for Development and Protection of Economic Entities" operation allowed to define the goal, the purposes and the basic type of activity – brick production by burning clay. The accounting policy of the enterprise is not perfect regarding the reflection of the enterprise operating expenses. Therefore, it

is proposed to approve the cost calculation items, as well as to establish methods of distribution of transport and procurement expenses.

The analysis of the main economic indicators shows that the the enterprise operates efficiently, as the net profitability of product sales in 2020 compared to 2018 increased by 8.73 %, which was caused by an increase in net revenue from sales by 5709.3 thousand UAH.

Also, the total liquidity ratio indicates that the enterprise has liquid balance sheet, as in analyzed period this indicator was equal 9.23. This shows that the enterprise has enough of its own current assets to cover current liabilities. Despite the positive growth trend of economic indicators, the average monthly payroll of an employee at LLC "Lviv Center for Development and Protection of Economic Entities" is low.

Analytical subsidiary accounts provide the possibility to collect necessary information to analyze the enterprise performance. Accounting for operating expenses with introduction of proposed subsidiary accounts ensure detailed analysis of these expenses in order to determine their effectiveness, necessity and feasibility of their incurrence.

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THEORETICAL AND METHODOLOGICAL PRINCIPLES FOR ACCOUNTING REFLECTON OF GOODWILL: DIALECTICS OF DEVELOPMENT AND DIRECTIONS OF IMPROVEMENT

Abstract. The rapid development of market relations, Ukraine's integration into the world economic space, encourage companies, in order to achieve competitive advantages, to explore new ways of capitalization. At the same time, the operations of purchase, sale, merger or acquisition of companies, the value of which directly depends on intellectual capital, are becoming more common. The difference in the assessment of market and book value of intellectual capital leads to a special economic and accounting category – goodwill.Despite the prospects of using such a component of assets as goodwill, today there are still a number of theoretical and practical problems, for example: problem of unambiguous understanding and interpretation of the essence of goodwill, methods of its valuation, and the practice of reflecting it in accounting and reporting by domestic enterprises.

The study addresses issues related to establishing the nature of goodwill, its content as an intangible economic resource of the enterprise and the component of the value of capital and the problem object of accounting.The purpose of the work is to reveal the economic essence of goodwill as an object of accounting, to conduct a critical analysis of the current standardization of goodwill accounting, to generalize and systematize of existing problems in the formation of accounting information about this object. The task of this study is to formulate separate proposals for improving methodological approaches to accounting for goodwill, which are obtained on the basis of examined legislative and research sources of information. The scientific novelty lies in the substantiation of the accounting category of goodwill as a subjective value and an objectively existing resource, which should be actually reflected in accounting and reporting.

Key words: accounting, enterprise, goodwill, internally generated goodwill, intangible assets, capital, business value.

Formulation of the problem. The dynamic development of market relations in the global space, the integration of Ukrainian enterprises into world economic relations, including investment, necessitate the demonstration of their competitive advantages. Modern market conditions encourage companies of any national economy to find ways to capitalize on their business.

The importance of this criterion is that the operations of purchase, sale, merger or acquisition of companies, the value of which directly depends on their available capital of intangible nature and business reputation in the market, expressed in the category of “goodwill” (acquired and created by the enterprise) are becoming more common.

At the same time, today there are a number of theoretical and practical problems regarding the method of goodwill valuation for accounting purposes, as well as the generally accepted practice

of reflecting this object in public reporting by enterprises.

The reflection in accounting and the presentation in one way or another of public information about goodwill as an economic resource of the intangible type during the evolution of this system has always been and remains to be the subject of discussion. The dual economic and legal nature of this economic category gives rise in accounting practice to different approaches to accounting for this object. Throughout the history of the development of accounting theory and practical accounting, unified approaches to its recognition, evaluation and agreed methods of reflection by the accounting system have not been achieved. This applies to both purchased and internally generated goodwill. This type of resources has a dual economic nature – they form a value comparable only to a particular enterprise (for example, a trademark) which, at the same time, is not directly commensurate with the costs incurred for its formation (primarily for goodwill created by the enterprise). At the same time, a significant part of the components of goodwill, as well as this economic category in general, cannot be identified with the help of traditional accounting tools. This makes it difficult to reflect it in the public reporting of the enterprise for the presentation of the book value of the business, makes it impossible to use accounting information in the processes of market valuation of economic entities.

In modern practice, the basic principles of estimating the market value of goodwill and other components of intellectual capital are focused on the use of expert assessments projected on the hypotheses of efficient market (Efficient Market Hypothesis) and the model of capital and asset valuation (Capital Asset Pricing model). In these models, data on the value of goodwill and other intangible economic resources are formed on the basis of subjective estimates that provide a fairly reliable expression of the fair value of assets and liabilities [1]. However, in modern accounting standardization, as the famous scientist Baruch L. concludes, "many estimates, such as the fair value of non-trading (non-market) assets, and especially goodwill, are often not better than simple assumptions and have a tendency to manipulate" [2].

Fluctuations in the share price of well-known companies on stock exchanges, which have systematically occurred over a long period, many analysts have attributed to the incorrect assessment (usually inflated) of goodwill and other intangible components of the market value of modern companies. The operation of well-known and socially significant companies in the global pandemic COVID 19 further confirmed the fact of overestimation of goodwill in most of them.

Based on the above and a number of other problematic aspects it becomes relevant the question of developing and improving accounting methods to more objectively reflect the entire intangible potential of the enterprise, expressed by the category of goodwill: "today the problem of objective reflection of goodwill as an accounting and economic object" [3, p. 1165].

Analysis of recent research and publications

In its specialized report for 2019, "Accountancy Europe" indicates that current accounting methods in many cases do not take into account internally generated intangible assets, which have become a major component of the market value of companies [4, p. 4].

Assessing the possibility of developing accounting methods based on existing standardization, a well-known researcher in the field of intangible assets and goodwill as components of capital of modern companies Marr W. concludes that the search for "objective approach to valuation of intangible assets creates huge problems, thus objective accounting for intangible assets is either quite complex or almost impossible" [5, p. 172].

Modern studies use different positions to improve the accounting of intangible assets, but also offers a reference to the developments of the past. This applies both to the view of the content of economic matter of certain types of economic resources, and the evolution of accounting techniques in general. For example, I. M. Nazarenko argues that "for an in-depth understanding of the accounting interpretation of the studied category is important retrospective analysis of the development of categorical-conceptual apparatus" [6, p. 135].

Formulation of research goal.

The purpose of the study is to reveal the content of "goodwill" as an accounting and economic category, to conduct a critical analysis of existing principles, approaches and regulations to reflect these objects in the accounting system, to generalize and systematize scientific achievements on approaches to goodwill accounting during the evolution of accounting.

Specific tasks include:

– to find out the essence and components of goodwill, its economic content in the acquisition and creation directly by the enterprise;

– generalize approaches and methods of goodwill valuation;

– to analyze the international and domestic practice of reflecting goodwill in the accounting system, to identify the main problems;

– formulate proposals for improving certain aspects of accounting methods of goodwill accounting.

Scientific novelty: the theoretical component of the study substantiates the need to change the method of accounting for goodwill, the practical orientation of the work reveals the problematic issues of the reflection of goodwill in the accounting system.

Subject and object of research

The subject of the study is the theoretical and methodological principles and practical approaches to the reflection of goodwill and their impact on the completeness and objectivity of information in the financial statements of the enterprise. The subject of the study is the economic nature of goodwill as a component of the value of capital (business/modern companies) and the accounting object of their economic resources.

Methodological approach

General scientific and special methods were used in the research process to perform the set tasks. The method of theoretical generalization was used to substantiate the essential characteristics of goodwill (acquired and created by the enterprise); systematization – to generalize approaches to its reflection in accounting and reporting; abstract-logical – in the process of identifying the features of goodwill accounting in different national systems of accounting standardization. The research is aimed at revealing the existing problems in the reflection in the accounting system of goodwill as an economic resource of intangible type, analysis of the evolution of theoretical accounting approaches, methods and principles of its cost verification for reflection in practical accounting and reporting. The following methods were used to provide scientific knowledge: empirical (modern practice and evolutionary experience of reflecting these objects in practical accounting); normative-legal interaction of regulatory requirements (standardization) and theoretical developments in the field of improving accounting knowledge for the formation of information about goodwill as a component of the value of enterprise capital: a fundamental approach to the essence of goodwill as an object of accounting system components (business reputation, internally generated and acquired goodwill, intangible capital, etc.).

Presentation of the main research material

Accounting is always under the influence of financial and economic doctrines that change over time, and therefore during the evolution of this system, a different definitions and concepts were adopted. In the vast majority of economic theories and accounting conventions, the content of the category "goodwill" was reduced to the fact that it organically combined all the assets of an intangible nature that are available at the enterprise. At different stages of economic interpretation in relation to this object of accounting the terms were used – "intangible assets", "intangible capital", "goodwill", and later – "information and intellectual assets", "intellectual capital" and others.

The improvement of accounting in the processes of its evolution in relation to the acquired and internally generated goodwill of the enterprise was carried out on the basis of such objects as a trademark, brand, business reputation, etc. At the same time, the prevailing position of scientists was that both goodwill and various intangible assets are the values of fixed assets and represent the real value of the capital of the enterprise. In accounting historiography on the subject under study, it is believed that the oldest established concept of goodwill is given in the "A Counting House Dictionary" in 1883 [7]. It defines goodwill as the

advantage associated with a good reputation in business. Goodwill is said to be valuable because the business acquired at an "inflated" price is expected to bring in excess profits. Later goodwill is associated with its component (brand names, patents, trademarks, copyrights).

In the period of the formation of theoretical and scientific principles of accounting in it with varying degrees of specification, the category of "intangible assets" contained four types of assets: goodwill, patents, trademarks and copyrights, which were combined on the basis of lack of material form. The intellectual capital market formed during this period required formalized information, that is the need to reflect intangible assets in the company's financial statements. This has led to increased attention of scientists to develop satisfied methods for the accounting system.

In accounting historiography, L. R. Dicksee is recognized as a well-known scholar in the field of accounting for intangible assets. It is believed that the article (lecture) "Goodwill and its Treatment in Accounts" published by him in the economic journal The Accountant in 1897 [8] and the manual published in 1906 laid down certain basic provisions for the definition of this accounting object [9]. According to this scholar, "goodwill as an asset includes the benefits that a business owner receives where the value of the business depends on business relationships – goodwill received in the acquisition of a business consists of the right to use those relationships". In other words, the elements of business relations were emphasized in these works – clients will continue to increase cooperation with the company. In his works, the author from a problematic point of view considered the method of estimating goodwill and the order of its reflection on the accounts.

Among the scholars who studied the problem of goodwill accounting was a practicing accountant and the founder of the London firm of chartered accountants Leake P. D. In 1914 he published an article "Goodwill, its nature and evaluation" and in 1921 published a book "Commercial goodwill: its history, value and treatment in accounts" [10].

Goodwill was seen as a collection of intangible assets: patent law, copyright and the right to conduct business, taking into account the use of brand names and trademarks. It was believed that the total working energy of these assets provides additional income in the future. In his proposed principles of construction of the valuation methodology, a postulate was put forward – the current market value of the business is associated with the criterion of future (expected) benefit. In this work was formulated "Super-profit Valuation Theory of Goodwill", according to which goodwill was considered as a right formed on the basis of past resources spent for the expected profit (increase in the value of the company). The value of goodwill in this sense depends on the probability of earning future profits. The described theory became, in fact, the basis for the formation of a profitable method of estimating goodwill.

Another scholar who studied the problems of goodwill accounting was Hatfield H. R., who in his work "Modern Accounting, its principles and some of its problems" [11] argued the impossibility of objectively assessing goodwill and took the position that in the financial statements of this object should be reflected subject to its purchase for the amount paid. Many scholars have criticized the approach to goodwill valuation based on expected super profits, one of which was Kaner H. A. His "New Theory of Goodwill" [12] stated that super profit is a variable and the theory of goodwill valuation based on it is incorrect. These arguments have given a new impetus to the study of accounting for intangible assets.

In 1944, the Accounting Procedures Committee of the American Institute of Accountants issued the world's first normative document – Accounting Research Bulletin No. -24 "Accounting for Intangible Assets" [13]. It substantiates the nature of intangible assets and discloses the rules relating to the recognition, measurement and order of their accounting. The defining feature of this document was the division of all intangible assets into objects with a certain useful life (patents, copyrights, licenses, franchises) and objects with an indefinite term (trademarks, trade secrets, perpetual franchises, subscriptions and organizational costs). For both types of intangible assets, a cost estimate was used. Various approaches to improving the accounting of intangible assets or goodwill have been proposed, including in the accounting developments of East Galician accountants of the past [14].

In accordance with international and domestic accounting standards, goodwill refers to intangible assets. However, this object differs in its features from the "traditional" intangible assets (for example, trademarks that still have a graphic image, or a license – documented, know-how confirmed by technical documentation). All intangible assets are reflected in the accounting by the amount of acquisition, or, at the same time, the value measure of goodwill is quite conditional.

International Financial Reporting Standard No. 38 "Intangible Assets" and other standards specify that goodwill is not recognized as an asset because it is not an identified resource that cannot be measured reliably. In the reports of some British companies there is an article "Business reputation", which is affixed a symbolic amount of 1$, that is confirmation that the company has a reputation that can't be expressed in value. At present, there are trends of revaluation of goodwill in current accounting. For example, the US adopted a new accounting standard FAS "Accounting for goodwill and intangible assets", the provisions of which abolish depreciation and regulate the annual analysis and revaluation of goodwill with the write-off of part of its value at the expense of the company.

Despite the initial number of studies of goodwill, there is still no single interpretation of this concept. There are several approaches to understanding it – for example, economic and accounting. Under both approaches, goodwill is treated as an intangible asset, but under the first one it may arise in the course of the entity's current operations as a set of identified assets from which the company will receive certain economic benefits in the future. Such goodwill is also called internal.

According to the accounting approach, unlike the previous one, goodwill is recognized only at the time of merger (or acquisition) of enterprises. The assertions of international financial reporting standards and Ukrainian national accounting standards are based on the second approach (table 1), as they are based on the condition of business combination.

Table 1

The content of goodwill in accordance with accounting regulations

Name of the standard	The content of goodwill
IFRS 3 "Business combinations"	Goodwill is an asset representing the future economic benefits arising from other assets acquired in a business combination that are not individually identified and separately recognized [15].
Ukrainian Accounting standard 19 "Association of enterprises"	Goodwill is the excess of the cost of acquisition over the buyer's interest in the fair value of the identified assets, liabilities and contingent liabilities received at the acquisition date.
The tax code of Ukraine	Goodwill is an intangible asset the value of which is defined as the difference between the market price and the book value of the assets of the enterprise as a whole property complex, resulting from the use of better management, dominant position in the market of goods, services, new technologies, etc.

Within each approach, goodwill is treated as a way of measuring a company's value. The authors focus on various aspects: future economic benefits, intangible benefits, and so on. Summarizing the above definitions, goodwill can be interpreted as a specific intangible asset of the enterprise, the value of its business reputation, which is formed under the influence of certain factors, which in the process of purchase and sale allows the company to gain additional benefits or losses.

The above statements show an important feature of goodwill – it cannot be separated from the company, it cannot be sold without the implementation of the entire business. Accordingly, without being the object of sale, goodwill has no price.Just as there is no single interpretation of goodwill, there is no generally accepted classification of the factors that determine it.

Typically, such factors include: reputation, trademarks, patents of the company, its customer

base, inventions, business model, well-established process of production of goods or services, and so on. Obviously, different scientists have their own assumptions about the components of goodwill. For example, Kevin Prall, Technical Director in the Valuation and Business Analytics practice of BDO, identifies 4 components of goodwill [16].

The first component, reputation, is to some extent recognized among intangible assets in the form of a trademark, but it is impossible to tie all the prestige of the company, the loyalty of its customers, which is also part of reputation, so these elements are partially included in goodwill. Under the infrastructure, the author describes the company's capabilities to create "future technologies", because they are created from existing assets – labor, know-how, basic technology, etc. and will be able to bring excess profits over the life of identified technological assets.

The company's workforce is often underestimated. It does not mean specific individuals, but their knowledge and experience, which will allow the company to continue its activities after its acquisition or merger without the need to train new staff. Workforce cannot be identified as an asset that should be recognized separately from goodwill, therefore, in accordance with international standards, any value allocated to it belongs to the category of goodwill. The synergy of all these elements, the fact that all elements of the business are physically and functionally assembled creates a specific intangible value for the company.

According to the American scientist Robert F. Reilly, the factors that influence goodwill are combined into three components [17]:

1. The company has assets ready for use. Like K. Prall, the scientist pays special attention to the synergy of assets.

2. The presence of excess profits. This element can't be distributed among specific fixed assets of the enterprise. It is best seen in comparison – if a competitor had the same tangible and intangible assets as our company, it would not guarantee him a profit of the same level.

3. Expectations of future events that are not related to current operations of the enterprise. Goodwill may arise from future investments, mergers and acquisitions, customer transactions and future services and products invented.

Determining the value of goodwill is not an easy task, as it is influenced by a significant number of factors, several of which are summarized in Table 2.

Table 2

Factors affecting the value of goodwill

Factors	Characteristic
Location of the company	Favorable location of the company allows you to attract more customers, which leads to increased turnover and increased value of goodwill
Management skills	Thanks to effective management – the established process of production, distribution of production, profits of the company increase that positively influences goodwill
Time factor	A company that has been operating in the market for years or even decades, compared to a new company that has the same strengths, will have more trust from customers, a better reputation
The nature of the business	A company that manufactures or sells high-quality products, has a stable demand for its products, favorable government regulation, easy access to raw materials, can make higher profits, and therefore have a higher cost of goodwill
Reputation of the owner	An owner who has a good personal reputation in the market attracts more customers to his business
Profitability	This factor is one of the most important, because fluctuations in the company's profitability can negatively affect the value of goodwill. At the same time, the upward trend in profits will lead to an increase in goodwill

There are also many approaches to valuing goodwill. The following can be called basic:

1. Accounting approach. Under this approach, goodwill is calculated as the difference between the amount paid (or the value of assets transferred) for the company and the value of its identified assets.

This approach is provided by national and international regulations [15]. However, this does

not mean that this approach has no drawbacks. There are problems with taking into account such goodwill after the merger – you need to confirm the fact that goodwill, which appeared on the balance sheet, really benefits as additional income or otherwise. Another disadvantage is that the structure and purpose of the components of goodwill are clear only to accountants, financiers, top managers, and for other stakeholders such things remain to be unknown.

2. "Excess" approach. According to this approach, goodwill allows the company to generate additional ("Excess") profits. That is why the value of goodwill in this case is equal to the amount of excess profits, cash or other benefits received.

3. Value approach. Under this approach, goodwill is measured by determining the fair value of the replacement of its components.

There are a dozen specific evaluation methods for each approach. The most common in foreign sources are such as: the method of average profit, the method of excess profit and the method of capitalization. Let's take a closer look at each of them.

The method of average profit. According to this method, goodwill is estimated on the basis of the average profit for the agreed number of years. When using this method, you need to subtract the non-operating profit and, accordingly, add the non-operating loss of the enterprise. The formulas used in this method is shown in Fig. 1.

Average profit = The amount of profit for the agreed number of years / Number of years Goodwill value = Average profit * Number of years purchase

Fig. 1. Formulas for determining the value of goodwill by the method of average profit

Method of super profit. This method refers to the part of the profit that the company receives in excess of its normal profit. The formulas shown in Fig. 2 are used for calculations.

Capitalization method. With this method, goodwill can be calculated through the capitalization of normal profit or super profit.

The capitalization of normal profits means follows: the average profit is determined, then, based on the rate of return, the cost of capital needed to make a profit of this level is calculated. This part of capital is called the capitalized value of average income.

Normal profit =Capital Employed * Normal rate of return/100 Super profit = Actual profit – normal profit Goodwill value = Super profit * Number of years purchase

Fig. 2. Formulas for determining the value of goodwill by the method of super profit

During the capitalization of the super profit, the super profit and the capital required to receive such profit are calculated.

Formulas for both types of capitalization method are shown in Fig. 3.

I. Capitalization of average profit Capitalized value of average profit = Average profit * (100/Normal rate of return) Capital Employed = Total assets – liabilities Goodwill value = Capitalized value of average profit-Capital Employed II. Capitalization of super profit Goodwill value = Super profit * (100/Normal rate of return)

Fig. 3. Formulas for determining the value of goodwill by capitalization methods

In some situations, goodwill may be negative. Such goodwill arises when the total value of a company is less than the net book value of its assets and liabilities, and when reliable forecasts indicate that the company will have economic losses or upheavals in its operations after the acquisition, which current managers cannot cope. Negative goodwill or badwill, as it is also called, is not defined in either the international financial reporting standards or the Ukrainian national accounting standards, but it is stated that its value is written off with the simultaneous adjustment of retained earnings.

In different countries, approaches to assessing goodwill are different (Table 3). In most countries, positive goodwill is written off or depreciated, negative goodwill is not reflected.

It should be noted that according to the source, there are two types of goodwill – acquired

and inherent (internal). From the name it is clear that the first type occurs during the acquisition of a company. This type of goodwill is reflected in the financial statements. Internal goodwill is created throughout the company's operations, so it is virtually impossible to identify or separate from other company assets. Internally generated goodwill is not recognized as an intangible asset in the financial accounting system, and most users, especially investors, still value it, as its presence creates a synergistic effect and affects other assets to generate greater profits.

The existence of unrecognized in the accounting system of the enterprise internally generated goodwill indicates the advantages of the enterprise and its better position in the market. Acquired and internally generated goodwill differ not only in reflection in the financial statements, but also in other features, as shown in Fig. 4.

Table 3

Features of goodwill assessment in different countries

Country	Features of goodwill assessment
Germany	Goodwill is the difference between the market value of the assets acquired and the investment cost. It can be written off when purchased on reserve, or depreciated (in practice, consider a period of 40 years).
France	Goodwill is an intangible asset that is not reported. There are no restrictions on the depreciation period.
Great Britain, Ireland	The difference between the cost of acquisition and the cost of its individual components. Positive goodwill is calculated through write-offs or depreciation.
Spain	When the acquisition price of a company exceeds the net book value of the acquired assets, they can be increased to their market value. The balance should be depreciated over 10 years.
Sweden	Goodwill is accounted as fixed capital, 10 % of which must be depreciated at least annually (over 10 years).
Belgium	It is calculated as the difference between the price paid for the company and the book value of its net assets. Depreciated not more than 5 years; negative goodwill is not reflected.
Estonia	Goodwill on the acquisition of a business unit represents the difference between the purchase price and the real value of the net assets. Positive goodwill is depreciated over 5 years. Negative goodwill is not reflected.

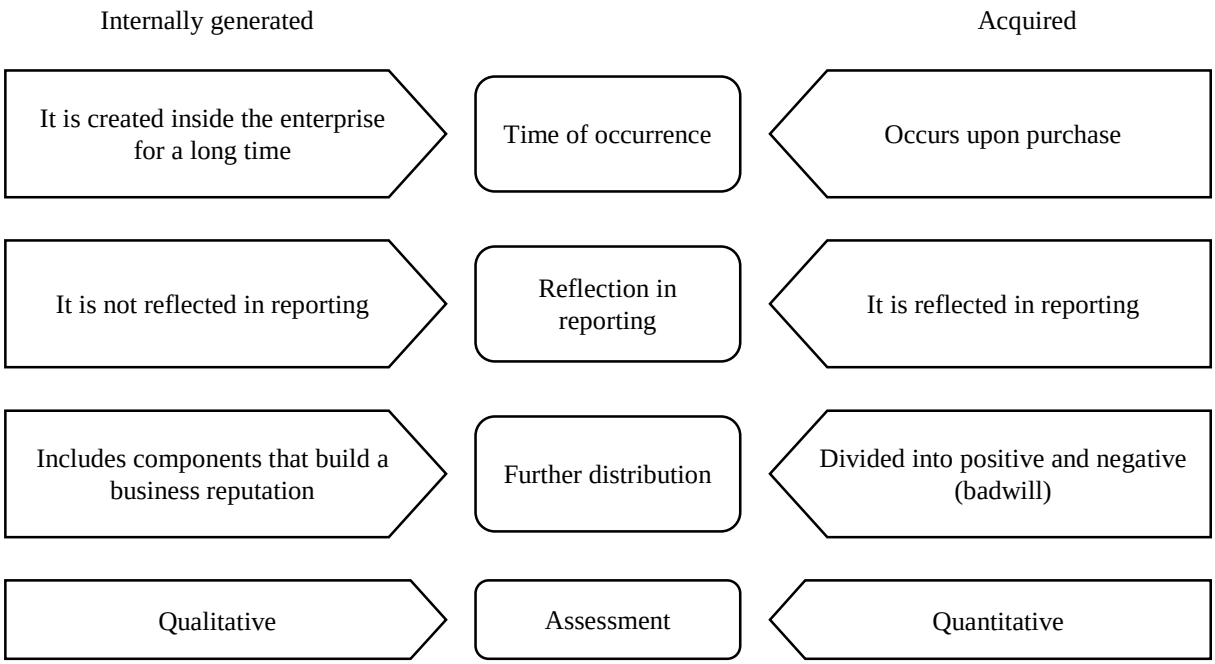

Fig. 4. Features that distinguish acquired goodwill from internal

The analysis of world practice shows the following possible approaches to the reflection of goodwill as an asset in the accounting system:

1. Capitalization of goodwill. The approach involves capitalizing goodwill with or without depreciation. In modern accounting practice, the first option is the most common. In this case, the company must use a certain method of depreciation of goodwill, which primarily depends on the depreciation period. If the activities of the acquire are projected to be impaired in the future, the cost of negative goodwill is recognized as income on a straight-line basis over the period in which the loss occurs. Under the second option, goodwill is accounted for as a non-depreciable asset, but this does not mean that the goodwill valuation is preserved forever. Periodic testing of goodwill for impairment is possible.

2. Fixing goodwill in the account with the subsequent write-off at the expense of various sources. Under the approach, goodwill is not recognized as an asset and its acquisition costs are written off against certain sources, in particular:

1) in international practice, the option of one-time write-off of goodwill by reducing the capital of owners is used. Today in Ukraine it is effective for goodwill in corporatization.

2) in some cases it is possible to write off one-time goodwill as part of the expenses of the reporting period or other components of equity. The current legislation does not regulate the procedure for such write-offs.

The main problem of goodwill accounting in Ukraine can be called non-reflection in the accounting of components of internal goodwill (there is reflection of acquired only). At present, the value of goodwill is reflected in the Goodwill account in accordance with the chart of accounts, but its analytical accounts do not reflect the business reputation, image, business relationships, customer base and other components of internal goodwill. The debit of the Goodwill account reflects the positive goodwill on the acquisition, on credit, its write-off (in correspondence with the withdrawn capital account and loss from impairment) (in correspondence with the expense account). So there is also the problem with financial statements, because internal goodwill is not reflected in it.

Once goodwill is recognized as an asset, it is subject to a systematic impairment test. According to ASU-2021-03, such testing should be performed if events have occurred that could affect the fair value of the entity. IAS 36 “Impairment of Assets” describes examples of significant adverse effects, including changes in the economic or market environment in which the company operates and the situation where the carrying amount of the company's net assets is greater than its market capitalization.

Covid-19 has caused a significant deterioration in economic conditions for many companies, such as tourism, construction, trade, education, etc., so the test for impairment of assets, including goodwill, must be conducted.

Conclusions and prospects of further research

Based on the developed theoretical and legal sources, it can be concluded that the existence of goodwill is objective in nature, and this allows us to assert the need to reflect in the accounting system both acquired and created by the enterprise goodwill. Today, the significance of this category is the regulation of the establishment of an objective expression of the capital of the enterprise and the value of the business. The main problem with goodwill remains its ambiguity, the lack of universal approaches to its definition, as well as the lack of research on internal goodwill and its non-reflection in the financial statements.

The acquisition of goodwill is usually made at the expense of the equity of the purchasing entity, and therefore the write-off of the value of goodwill from impairment should be made at the expense of capital, and not attributed to costs. A possible option is to write off the lost business reputation at the expense of “reserve capital”.

This becomes especially evident in crisis situations within the national or global economy. In order to create such a target reserve capital, it is necessary to include it in the international standard “Business combinations” at the state level. To reflect the lost (written off) value of goodwill, it is proposed to open a counter-passive item (including a counter-passive account) in the “Equity” section of the balance sheet liability, which will allow to interpret changes in the company's position in capital and investment markets.

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DISADVANTAGES OF THE METHODOLOGY AND PRACTICE OF ANALYSIS OF THE FINANCIAL STATUS OF THE ENTERPRISE: CAUSES, CONSEQUENCES, WAYS OF ELIMINATION

Abstract: Today, businesses operate in conditions of significant competition and a high level of unpredictability of changes in the environment. Therefore, for each company even more important is the importance of making optimal management decisions. A significant number of decisions are made based on the results of the analysis of the financial condition of the enterprise. However, the existing methodology and practice of financial analysis have many different types of shortcomings that significantly distort the results of the analysis. The main shortcomings can be grouped into the following groups: organizational, methodological, technical, legislative, conceptual, informational. As a result of their presence, many users of financial information form incorrect conclusions and make suboptimal management decisions, which negatively affects the future results of the enterprise, related entities and the economy in general. Therefore, the purpose of scientific work is to study the shortcomings of the methodology and practice of financial analysis, and to find ways to address these shortcomings. The article examines foreign and domestic experience in analysing the financial condition of enterprises; identified and grouped the shortcomings of the methodology and practice of this type of analysis; the importance of taking into account the factors of its internal and external environments during the analysis of the financial condition of the enterprise is substantiated; recommendations for eliminating a number of shortcomings of the analysis of the financial condition of enterprises are offered. The results of the study will help to obtain much more reliable results of financial analysis, which will improve the quality of management decisions of operational, tactical and strategic nature.

Key words: analysis methodology; financial condition of the enterprise; shortcomings and ways to eliminate them; practice of financial condition analysis; financial indicators; subjects of financial analysis.

Formulation of the problem

Today, businesses operate in conditions of significant competition, which further increases the importance of making optimal management decisions on which depends the efficiency of each enterprise. A significant number of decisions are made based on the results of the analysis of the financial condition of the enterprise. The existing methodology and practice of analysing the financial condition of the enterprise contains a number of shortcomings (Fig. 1), which significantly distort the

results of the analysis and as a result lead to the formation of incorrect conclusions, assumptions and management decisions of operational, tactical and strategic nature.

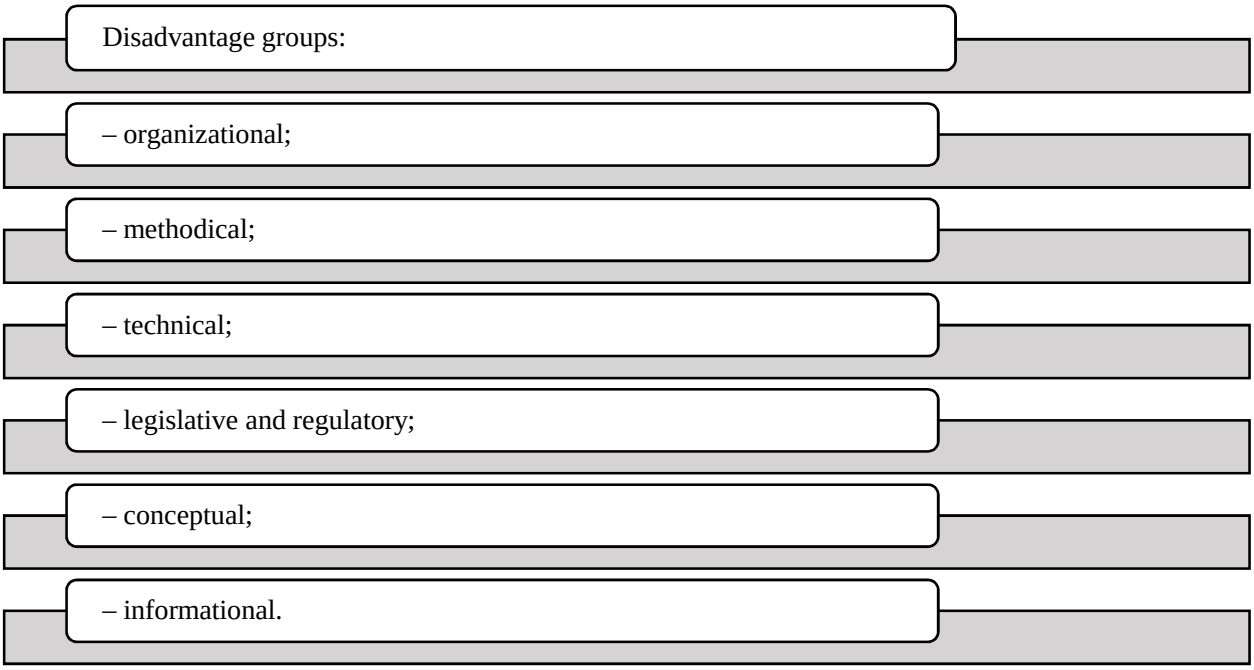

Fig. 1. Groups of shortcomings related to the methodology and practice of analysing the financial condition of enterprises

Organizational shortcomings in particular include the often incorrect organization of financial analysts, and in particular their failure to identify (before analysing the financial condition of the enterprise) problems and distortions that have arisen at different stages of transformation of information needed for analysis. Methodological shortcomings in particular are the lack of detailed tables of interdependence of changes in various financial indicators, disregard in the analysis of the financial condition of important industry features of the enterprise, insufficient consideration in domestic methods of analysis of modern foreign practice. Technical – the use of outdated computer programs for financial analysis or the use of any relevant information systems. Legislative and regulatory – differences in the regulatory framework for the calculation formulas and regulatory values of the same indicators, the lack of justification of the established level of regulatory values, in particular in terms of different activities. Conceptual – the obsolescence of approaches to the analysis of financial condition, which are still not adapted to modern conditions of enterprises, the need to take into account during this analysis of dozens of factors of internal and external environment, including non-financial quality indicators. Information shortcomings are in particular the lack of prompt and complete information for the analysis of the financial condition of the enterprise, the low informativeness of domestic Internet resources, which contain information about enterprises (for example, the annual financial reporting appear on them in 4–5 months after the end of the reporting period), lack of reliable, comprehensive and operational statistical information, etc.

Relevance of the research topic

The above shortcomings of the methodology and practice of financial condition analysis affect not only the management decisions of the management of enterprises, but also a significant number of different groups of entities shown in Fig. 2.

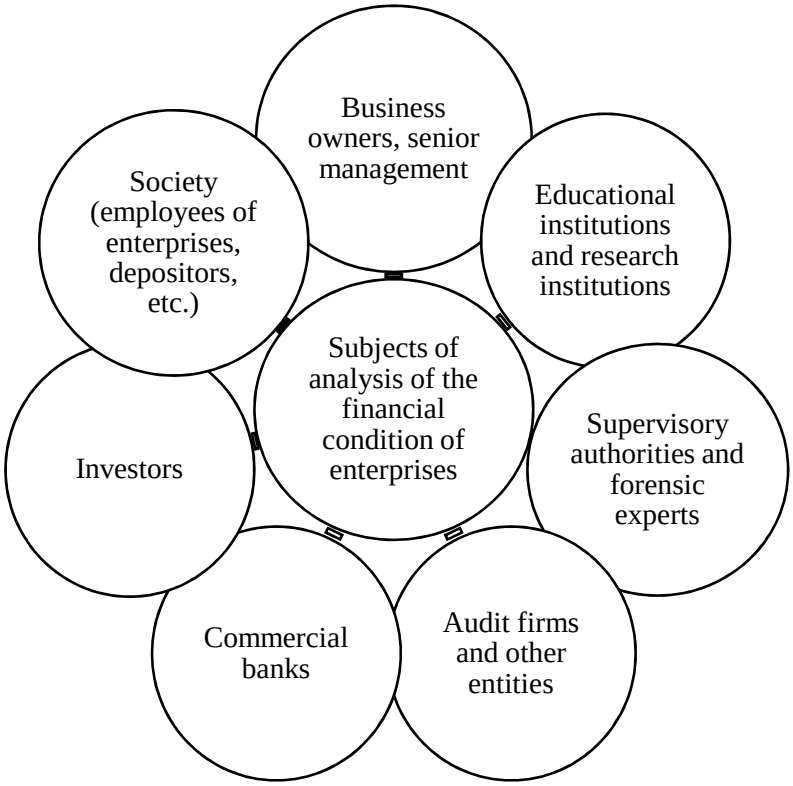

Fig. 2. Groups of entities whose conclusions and decisions are affected by the shortcomings of the methodology and practice of analysing the financial condition of enterprises

These shortcomings have a different essentially negative impact, in particular, on:

– business owners and senior management (deficiencies in particular lead to incorrect management decisions due to the use of unreliable results of the analysis of the financial condition of enterprises);

– supervisory authorities (deficiencies lead to the formation of incorrect conclusions about the suspicion of bringing the company to bankruptcy or concealment of bankruptcy, etc.);

– audit firms (shortcomings in particular lead to the provision of inappropriate audit opinion on the possibility of ensuring the principle of continuity of the enterprise, and may lead to failure to detect certain fraudulent actions, aimed at distorting the financial condition of the enterprise);

– commercial banks (deficiencies lead to incorrect assessment of the financial condition of the debtor or potential borrower);

– investors (shortcomings in particular often lead to incorrect decisions on the feasibility of investing in the company, joining the co-founders, acquisition of the company, etc.);

– society in general, including citizens who may be in particular in the status of employees of enterprises, depositors (shortcomings in particular lead to incorrect decisions on the choice of place of work, the bank for the deposit, which further leads to financial losses of members of society);

– educational institutions (shortcomings lead to a decrease in the level of training of future financial analysts due to the use in the educational process of imperfect methods of financial analysis, etc.).

That is, the correctness of the methodology and practice of analysing the financial condition of enterprises is important for many groups of entities – both internal and external. Therefore, a very important issue is to improve the methodology of analysis of financial condition, taking into account in domestic practice adapted to our realities of foreign experience of this type of analysis.

Analysis of recent research and publications

Researchers are exploring various aspects of financial analysis. Ivchenko L. V. and Lezhnenko L. I. [1] considered the problems at the stage of formation of financial statements, which will affect in the future and the analysis of the financial condition of the enterprise. Sobchenko T. S. and Soskida Yu. M.

[2] investigated the peculiarities of the analysis of the reporting of small business entities. Soroka Y. J. [3], Torshin E. A. [4] studied foreign experience in assessing the financial condition of enterprises in modern business conditions. Fesenko V. V., Zagorelska T. Yu. [5], Bezverkhy K. V. [6] investigated accounting distortions and their impact on financial statements, manipulation of financial results. Klebanova T. S., Dymchenko O. V., Rudachenko O. O. [7] emphasized the importance of preventing the crisis of enterprises. Legenchuk S. F., Polishchuk I. R., Brokhun N. S. [8] investigated the mechanism of disclosure of financial and non-financial indicators in integrated reporting. Azarova A. A. [9] stressed the importance of using the coefficient method for the analysis of financial condition, as it will allow to take into account the influence of both internal and external factors.

Most often in domestic and foreign literature sources, the analysis of the financial condition of enterprises is proposed to be carried out in the areas presented in Fig. 3.

Directions of analysis of the financial condition of the enterprise		
1. Analysis of absolute indicators of financial statements (net income and profit, equity, asset value, etc.).	2. Analysis of individual ratios and other indicators for the following groups: – indicators of solvency of the enterprise and its liquidity; – indicators of business activity; – indicators of financial stability; – profitability indicators; – indicators related to the profitability of shares, dividends per share, the ratio of the market price of one share to the net profit attributable to it.	3. Analysis of complex indicators (integrated indicators).

Fig. 3. Directions of analysis of the financial condition of the enterprise

The first direction of analysis, in particular, involves horizontal and vertical analysis of reporting, analysis of trends in absolute financial performance of the enterprise for recent reporting periods. The second direction – involves the calculation of individual coefficients and other indicators in terms of several groups. The third direction – involves the calculation of integrated indicators (for example, determining the level of threat of bankruptcy). Based on the results of the analysis in these areas, information users form their conclusions and make decisions. However, today is characterized by a large number of approaches to calculate the same indicators, which can lead to incorrect comparison of the results of the analysis of the financial condition of different enterprises and creates opportunities for companies to manipulate the results of the analysis in their own interests.

The purpose and objectives of the study

The aim is a comprehensive study of the shortcomings of the methodology and practice of the financial condition of the enterprise for further development of recommendations on ways to correct existing problems of financial analysis. The tasks are: research of foreign and domestic experience of analysis of the financial condition of enterprises, in particular approaches to determining indicators; identifying and grouping the shortcomings of the methodology and practice of this type of analysis; substantiation of the importance of taking into account during the analysis of the financial condition of the enterprise the factors of micro-, meso-, macro- and global environments of the enterprise; development of recommendations for eliminating a number of shortcomings of the analysis of the financial condition of enterprises. The results of the study will help to obtain much more reliable results of the analysis of the financial condition of enterprises,

which will improve the quality of management decisions of operational, tactical and strategic nature.

Presentation of the main material of the study and the results obtained

In Ukraine, various entities (auditors, employees of commercial banks, specialists of supervisory authorities, forensic experts, etc.) use different regulations [10–12], which regulate the definition of indicators of financial condition of enterprises. In the Table 1 shows the approaches to the calculation of the most common indicators of financial condition in domestic and foreign practices.

Table 1

Approaches to determining some key indicators of the financial condition of the enterprise

<table>
<tr><td colspan="3">Domestic practice</td><td>Foreign practice [13]</td></tr>
<tr><td colspan="3">1</td><td>2</td></tr>
<tr><td>Resolution of the Board of the National Bank of Ukraine No. 351 [10]</td><td>Methodical recommendations of the Audit Chamber of Ukraine No. 99 [11]</td><td>Methodical recommendations of the Ministry of Economy of Ukraine No. 14 [12]</td><td></td></tr>
<tr><td colspan="4">Analysis of solvency and liquidity of the enterprise</td></tr>
<tr><td>Current ratio = CA / CLC,
where:
CA – current assets;
CLC – current liabilities and collateral</td><td rowspan="2">Coverage ratio (total liquidity)** = CA / CL
where:
CL – current liabilities</td><td>Current (overall) liquidity ratio** = CA / BC,
where:
BC – borrowed capital (long-term and current liabilities of the enterprise).</td><td rowspan="2">Current liquidity ratio = CA / CL</td></tr>
<tr><td>Total liquidity ratio = CA* / CLC</td><td>Coverage ratio** = CA/CL</td></tr>
<tr><td colspan="4">Analysis of business activity</td></tr>
<tr><td rowspan="2">Inventory turnover ratio =
= 365 × EIBA / COGS
where:
IBA – the value of stocks and current biological assets at the end of the year;
COGS – cost of goods sold (goods, works, services) for the year</td><td>Inventories turnover ratio***
TR_i = COGS / ((BI. + EI) / 2),
where:
I – inventories;
letters “B” and “E”. indicate the value of indicators at the beginning and end of the period, respectively</td><td rowspan="2">Inventory turnover ratio = 360 / TR_i</td><td rowspan="2">Inventory turnover ratio =
=365 × ((BI +
+ EI) / 2) / COGS</td></tr>
<tr><td>Term of turnover of inventories = T / TR_i
where:
T – the duration of the period (is usually taken for 365 days)</td></tr>
<tr><td rowspan="2">The turnover of accounts receivables**** = 365 × EAR / N,I
where:
AR – receivables for products, goods, works, services;
NI – net income from sales of products (goods, works, services) for the year</td><td>Accounts receivables turnover ratio
TR_{CAR} = NI / ((BCAR. +
+ECAR.) / 2),
where:
CAR – current receivables</td><td>Turnover of funds in the calculations
TR_{TAR} = In / ((BTAR +
+ ETAR.) / 2),
where:
In – income from sales of products (goods, works, services);
TAR – long-term and current accounts receivables</td><td rowspan="2">Accounts receivable turnover ratio =
= 365× ((BAR +
+ EAR) / 2) / NI_c,
where:
NI_c – net income arising from the sale of goods, works, services on a post-payment basis</td></tr>
<tr><td>Maturity of receivables =
= T / TR_{CAR}</td><td>Turnover time of funds in calculations = 360 / TR_{TAR}</td></tr>
</table>

Continuation of Table 1

1			2
The turnover of accounts payable = 365 × EAP / COGS, where: AP – current accounts payable for goods, works, services	*Accounts payable turnover ratio* TR_{CAP} = NI / ((BCAP + + ECAP) / 2), where: CAP – current accounts payable without taking into account debts on short-term bank loans, current debts on long-term liabilities, without taking into account the item "Other current liabilities", current collateral and deferred income	*Turnover time of accounts payable*** = = 360× ((BBC + EBC) / 2) / COGS	*Accounts payable turnover ratio* = =365× ((BAP + +EAP) / 2) / NCP, where: NCP – net credit purchases
	Maturity of accounts payable = T / TR_{CAP}		
Analysis of financial stability			
Capital ratio = SE / TC, where: SE – shareholder's equity; TC – total capital (total assets of the balance sheet)	*Solvency ratio (autonomy)* = = SE / TC	*Coefficient of financial autonomy* = SE / TC	*Equity ratio* = = SE / TA, where: TA – total assets
–	*Funding ratio***** = = BC / SE	*Financial leverage ratio* = (TC – SE) / SE	*Debt equity ratio* = = BC / SE
Analysis of financial results and profitability of the enterprise			
Operating return on assets ****** = FR_o / ETA, where: FR_o – financial results from operating activities	*Return on assets* = = NP / (BTA + $ETA_.$) / 2, where: NP – net profit	*Return on assets* = = 100 % × NP / (BTA + + ETA) / 2	*Return on assets ratio* = =NP / (BTA + +ETA) / 2
Return on assets before tax ****** = FR_b / ETA, where: FR_b – financial results before tax			

Notes:

** – current assets are taken into account for calculation only in the part of stocks, biological assets, receivables for products, goods, works, services, as well as cash and cash equivalents.*

*** – for the calculation take the obligations given in the formula, but without taking into account the collateral and deferred income; for calculation take current assets without taking into account the costs of future periods.*

**** – stocks in the formula include production stocks, animals for breeding and fattening, work in progress, finished products, goods.*

***** – as amended on November 7, 2019, the receivables turnover ratio was removed from Table 3 of Annex 7 to Regulation No. 351.*

****** – BC for this formula is defined as the sum of long-term liabilities, current liabilities, collateral for subsequent expenses and payments, deferred income.*

******* – in the wording of November 7, 2019, the indicators of return on assets were removed from Table 3 of Annex 7 to Regulation No. 351.*

As you can see from Table 1, there are different approaches to the calculation of the same name indicators (for example, the turnover ratios of receivables and payables) in different domestic regulations and foreign practice. This is a problem, because it creates difficulties in comparing the published indicators of different companies, if you do not know what method is used by each of them.

Also, there is a problem when the same company is analysed using different regulations of different groups of entities. Another problem is the different names of indicators with the same formulas for their calculation. For example, according to Resolution No. 351 we have – capital ratio, according to Methodical recommendations No. 99 – solvency ratio (autonomy), according to Methodological recommendations No. 14 – financial autonomy ratio, and in foreign practice – equity ratio. In the Table. 2 shows the calculation of indicators of financial condition, the formulas for determining which there are differences in various domestic regulations, on the example of PJSC "Kyivstar" [14].

The results of the analysis of the financial condition and activities of PJSC "Kyivstar" for 2020 confirm our statement about obtaining different results, using the approaches given in various domestic regulations and approaches used in foreign practice. Consequently, this will lead to significant differences in the conclusions of various subjects of analysis (including domestic and foreign investors, auditors, supervisors, forensic experts, employees of commercial banks and many other users of the results of financial analysis). Therefore, the urgent task at the state level is to eliminate differences between domestic regulations and take into account foreign experience in calculating the relevant financial indicators.

In foreign practice (Table 3) widely used indicators EBITDA (Earnings before Interest, Tax, Depreciation and Amortization), EBIT (Earnings before Interest and Tax), EBT (Earnings before Tax) to analyze the profitability of companies, to compare companies with their competitors, enterprises that have the same owner, but which operate in different areas or countries, or with other companies that are somehow related to the analyzed.

Table 2

Some indicators of the financial condition of PJSC "Kyivstar" for 2020

<table>
<tr><td colspan="3">Domestic practice</td><td rowspan="2">Foreign practice [13]</td></tr>
<tr><td>Resolution of the Board of the National Bank of Ukraine No. 351 [10]</td><td>Methodical recommendations of the Audit Chamber of Ukraine No. 99 [11]</td><td>Resolution of the Board of the National Bank of Ukraine No. 351 [12]</td></tr>
<tr><td>Current ratio = 0.27</td><td rowspan="2">Coverage ratio (total liquidity) = 0.29</td><td>Current (overall) liquidity ratio = 0.15</td><td rowspan="2">Current liquidity ratio = 0.27</td></tr>
<tr><td>Total liquidity ratio = 0.24</td><td>Coverage ratio = 0.29</td></tr>
<tr><td>The turnover of accounts receivables = 9.67 days</td><td>Maturity of receivables = 12.21 days</td><td>Turnover time of funds in calculations = 10.04 days</td><td>Accounts receivable turnover ratio* = = 83.95 days</td></tr>
<tr><td>The turnover of accounts payable = 61.9 days</td><td>Maturity of accounts payable = 91.87 days</td><td>Turnover time of accounts payable = 516.15 days</td><td>Accounts payable turnover ratio = = 55.69 days</td></tr>
</table>

** Note. Assume that only 80 % of NP were on post-payment terms*

Table 3

General characteristics of EBITDA, EBIT and EBT and advantages of their use

Name and calculation of the indicator	Advantages of application
EBITDA (Earnings before interest, taxes, net of depreciation) = EBT + I + DA where: EBT – pre-tax profit; I – interest payable in this period; DA – depreciation of non-current assets	Ability to compare companies with different accounting policies in terms of period and depreciation method.
EBIT (Profit before interest and taxes) = EBT + I	Ability to compare the financial results of competing companies operating in the same industry, but which attract borrowed capital at different loan rates, terms of interest payment
EBT (Profit before tax)	Ability to compare companies with different tax burdens

Source: [15]

Aside from the benefits of using EBITDA, there are issues that are hard not to notice. This is the lack of a single approach to the calculation of EBITDA without the risk of distortion of results due to disregard for the specifics of the activities of a particular enterprise in different countries. Therefore, the calculation of normalized (adjusted) EBITDA is popular among public companies, which is adjusted in particular for certain types of costs and revenues that are specific to the activities of a particular enterprise, or the adjustment of which is necessary due to certain events. In particular, due to the COVID-19 pandemic, the normalized EBITDA can be adjusted for lost sales revenue due to supply disruptions, operational inefficiencies, unforeseen changes in the cost structure, termination of contracts due to the pandemic, and so on.

Scientists have different attitudes to the use of normalized EBITDA. Some experts justify the benefits of using this indicator, while others, on the contrary – consider the existence of individually adjusted costs and revenues a significant problem. Some authors argue that EBIT and EBITDA, which are calculated in a way other than the classical way, cannot be called so. Therefore, companies that use a non-conventional classical formula for one reason or another, call these indicators differently, often adding the word "adjusted" [15]. Different calculation methods lead to incomparability of indicators of different enterprises and create opportunities for manipulation of these indicators in an effort to improve their value.

In Ukraine, EBITDA is mostly calculated only by those companies that are subsidiaries of foreign companies or which also operate in foreign markets. The practice of calculating this indicator should be introduced into the activities of Ukrainian companies, as it will allow to more correctly compare the company with domestic and foreign competitors with different differences in depreciation policy, lending conditions and tax rates.

We believe that for a correct analysis of the results of any enterprise still need to consider the normalized EBITDA, while trying to prevent manipulation of its calculation. This will allow to take into account the impact of atypical transactions or events that occurred during the analysed period, namely: extraordinary (non-operating) income and expenses (for example, the sale of all stocks due to production stoppage); significant exchange rate differences; costs of sale (disposal) of non-current assets; impairment losses on various groups of assets, including goodwill; shares of financial result in associates and joint ventures and operations; accrual of reserves for various needs.

Another obstacle to comparing the results of domestic enterprises with foreign ones is the different approaches to defining and ensuring the operating cycle, which, in turn, is associated not only with the specifics of the enterprise (including technical and technological features), but also with established practice. relationships with their counterparties, in particular regarding the terms of settlements, etc. In addition, the quality of current assets management and the efficiency of financial and economic activities of the enterprise as a whole directly affect the duration of the operating cycle [16]. On the other hand, in addition to various micro- and meso-environments of Ukrainian and foreign enterprises, the macro-environment also has an impact on the duration of the operating cycle, the factors of which are: the state of the economy, inflation, credit relations, products, the tax system in the country, legislation and regulations, etc. It should be noted that an individual enterprise is largely unable to influence the factors of the macro-environment, and therefore it adapts to their influence, in particular, on the operating cycle. Also, it is important to take into account the influence of the above factors when analysing the causes of deterioration of the financial condition of the enterprise.

Today, in the process of analysing the financial condition, it is necessary to understand the conditions in which enterprises operate, and what trends are occurring in the markets of individual countries, regions and the global market in general. For this purpose, in foreign countries (in particular in the USA) Purchasing Managers' Index (PMI) is widely used. PMI calculates and publishes the Institute for Supply Management on a monthly basis. PMI – ranges from 0 to 100. If the index is above 50, it indicates an improvement in operating conditions compared to the previous month. If below 50, then, accordingly, the deterioration of

conditions. When the index value is 50 – no change. Figure 4 shows the dynamics of changes in global PMI, starting from April 2018 until March 2021.

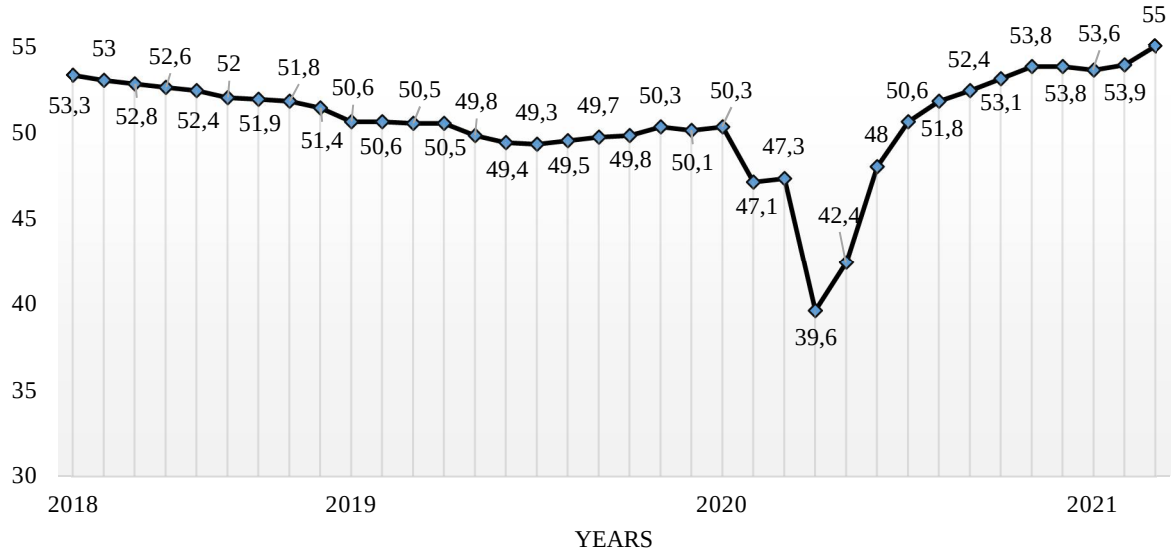

Fig. 4. Dynamics of global PMI change from April 2018 until March 2021. [17]

As we can see from the schedule of changes in the global RMI in recent years, the conditions of business are not stable. During the analyzed period, the lowest level of RMI was 39.6 in April 2020 (the period of strict quarantine, closure of borders in connection with the COVID-19 pandemic, etc.), and the highest – 55 in March 2021. Therefore, the study of methodology and practice of analysis of the financial condition of the enterprise must be carried out taking into account the conditions of the external environment.

To carry out a comprehensive analysis of the financial condition of enterprises, it is necessary to have enough reliable financial and non-financial information (Table 4) for several reporting periods.

Table 4

General characteristics of domestic and foreign sites of generally available information about enterprises

Ukrainian sites	Foreign sites
smida.gov.ua – contains regular and irregular information about issuers of securities; you can find information about registrars, securities traders, depositories, etc.; contains all the facts of offenses committed on the stock market by issuers of securities, etc.	bloomberg.com/markets – available data on futures, commodities, bonds and currencies of companies, current and future economic announcements, etc.
stockmarket.gov.ua – is a publicly available information database of the National Securities and Stock Market Commission about the securities market, in particular in terms of types of participants – issuers of securities, exchanges, traders, rating agencies. In particular, it contains information on transactions on exchanges and off-exchange, etc.	**sec.gov/edgar** – the US Securities and Exchange Commission's Electronic Data Collection, Analysis and Search (EDGAR) database provides free public access to corporate information, including registration applications, prospectuses and periodic reports submitted on 10-K forms (verified annual financial statements) and 10-Q (unaudited quarterly financial statements) etc.
clarity-project.info – contains basic information about companies, including their licenses, related parties, inspections, intellectual property, enforcement proceedings, documents, etc.	seekingalpha.com – contains information on financial markets, articles and research covering a wide range of stocks, asset classes etc.
ZAKUPKI.PROM.UA – detailed information about auctions, commercial and government procurement, etc.	finviz.com – contains in particular information about the participants of stock exchanges.

It is worth noting that there are many more foreign sites with publicly available information about companies. One of their advantages is the availability of up-to-date information on the financial and economic condition of enterprises for a specific day, month, quarter, year (depending on the types of indicators), and not only the data of annual financial statements provided on domestic sites. Also on a number of foreign sites you can see the dynamics of various financial indicators (including graphically presented), as well as grouped financial and economic information for any of the last 12 months and comparative previous periods. Monitoring this information is useful for different groups of users related to a particular company, including creditors, investors, competitors, auditors, buyers, shareholders, and so on. At any time, they can analyse the required indicators of the financial condition of the enterprise. This prompt presentation of information by enterprises once again confirms their transparent conduct of business. In Ukraine, it is necessary to create Internet sites with up-to-date open financial and economic information of enterprises for external and internal users by analogy with foreign sites listed in Table. 4.

Conclusions and prospects for further research

As a result of the study, the shortcomings of the methodology and practice of analysing the financial condition of the enterprise were identified, the impact of these shortcomings on management decisions of users of relevant analytical information, analysed foreign experience in financial analysis, and proposed recommendations to improve the quality of this analysis. In particular, on the example of a real enterprise, differences in approaches to the calculation of the same indicators by name, but regulated by different domestic regulations, as well as a comparison with the approaches that exist in foreign practice. This situation allows different entities to manipulate the results of the analysis of financial condition. In order to solve it, it is necessary at the state level to eliminate differences between domestic regulations that regulate the financial situation, and are used by investors, business owners, regulators, creditors, including commercial banks and more. It is also justified to determine the normalized EBITDA, as this approach will eliminate the impact of atypical transactions or emergencies on the financial result. This will make it possible to more accurately compare the performance of the enterprise for different years.

Among the prospects for further research is the development of recommendations for improving the methodology and practice of analysing the financial condition of enterprises, and in particular taking into account the introduction in Ukraine of taxonomy of financial reporting under IFRS and improving integrated reporting of enterprises and more.

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PROBLEMS AND PROSPECTS OF TRAINING CIVIL SERVANTS IN CONTEMPORARY UKRAINIAN REALITIES

Abstract. The purpose of the article is to identify the main problems in the basic and advanced training of civil servants. Using a retrospective review and taking into account the current situation, develop a strategic plan for further action to improve the system of training of civil servants. Outline priority areas and forms of advanced training of existing staff and basic training of new civil servants to meet the needs of highly qualified and competitive staff. In this article, the authors used the literature review method and analytical method to develop a strategic plan for further action to improve the training of civil servants. Based on these two methods, the priority areas and forms of advanced training of existing staff and basic training of new civil servants were outlined. It is established that the existing system of advanced training and basic training of civil servants still needs to be improved without moving towards the reforms carried out by the National Agency for Civil Service Affairs of Ukraine. The main attention in the basic training should be paid to the practical application of the acquired knowledge. The most effective for full-time students will be the internship of study in public authorities lasting 1 week of each semester. In this case, the topic of internship should correspond mainly to the three subjects studied, and it should take place at the end of the semester as a result before the exam or test. The results of the internship must be evaluated at least 20% of the total grade for the subject. Part-time students are invited to take an internship before the session. Civil service advanced training is encouraged to take place annually in order to be competitive in times of rapid change. Thus the direction of advanced training is recommended to choose independently and to coordinate with the direct head. The number of hours per year must be at least 7 ECTS credits (210 hours), as 1 ECTS credit is insufficient for the effective acquisition of new knowledge. The results of this research can be implemented in the educational process to meet the needs of highly qualified and competitive staff, namely civil servants of the new generation. Also, the findings may be of interest to the leadership of the National Agency for Civil Service Affairs of Ukraine for further effective civil service reform in Ukraine. This article highlights the main problems of today, developed a strategic plan for further improvement of the existing system of training and retraining of civil servants. This will help to take effective steps towards the existing problems and move in the right direction of further reforms, and thus speed up progress towards the EU.

Key words: Civil Servants, Civil Service Personnel, Training, Advanced Training, Public Administration, Training System, Strategic Plan.

Introduction

The condition for the successful development of the state is the stability of its administration, regardless of external and internal factors. The standard of citizens' living in the state depends on the level of efficiency of public administration [3]. The main actors in government are civil servants who interact with society. The image of state power, and the state as a whole, often depends on them. Therefore, it is extremely important to carry out public administration reforms not only in the right direction, but also with appropriate effectiveness. It should be noted that the basis of effective work and successful career advancement is the knowledge obtained during training at the educational and qualification level of bachelor, master or during advanced training [11]. In order to obtain a new generation of public officials it is necessary to implement reforms in the knowledge acquisition system.

The current system of training new civil servants and advanced training of existing employees was preceded by a long process of formation and change, which was directly affects the position on the world stage and the leadership of Ukraine. On July 18, 2011 National Agency for Civil Service Affairs of Ukraine was created. It is the central executive body, which provides:

– formation and implementation of state policy in the field of civil service;

– functional management of the civil service.

In fact, it is part of the civil service management system, which consists of:

– Cabinet of Ministers of Ukraine;

– National Agency for Civil Service Affairs;

– Commissions for senior civil service and relevant tender commissions;

– heads of civil service;

– personnel management services.

On the website of the National Agency for Civil Service Affairs of Ukraine there is knowledge management portal which contains basic information related to the professional training of civil servants, heads of local administrations, their deputies and local government officials. In addition, National Agency for Civil Service Affairs of Ukraine manages:

– Center for Adaptation of the Civil Service to EU Standards;

– Ukrainian School of Government.

In the strategic plan of the National Agency for Civil Service Affairs of Ukraine for 2019–2022, the issue of professional training reforming is one of the priorities, and, therefore, our article is relevant and can find practical application [9].

Literature review

To better understand the current system of training and advanced training of civil servants we need to consider the background. Schematically, the main milestones are shown at Fig. 1. The first steps in shaping the system of professional education of civil servants were made back in 1992. At this time, the Institute of Public Administration and Self-Government was established. Two years later, the Decree of the President of Ukraine of May 30, 1995 №398 / 95 was issued [18].

It concerned the system of training, retraining and advanced training of civil servants. The first point in it was the Academy of Public Administration under the President of Ukraine with branches in Lviv, Dnipropetrovsk, Odessa and Kharkiv. By July 1 of the same year The Cabinet of Ministers had to determine a list of higher education institutions (HEIs) that would also train new civil servants and improve the skills of existing ones. In addition, it was necessary to create centers at each executive committee to ensure a coordinated and methodologically sound approach to training. It was expected that they would be financed from regional budgets.

After the liquidation of executive committees and the creation of regional state administrations, it was decided that they would become the founders of specialized centers with the purpose to provide the necessary knowledge of existing civil servants during the active changes and provide advice to public authorities. Therefore, in 1996 for their legalization the Cabinet of Ministers adopted Resolution 24224 of February 19, 1996 "On the Center for Advanced Training of Civil Servants and Managers of State Enterprises, Institutions and Organizations". It clearly stated that its coordination and control is carried out by the Head of the Civil Service [20]. At the same time, the center was the main generator of educational and methodological support. It is cooperated with the educational institutions, executive authorities and local governments. In the center was full-time, part-

time and mixed form of training and advanced training. Thus, equal opportunities for civil servants of all categories were provided as much as possible, as well as an attempt was made to make training interesting and non-trivial.

A year later, on February 8, 1997, the Resolution of the Cabinet of Ministers No. 167 was promulgated. It was significant because it approved the Regulations on the system of training, retraining and advanced training of civil servants and the Regulations on a single procedure for training, retraining and advanced training of state enterprises, institutions and organizations. It affirmed the main components of the system and its management [14]. Thus the period of formation of personnel, organizational and methodological approaches was ended and the period of development was begun. However, due to the changes by Resolutions of the Cabinet of Ministers No. 1071 from 30.07.1998 and No. 619 from 16.05.2002 it was not perfect. It should be noted that public administration as a branch of science with the degree was awarded on November 29, 1997. On that time the whole system reached a qualitatively new level [2].

On July 7, 2010 the Resolution of the Cabinet of Ministers No. 564 was issued. It is approved the Regulations on the system of training, specialization and advanced training of civil servants, heads of local state administrations, their first deputies and local government officials. In fact, it approved the changed types of professional development. The system of training of civil servants continued to change [15], although this was not the finish line. It was amended by six Resolutions until June 13, 2018.

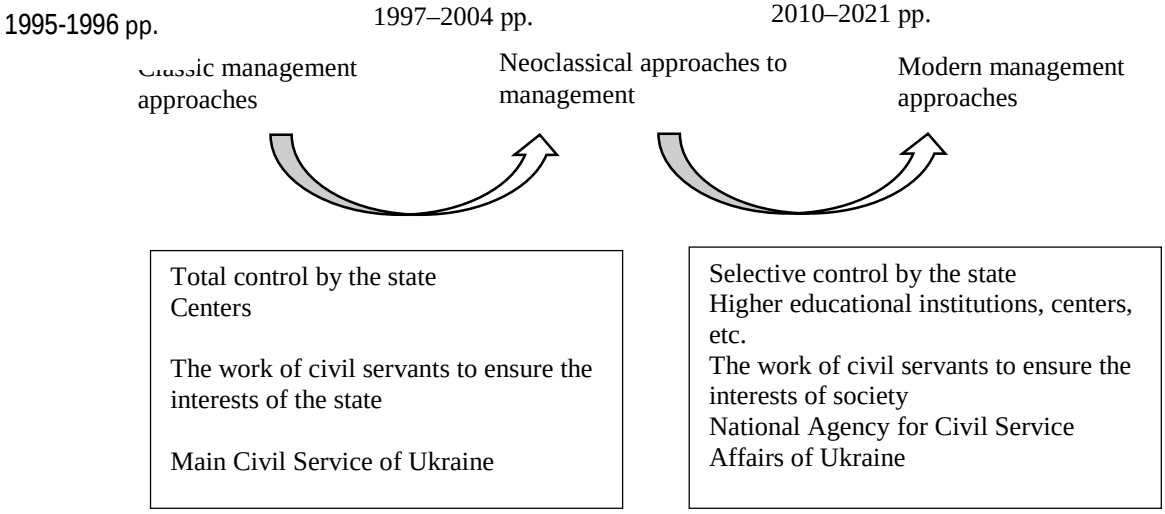

Fig. 1. The main milestones in the development of the system of advanced training and basic training of civil servants

Source: compiled by the authors based on the analysis of literary sources and their own works

Over time, some centers without first licensing in 1999–2000 were eliminated, and the complexity of the requirements further encouraged the centers to develop and improve their human resources. As a result of the adoption of the Law "On Higher Education" in 2014 and the Law "On Education" in 2017, the loss of the status of civil servants by the management of centers (according to the Law of Ukraine "On Civil Service" from December 10, 2015) transferred their activities to the regulation of general and educational legislation [7]. From this time begins the rapid reformatting from the closed system to the open. On February 6, 2019, Resolution No. 106 "On approval of the Regulations on the system of professional training of state investigators, heads of local state administrations, their first deputies, local government officials and deputies of local councils" was issued by the National Agency for Civil Service Affairs of Ukraine. It not only updated the terminology and introduced a new division of training programs, but also legalized the activities of various service providers. Moreover,

the budget of public authorities provided for no more than 2 % of the payroll to pay for relevant services [16]. And all this happened on the background of reducing the number of civil servants at all levels, but increasing their quality.

As part of the civil service reform, on December 1, 2017, the Cabinet of Ministers of Ukraine approved the Concept of reforming the system of professional training of civil servants, heads of local state administrations, their first deputies and deputies, local government officials and deputies of local councils. It outlines the issues of creating appropriate conditions to ensure continuous planned professional development and the creation of an appropriate system for all groups of civil servants. In addition, this Concept approves items on the development of the market of educational services in the field of professional development and quality assessment of educational services [19]. However, there are absolutely no issues of basic education for civil servants.

Within a month after its publication on May 10, 2018, another order № 342 came into force. It approved the action plan for the implementation of the Concept of reforming the vocational training system of civil servants, heads of local administrations, their first deputies and deputies, local government officials and deputies of local councils. It described new methods of developing criteria for assessing the degree of risk from business activities, as well as determined the frequency of planned measures of state supervision (control) [13]. Although clearer evaluation requirements have been introduced, this provision has also proved to be imperfect. Thus, on March 3, 2021, by order № 165-r, another changes were made [12], not only about advanced training of civil servants but on including items on preparation. However, it should be noted that these changes need to be refined.

The Regulation' amendments by Resolution № 532 from June 25, 2020 stated that along with "Governance" appears "Public management and Administration". This was preceded by a large number of works by scientists who studied the essence of the concept of "Governance", "Public Administration" and "Public Management and Administration" [10].

It can be concluded that in governance the object is society, and in public administration – the state. Coercive mechanisms of influence are not used in public administration [1]. Thus, the transition to a fundamentally new system was indirectly legalized, but it also has its shortcomings and needs to be improved (Fig. 1).

Methodological approach

To research the period of formation of governance, public management and administration as specialties for training and areas of advanced training of civil servants, the method of analysis of literature sources was used. To develop a strategic plan for further action to improve the system of training of civil servants an analytical method was used. Based on these two methods, the synthesis of information outlined the priority areas and forms of advanced training of existing staff and basic training of new civil servants.

Substantiation of the subject and methods of research

Substantiation of the subject and research methods

The subject of the research is the problems of training of civil servants in modern Ukrainian realities, which covers the issues of both basic training and advanced training. This problem is extremely relevant because of:

– inclusion of this issue in the number of priorities for NAPS;

– changing of the whole paradigm of advanced training of civil servants in accordance with the Resolution of the Cabinet of Ministers of Ukraine No. 106 of 06.02.2019 [17];

– implementation of National Agency for Civil Service Affairs of Ukraine successive steps towards the development of a systematic approach to the training of civil servants;

– the presence of scientific interest in other authors on the training of civil servants, as evidenced by the presence of articles on this issue. Altough the study of this issue was conducted from different angles, most key points remain insufficiently covered [4].

The selected research methods are completely sufficient for a comprehensive consideration and solution of the problem, as they are characterized by the completeness and reliability of the results. The leveling of the influence of the subjective

perception of the obtained facts was carried out by independent analysis of literature sources and analysis of all data. After that, a comparison of opinions and their generalization was carried out. That is why we can assume that the presented results are fully objective and reflect the real state of affairs.

General and special characteristics of research

Discussion of the obtained results

After a detailed analysis of the information, it was found that training in the specialty "Public management and Administration" in Ukraine is carried out by 97 universities [5]*. Table 1 shows the territorial distribution of these universities.

Table 1

Territorial distribution of universities that conduct training in specialty 281 "Public Management and Administration"

No.	Name of the region	Area of the region, km^2	Population, thousands of people	Number of universities, units
1	Vinnytsia	26492	1529.1	2
2	Volyn	20144	1027.4	0
3	Dnipro	31923	3142.0	10
4	Donetsk*	26517	4100.3	7
5	Zhytomyr	29827	1195.5	1
6	Transcarpathian	12753	1250.1	3
7	Zaporizhya	27183	1666.5	6
8	Ivano-Frankivsk	13927	1361.1	2
9	Kyiv and Kyiv city	28121	4750.7	20
10	Kirovograd	24588	920.1	1
11	Luhansk *	26684	2121.3	3
12	Lviv	21831	2497.8	6
13	Mykolayiv	24585	1108.4	1
14	Odessa	33314	2368.1	3
15	Poltava	28750	1371.5	2
16	Rivne	20051	1148.5	1
17	Sumy	23832	1053.5	2
18	Ternopil	13824	1030.6	2
19	Kharkiv	31418	2633.8	11
20	Kherson	28461	1016.7	1
21	Khmelnytskyi	20629	1243.8	4
22	Cherkasy	20916	1178.3	3
23	Chernivtsi	8096	896.6	1
24	Chernihiv	31903	976.7	3

* – as Donetsk, Luhansk region and Crimea are temporarily occupied territories for 2021 – we do not take them into account in the calculations

Source: systematized by the authors

The Table 1 shows that there is no uniform distribution of universities in the regions. The largest number of them is available in Kyiv, Kharkiv, Dnipro, Lviv and Zaporizhia regions, which covers the East, Center and West of Ukraine. There are 20 universities that train future civil servants in Kyiv region, 11 universities in Kharkiv region, 10 universities in Dnipro region, 6 universities in the Lviv region, and 6 universities in Zaporizhia region. At the same time, their areas are respectively 28121 km^2, 31418 km^2, 31923 km^2, 21831 km^2, 1666.5 km^2. There are 2,119 civil servants in Kyiv region and Regional State Administrations, 462 of which are in the Regional State Administration and 1.467 in the District State Administration. There are 2.449 civil servants

in the Kharkiv Regional and District state administrations, 608 of which are in the Regional state administration and 1,841 in the Districtl state administration. There are 1,639 civil servants in the Dnipro Regional and District state administrations, 577 of which are in the Regional state administration and 1,062 in the District state administration. There are 1983 civil servants in the Lviv Regional and District state administrations, 540 of which are in the Regional state administration and 1443 in the Distrct state administration. There are 1,429 civil servants in the Zaporizhya Region and District State Administrations, of which 538 are in the Regional State Administration and 891 in the District State Administration. At the same time, the number of universities that study the specialty "Public Management and Administration" does not depend on the area of the region, as well as on the number of civil servants already working in it. The population of the regions has little effect on this number of universities. The determining factor is the so-called "popularity of cities": Kharkiv was the capital of Ukraine, Kyiv is its capital, and Lviv is considered the cultural capital of Ukraine, Dnipro and Zaporizhia are large industrial centers.

There is a significant shortage of institutions for the training of civil servants in the Volyn region, although there are 5 in the direction of management and administration. The area of the Volyn region is 20144 km^2 with a population 1027.4 thousands of people (as of 1 January 2021). It is 2.5 % of the total population of Ukraine. At the same time, 1419 civil servants work in Volyn Regional and District state administrations, 357 of them are in the Regional state administration and 1062 of them are in the District state administration [8]. There are only one university in Zhytomyr, Kirovohrad, Mykolaiv, Rivne, Kherson and Chernivtsi regions that train staff in the specialty "Public Management and Administration".

Training in the specialty "Public Management and Administration" takes place at the bachelor's and master's educational levels. Form of study is full-time and part-time. As National Agency for Civil Service Affairs of Ukraine established direction on the formation of new generation of civil servants, it is necessary to constantly monitor the content of programs, to ensure their compliance with the requirements of the time. To do this, the heads of university departments should be in constant cooperation with the National Agency for Civil Service Affairs of Ukraine, and the National Agency for Civil Service Affairs of Ukraine should create a working group, which would include heads of departments – leaders from each region in this area of training. Leadership is proposed to be determined by the number and quality of trained graduates in the specialty "Public Management and Administration".

In addition, in the process of training future civil servants, considerable attention should be paid to the practical application of the acquired knowledge. To this end, it is necessary to increase the number of hours provided for student practice. The most effective for full-time students will be the internship of study in public authorities lasting 1 week of each semester. It is recommended to choose the topic in accordance with the three main subjects studied in the current semester. In this case, the choice of topic is given to the student, and the practice take place at the end of the semester as a result before the exam or test. The grade for the internship must be at least 20 % of the total score for the subject. For part-time students, internships are recommended before the session. This approach will ensure the effective assimilation of knowledge and their use in practice and, in addition, will maximize the integration of theory and practice, which is extremely important for further effective work of future civil servants.

In Ukraine advanced training of civil servants are provided by: 20 specialized centers, the Institute of Advanced Training in Kyiv, 4 regional institutes of public administration (in Lviv, Odessa, Dnipro and Kharkiv), the Ukrainian School of Government, created for this purpose by National Agency for Civil Service Affairs of Ukraine, departments of 110 higher educational institutions of the corresponding direction and some institutions of postgraduate education [6]. This number of institutions is due to the fact that according to the law, every civil servant is obliged to undergo advanced training in such a way that during the year for various forms of training the total number of hours was at least 30 hours (1 ECTS credit). Form of study – evening, correspondence and distance. According to the changes approved by the Resolution of the Cabinet of Ministers of June 25, 2020 introduced in the Regulation No. 106 of

February 6, 2019 on the system of professional training of civil servants, heads of local state administrations, their first deputies and deputies, local government officials and deputies of local councils the share of self-education should be no more than 50 % of ECTS credits received.

On the website of the National Agency for Civil Service Affairs of Ukraine, the section on vocational training provides information on available opportunities for various types of training, which includes:

– general short-term programs;
– special short-term programs;
– general professional (certificate) program;
– special professional (certificate) program;
– educational and professional program;
– educational and scientific program;
– self-study.

This provides a search by region, which significantly saves time spent on the website. However, it should be noted that the information provided needs to be expanded. For example, it is necessary to post information about all universities that conduct training in the specialty "Public Management and Administration". There is currently no necessary information in the self-study section, so specialists from universities and advanced training centers should be involved to speed up its filling.

In the world's leading countries, the amount of training that civil servants must undergo each year in the framework of advanced training is from 3 to 7 ECTS credits [7].

Given the situation in our country, the modernization of the civil service and accession to the EU it will be justified to introduce advanced training of civil servants in the amount of 7 ECTS credits (210 hours) each year, leaving the allowable amount of self-education at no more than 50 %. At the same time it is necessary to ensure mandatory quality control of the results of such self-education by the relevant Centers and universities. If the self-study results are unsuccessful, such a civil servant should not be sent for re-training, but under the guidance of a mentor. In parallel with such innovations, the results of advanced training should be linked to the system of setting allowances and surcharges for civil servants. This approach completely eliminates the risk of ineffective self-education and training. The proposed system of advanced training is shown at Fig. 2.

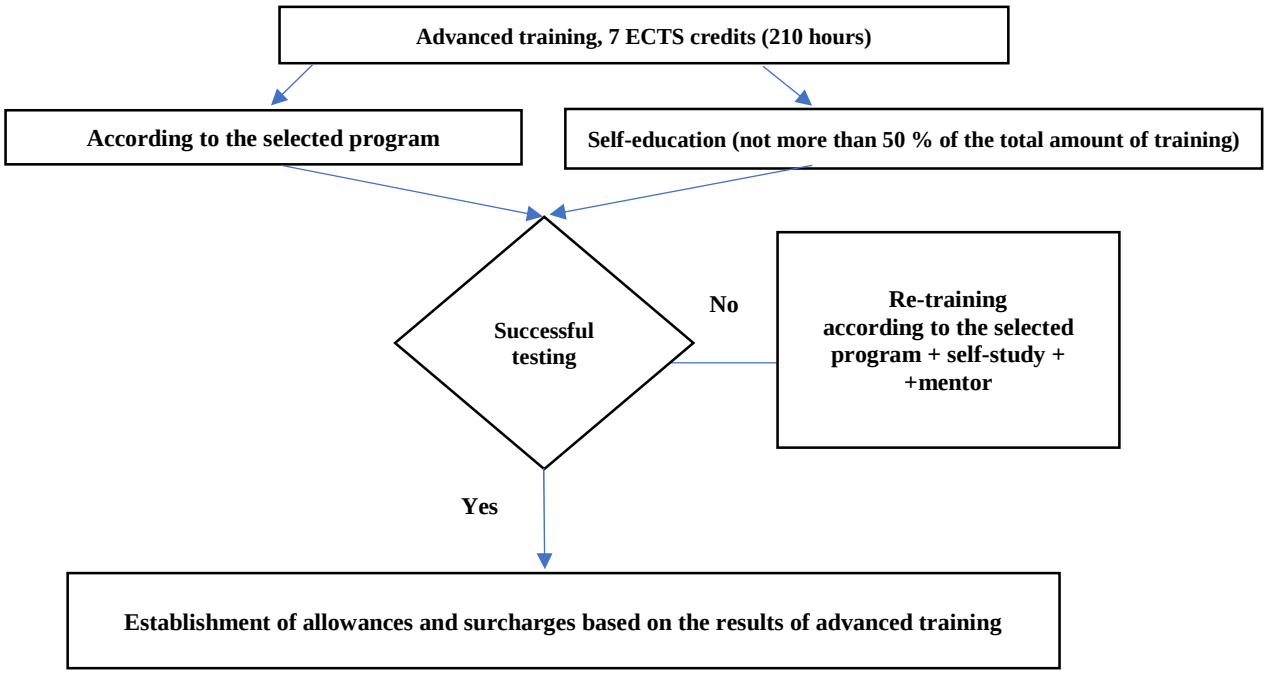

Fig. 2. Block diagram of the system of advanced training of civil servants

Source: compiled by the authors

Given the uneven distribution of universities that provide training in the field of "Public Management and Administration" in Ukraine, as well as threats to the effective implementation of the learning process arising in connection with the Covid-19 pandemic, it is necessary to introduce new methods of distance learning. As shown practice at Lviv Polytechnic National University, learning developed on the basis of the MOODLE platform (Modular Object-Oriented Dynamic Learning Environment) is extremely effective. It belongs to the automated information systems of the LMS class (Learning Management System), and is used in more than 30.000 educational institutions around the world. Thanks to its architecture, it allows the teacher to independently create and manage the training course: to upload lecture material and tasks for practical work, download self-developed tests with automated testing, control access to it and time of submission for testing, organize chat, etc. It is very convenient that you can download and use presentations, tables, diagrams and videos without restrictions. Automated calculation of points obtained for tests and a summary table of grades for all types of work with the resulting sum of points greatly facilitates the work of the teacher. The function of individual communication with the student in the form of commentary on works, exchange of attached files, forums and chats not only equates distance learning to full-time, but also makes it much more effective.

Given all the advantages of such a training system, it is recommended to implement it to improve the skills of existing civil servants. This will make more efficient use of the time allotted for training.

In addition, the lack of English language proficiency is a significant shortcoming in the training of civil servants. Given that Ukraine is confidently moving towards the EU, and civil servants actually represent the state, it is necessary to introduce the need to speak English at a level not lower than B2 with the mandatory presence of a certificate. To do this, it is necessary to introduce the study of business English during all semesters of student study, as well as in the amount of 1 ECTS credit for advanced training. This 1 ECTS credit must be included in the total annual 7 credits. Ukraine is confident in joining the EU, and civil servants actually represent the state, that is why it is necessary to introduce a requirement to speak English at not lower than B2 level with the mandatory presence of a certificate. To do this, it is necessary to introduce the study of business English during all semesters, as well as for advanced training in the amount of 1 ECTS credit. This 1 ECTS credit must be included in the total annual 7 credits.

In summary, the strategic plan for further improvement of the existing system of future civil servants training will include:

1. Monitoring the content of programs, to ensure their compliance with the requirements of the time; introducing close cooperation of the National Agency for Civil Service Affairs of Ukraine with the heads of departments of universities – leaders from each region of Ukraine in this area of training. Leadership is proposed to be determined by the number and quality of trained graduates in the specialty "Public Management and Administration".

2. Review the territorial feasibility of a large number of universities that provide training in the specialty "Public Management and Administration", consider the possibility of opening new departments in cities where they are lacking.

3. Introduction of training developed on the basis of the MOODLE platform.

4. Introduction the internship of study in public authorities lasting 1 week of each semester.

5. Introduction of business English during all semesters of students' studies.

The strategic plan for further improvement of the existing system of advanced training of already working civil servants will provide:

1. Increasing the duration of advanced training of civil servants during the year to 7 ECTS credits (210 hours). Self-education should not exceed 50 % of the total amount of training.

2. Introduction of testing based on the results of advanced training.

3. Establishing surcharges and allowances for civil servants on the basis of such testing (Fig. 2).

4. Introduction of business English in the amount of 1 ECTS credit.

Conclusions

Based on the results of research, the following conclusions can be drawn:

1. There is a significant territorial unevenness of the location of institutions that provide training

and retraining in the specialty "Public Management and Administration". It is necessary to reconsider the expediency of their accumulation in one area and the lack of it in another.

2. Given the modernization of the civil service in accordance with modern world standards, the existing system of future civil servants training in the specialty "Public Management and Administration", as well as advanced training of existing staff need significant improvement.

3. The main attention should be paid to: the coordinated work of the National Agency for Civil Service Affairs of Ukraine and the relevant profile departments of universities; English language proficiency at a level not lower than B2; combination of theoretical knowledge and practical skills.

4. In order to increase the effectiveness of advanced training of civil servants, its results should be linked to the establishment of allowances and surcharges, as well as increase the number of hours to 7 ECTS credits (120 hours).

5. Given today's challenges, training should be implemented on the basis of the MOODLE platform – one of the most effective and convenient that exists today.

Prospects for further research

In the future, it will be useful to explore the progress in the implementation of the National Agency for Civil Service Affairs plan for 2019-2022 in the context of the formation of a new generation of civil servants.

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FORESIGHT AS A TOOL OF PUBLIC ADMINISTRATION IN THE FIELD OF SCIENCE, TECHNOLOGY AND INNOVATION

Annotation. Given the growing role of technological foresight as a tool for reconciling visions, goals and ways of STI development in an era of rapid technological change and global challenges, the approach to foresight research to select priorities for science and innovation in Ukraine for 2022–2026 has been improved. It takes into account a wide range of national targets for achieving SDGs by 2030. The developed Methodological recommendations provided a thorough analysis of more than 3.000 potentially acceptable technological and innovative proposals. The approach to setting STI priorities is new for Ukraine and involves a consistent process of selecting the top 30 most acceptable proposals in each of the seven thematic areas through five stages of discussions and evaluations. The result was the formation of a database of technology passports and developments on the experts' proposals, their selection by practitioners, ranking, evaluation in terms of the potential of Ukrainian science and relevance in terms of world science and new technologies using international databases. They are the basis for decisions by the Expert Councils and the High-Level Working Group on key thematic areas and the preparation of a relevant draft government decision. Despite the conditions of quarantine, for the first time more than 2.500 experts from science, business, state and public organizations took part in the discussions, which is the basis for impartial and public decision-making. To strengthen the role of foresight as a tool for public planning and management in the field of STI, it is proposed to develop a STI roadmap as part of a research and innovation strategy for smart specialization (RIS 3) at the national level.

Key words: forecasting of scientific and technological development; expert panels; scientometrics, patent research; priority scientific and technological directions

The problem

With the rapid technological progress and alarming forecasts of climate and environmental deterioration, the requirements and approaches to technological foresight are changing: on the one hand, the analysis of big digital data of scientometric and patent information allows to assess the scientific and innovative priorities of the country's development for their compliance with global trends, on the other hand, those research areas should respond to societal challenges and affect both competitiveness of production and Sustainable Development Goals (SDGs) achievement by 2030.

Taking into account these tasks, the Ukrainian Institute of Scientific and Technical Expertise and Information (UkrISTEI**)**) has developed methodological recommendations and is working to identify priority areas for science and innovation in Ukraine for 2022–2026, which are based on technological foresight. Foresight is seen as one of the tools of a unified system of public administration

in the field of science, technology and innovation (STI), aimed at achieving strategic goals of the country's development by aligning the goals and actions of all key stakeholders.

Relevance of the chosen topic

Due to the fact that in 2021–2022 the Laws of Ukraine "On priority areas of science and technology" and "On priority areas of innovation" expire, the Plan of Priority Actions of the Government of Ukraine for 2021, approved by the Government Order of March 24, 2021, provides for the formation of a new system of priority areas for science and innovation, focused on achieving the SDGs. According to the relevant Decree of the President of Ukraine dated 30.09.2019 No. 722/2019, the tasks of the SDGs must be taken into account when determining the priority areas of science development.

Analysis of recent research and publications

Problems of scientific and technological forecasting, the formation of scientific, technological and innovation policies are actively explored by the representatives of the Kyiv School of Science of Science B. A. Malitsky, V. P. Solovyov, O. S. Popovych, I. Yu. Egorov [1, 2, 3]. Works by G. O. Androschuk, O. B. Vasiliev, V. V. Virchenko, A. G Zharinova, O. I. Zhilinskaya, M. Z. Zgurovsky, T. K. Kvasha, T. V. Pisarenko, O. F. Paladchenko, P. M. Tsibulyov, L. I. Fedulova, V. K. Khaustov, B. P. Sidenko, Y. Kharazishvili, V. Denisyuk and others [4, 5, 6]. Foreign and domestic scientists [7, 8, 9, 10, 11, 12, 13] consider various aspects of determining the priority areas of scientific, technical and innovative activities through foresight research, in particular for forecasting the future, planning technological policy, and so on.

UN organizations emphasize the important role of the strategic foresight, which generates insights into the dynamics of change, future challenges and new ideas that serve as input for policy development towards the implementation of the Agenda – 2030 [14; 15, p. 5]. Under the United Nations Technology Facilitation Mechanism, a Global Pilot Program has been launched to support countries in developing their STI roadmaps to achieve SDGs. Foresight is an integral tool for the formation of such STI roadmaps, which involves a public discussion of the vision, goals and objectives, alternative scenarios for the country development with all stakeholders [16, p. 23–24].

Purpose and objectives

Develop Methodological recommendations for determining the priority areas of scientific and technological development of Ukraine for 2022–2026 and assessing their compliance with modern world scientific and technological trends using the capabilities of information and communication technologies, in particular, international databases Web of Science, Derwent Innovation and others.

To formulate the basic methodological principles of foresight integration into a single system of public management in the field of STI, aimed at achieving strategic goals of the country's development, including the SDGs, based on aligning the goals and actions of key participants in the process.

Presentation of the main material and the results obtained

Foresight is an interdisciplinary tool and uses a wide range of methods that reflect its functions: forecasting (forecasting trends), analytical (situation analysis), creative (developing new ideas for the future). It covers various methods: qualitative (expert panels, critical technologies, competitive analysis, etc.), quantitative (web metrics, bibliography and scientometrics, modeling, market forecasting), complex (Delphi, scenario development, road mapping, etc.). Expert surveys are a mandatory part of foresight research.

According to Ukrainian legislation, the priority areas of science and technology development are scientifically, economically and socially justified areas of scientific and technical development for the long term, which are given priority state support to form an effective sector of research and development to ensure competitiveness of production, sustainable development, national security and improving the quality of life.

Priority areas of innovation in Ukraine – scientifically and economically sound areas of innovation aimed at ensuring the economic security of the state, creating high-tech competitive environmentally friendly products, providing high quality services and increasing the export potential of the state with effective use of domestic and

world scientific and technological achievements. For the period 2022–2026, the Ministry of Education and Science (MES) and the Government have decided to develop a single system of priority areas for science and innovation, focused on achieving SDGs.

In accordance with the developed Methodological recommendations, the definition of priority areas of scientific and technological development for 2022–2026 is carried out using the foresight methods, taking into account the European Union approach to selecting the priority areas of research under the Horizon-Europe program, as well as nationally defined SDGs tasks for Ukraine [17]. Foresight research was carried out in seven thematic areas: social sciences, energy, environmental management, information and communication technologies (ICT), life sciences (include two separate areas – medicine, agro-food complex), industry, national security.

Foresight research is carried out in five stages, aimed at a comprehensive and impartial choice of priority areas of scientific and technological development of Ukraine, by conducting two surveys of experts. The submitted expert's proposals should be evaluated both in terms of the possibilities for their implementation by Ukrainian scientists, and of the international competitiveness of the proposals, based on the trends of world science and technology. At the final stage, the Expert Councils consider the selected 30 top technologies. The mentioned 5 stages include:

1. Definition of the scientific community's opinions and vision on the priority areas of scientific and technological research and the possibility of their implementation;

2. Evaluation of proposals of experts-scientists by experts-practitioners to determine the proposals in which business and authorities are interested;

3. Evaluation of proposals of experts-scientists from the point of view of possibilities and available potential of the Ukrainian science to carry out the offered researches;

4. Assessment of the relevance of the proposals of experts-scientists in terms of trends in world science and new technologies;

5. Consideration by the Expert Councils of the results of foresight research, formulating and approving the thematic priority areas of scientific and technological development in each area of research.

The opinion and vision of the scientific community was determined by means of a questionnaire. Based on the questionnaires, technology/research proposal passports were developed, which were then provided to expert practitioners to review and evaluate these proposals.

Assessment of opportunities and potential of Ukrainian science for the implementation of the proposed research was carried out using a database of research and development (DB R&D) and defended dissertations, which was created in UkrISTEI and is constantly updated in accordance with the Procedure for state registration and accounting of open R & D and dissertations, approved by the Order of the Ministry of Education and Science N 977 of 27.10.2008 (registered in the Ministry of Justice on 06.04.2009 under No. 312/16328). According to this Order, all R&D performed in scientific institutions, higher education institutions (HEIs), enterprises and organizations of Ukraine, which are fully or partially financed from the state budget, are subject to mandatory state registration and accounting.

The relevance of the proposals of experts-scientists from the point of view of world science and the latest technologies was determined for each proposal separately on the basis of the use of international databases: scientific publications – Scopus, Web of Science; patent publications and applications – Derwent Innovation.

For each of the proposed areas of research, a step-by-step analysis was performed with the selection of the following stages for each step [18]:

Step I. a) selecting from the database of Web of Science the publications related to the research area subject.

b) Analysis of a selected array of publications from the Web of Science database and, based on its results, selection of the most promising scientific areas.

Step II. a) Selecting from the Derwent Innovation database the patent publications that correspond to the subject under study.

b) Patent analysis based on a selected array of patents using the patent landscape tool [19], and, based on its results, the selection of world advanced technological directions.

Step III. Analysis of compliance of the scientific and technological development directions, offered for Ukraine, with modern world technological trends.

For each of the first 4 stages, each proposal is evaluated on the basis of methods – systems analysis (stage 1), pairwise comparison (stage 2), cluster analysis (stages 3, 4), which are then reduced to a generalized method of constructing integrated estimates. Based on the generalized evaluation, all proposals are ranked, the first 30 of which are proposed for processing as priority thematic areas.

The Working Group established by the MES' order to determine the priority areas of scientific, scientific-technical and innovative activity consists of seven thematic Expert Councils – a group of top experts consisting of leading specialists of the National Academy of Sciences of Ukraine, national branch academies, leading research organizations, institutions higher education, as well as representatives of business and government.

The Expert Councils consider the proposed top 30 technologies / developments, form clusters from them, formulate their names and approve the project of priority scientific and technological directions. In the absence of consensus among the members of the Expert Councils, an additional survey is conducted using the Delphi method. The Working group considers the thematic priorities selected by all Expert Councils, approves them and submits them to the VES for preparation of a draft government decision.

In 2021, more than 2.500 experts were involved in foresight research.

At the first stage – 1556 representatives of scientific research organizations (SROs), institutions of higher education (HEI), which provided almost 3.000 proposals for new promising areas of scientific and technological development of Ukraine in the seven above-mentioned areas of research.

At the second stage – 1062 representatives of large and small industrial enterprises, state, municipal and departmental enterprises, associations, unions, authorities of different levels.

Representatives of all regions of Ukraine took part in the polls, among which the highest activity showed the city of Kyiv and Kharkiv region (Table 1).

407 organizations joined the second stage of the expert survey, most of them from Kyiv, Mykolayiv and Odesa oblasts.

According to the results of the analysis, most proposals were received in the socio-humanitarian sphere (Table 2), the highest marks were received from the medical sphere.

Table 1

The structure of organizations whose representatives submitted proposals for the draft list of scientific and technological priorities in Ukraine in 2021

No.	Administrative centers	Univer-sities	SRO academic	SRO non-academic	Other SPOs and HEIs	Others	TOTAL
1	2	3	4	5	6	7	8
1	City of Kyiv	33	112	35	9	6	**195**
2	Vinnytsia region	3	0	0	1	0	**4**
3	Volyn region	2	0	0	0	0	**2**
4	Dnipropetrovsk region	13	6	2	1	1	**23**
5	Donetsk region	7	1	1	0	0	**9**
6	Zhytomyr region	4	1	0	0	0	**5**
7	Transcarpathian region	0	2	1	0	0	**3**
8	Zaporozhye region	7	1	0	1	0	**9**
9	Ivano-Frankivsk region	3	0	1	0	1	**5**

Continuation of Table 1

1	2	3	4	5	6	7	8
10	Kiev region	1	6	1	0	1	**9**
11	Kirovograd region	1	1	0	0	0	**2**
12	Luhansk region	3	0	0	0	0	**3**
13	Lviv region	8	12	1	0	0	**21**
14	Mykolaiv region	3	1	1	0	0	**5**
15	Odessa region	15	9	7	0	0	**31**
16	Poltava	4	1	1	0	0	**6**
17	Rivne region	1	1	0	0	0	**2**
18	Sumy region	4	2	0	1	0	**7**
19	Ternopil region	4	0	0	0	0	**4**
20	Kharkiv region	26	28	7	0	0	**61**
21	Kherson region	2	3	1	0	0	**6**
22	Khmelnytsky region	2	0	0	0	0	**2**
23	Cherkasy region	5	0	1	0	0	**6**
24	Chernivtsi region	4	2	0	0	0	**6**
25	Chernihiv region	3	1	0	0	0	**4**
	Total	**158**	**190**	**60**	**13**	**9**	**430**

Table 2

Characteristics of proposals for determining the priority areas of scientific and technological development in Ukraine in 2021

No.	Name of research area	Number of proposals	Highest rating	Lowest rating
1	Energy	229	0,83	0,04
2	ICT	231	0,85	0,001
3	Agro-food complex	317	0,86	0,18
4	Medicine	470	0,97	0,15
5	Rational use of nature	329	0,84	0,14
6	Industry	338	0,81	0,01
7	Social and humanitarian	654	0,73	0,09
8	National security	284	0,85	0,09

Based on the results of the proposals' evaluation as well as discussion of the foresight research results, the Expert Councils identified the most important areas of scientific and technological research for Ukraine.

For example, *in the field of ICT*, the following areas of research are recognized:

1. Artificial intelligence systems

2. Technological tools and software engineering services.

3. Cyber physical systems, the Internet of Things. Robotics. Computer processing of signals of various nature

4. Information and cyber security.

5. Deep learning, Big Data, neural networks.

6. Information and communication systems and networks.

7. Supercomputer complexes. Modeling and solving complex problems. Cloud computing.

8. Intelligent interactive information-analytical systems.

In the field of "Medicine" there are:

1. Etiology, pathogenesis, treatment, prevention of non-communicable diseases (including precision medicine).

2. Etiology, pathogenesis, treatment, prevention of infectious diseases.

3. Creation of new medicines and medical devices.

4. New methods and technologies for disease diagnosis.

5. Minimally invasive, high-tech, reconstructive surgery and transplantology.

6. Information technology in medicine.

7. COVID-19 and postpartum syndrome 8. Biosafety and biological protection.

At the time of writing, the Working Group has not considered the scientific and technological priorities approved by the Expert Councils, so the list is preliminary. The identified priority areas are the basis of budget funding for scientific and technological research, i.e. those areas of research for which public funds will be allocated. In view of this, foresight studies play an important role in public administration.

Conclusions and prospects for further research

Adoption of the Agenda – 2030 in September 2015 helped strengthen the strategic nature of Technology Foresight and its role in identifying solutions to problems in a wide range of areas covered by the SDGs. Increasingly, foresight is being used as a process to encourage debate between all stakeholders to share a long-term understanding and reach consensus on future policies.

In view of this approach, the Methodological recommendations, developed to identify priority areas for science and innovation in Ukraine for 2022–2026, provided a thorough analysis of more than 3.000 potentially acceptable technological and innovative proposals of Ukrainian experts in seven key thematic areas. They take into account a wide range of national targets for achieving the SDGs by 2030.

The approach to setting STI priorities is new for Ukraine and involves a consistent process of selecting the top 30 most acceptable proposals in each thematic area through five stages of discussions and evaluations. As a result of the adopted approach, a database of technology passports / developments was formed based on the proposals of expert scientists, the proposals were ranked according to the results of evaluation by expert practitioners, evaluated in terms of Ukrainian science potential, as well as relevance in terms of world science and latest technologies.

The developed by UkrISTEI Methodological recommendations for foresight study are aimed at discussing potentially priority technological and innovative proposals for Ukraine with a wide range of stakeholders, including science community, business, public authorities and NGOs.

They are structured in seven thematic areas and cover all SDGs. Due to the quarantine restrictions, caused by the COVID-19 pandemic, discussions were mostly conducted online, but this did not reduce the number of participants. In total, in 2021, more than 2,500 experts were involved in foresight research.

The opinion and vision of the scientific community was determined by means of a questionnaire. Based on the questionnaires, technology/development passports were developed, which were then provided to expert practitioners to review and evaluate these proposals.

Involving a wide range of participants from science, business, government and NGOs in the discussions ensured the public nature of foresight research and reaching a consensus on medium-term priorities for science development and innovation in Ukraine. Due to the quarantine restrictions caused by the COVID-19 pandemic, discussions were mostly conducted online, but this did not reduce the number of participants. In total, in 2021, more than 2.500 experts were involved in the foresight.

At the first stage of the discussion, out of a total of 1.556 participants, 816 represented the academic community, 196 non-academic NGOs and 740 higher education institutions. At the second stage, 1.062 representatives of large and small industrial enterprises of various organizational forms, associations, unions, and authorities of various levels were involved in the discussions. Representatives of the agricultural sector, the medical industry, ICT, security and defense are the most constructive in their cooperation. However, the issue of commercialization of the results of domestic academic research remains problematic. Business experts do not accept all proposals of scientists.

At the same time, there is a request from industry to governments and universities to build infrastructure to support modern digital technologies

and industries, including Industry4.0 centers, digital hubs, clusters, which requires more active business participation in foresight and proposals to the Government.

Currently, the process of clarifying priorities and finding common ground between scientists and business continues. Based on its results, the thematic Expert Councils and the High-Level Working Group will decide on key thematic areas of science and innovation development for the preparation of a draft government decision.

Ukraine's support for the European Green Course will facilitate the digital and green transition of the economy and industry. This will strengthen the role of foresight and innovative solutions, but will require their wider involvement in the public planning and management process.

The European approach to smart specialization, implemented by the European Commission's Joint Research Center (JRC / EC), provides encouraging results in this direction. Development of research and innovation strategies for smart specialization (RIS 3) [20] aims to integrate priorities and plans for the development of science and innovation in a single system of public management of STI at the national and regional levels. It is proposed to use the JRC / EC recommendations on the development of the STI roadmap as part of the smart specialization strategy of Ukraine at the national level, which is currently being developed by the Ministry of Economic Development, Trade and Agriculture together with other interested authorities. The development of a STI roadmap based on foresight will promote more efficient use of state funds for the development of the STI system and attract business funds for the implementation of its achievements and the development of innovative technologies.

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DECENTRALIZATION OF POWER IN EUROPEAN COUNTRIES: THE EXPERIENCE OF POLISH AND FRENCH REFORMS AS A CONCEPTUAL BASIS FOR THE ORGANIZATIONAL STRUCTURE OF UKRAINE'S GOVERNING BODIES

Abstract. The reform of the state power, both at the level of local self-government and at the level of the state executive authorities, cannot be carried out without reviewing the basic legislative framework, Amendments to the current legislation and the development and adoption of completely new regulations, which will be the legislative basis for the quality implementation of the public administration reform. The work analyzes the current stage of reforming the administrative and territorial structure of our state, which provides for a significant expansion of the sphere of influence and competence in certain areas of local self-government bodies. The reform of local self-government must be carried out on the basis of the Constitution and laws of Ukraine, the provisions of the European Charter of Local Self-Government and respect for the basic European principles of democracy. That is why the best example for the implementation of reforms in Ukraine can be the experience of European countries on the implementation of the reform of the new distribution of powers among the authorities. The most practical way for Ukraine will be to apply the experience of reforming the governing bodies of France and Poland. This article contains my developed comparative table of the duties of a newly established body, such as a prefect in Ukraine, as well as the corresponding duties of officials of this type in European countries (Poland and France). The work also investigated the impact of the newly established body on local self-government. The current draft of the Law of Ukraine "About Prefect" is analyzed and the appropriate conclusions are made.

Key words: decentralization, reform, local self-government bodies, organizations of executive power, perfekt, powers.

Introduction of the basic material

At the current stage of Ukraine's development as a democratic legal state the important role is played by the implementation of the power decentralization reform that is based on the establishment of democratic governance, transfer of the power authority to territorial bodies, Ensuring a wide participation of citizens in the management of state affairs and society as a whole, as well as the creation of a completely new formation of bodies of executive power, which should provide adequate control over local self-government, in order to ensure their effective functioning.

The current stage of reforming the administrative and territorial structure of our state provides for a significant expansion of the sphere of influence and competence in certain areas of local self-government bodies. Namely, now the necessity of forming an integrated system of oversight and control over their activities becomes relevant. Therefore, the next stage of the decentralization reform of power is the activation of state policy in the field of creation of appropriate bodies of executive power, which will be able to ensure the level of control necessary for the effective implementation of their functions by local self-government bodies.

The responsibilities of the bodies of executive power in the system of public administration should be legally consolidated, including by amending the Constitution. The relevant oversight and

control functions are proposed to be performed by prefects acting at the level of districts and regions.

R. Naumenko, V. Rilska, I. Bezzub, M. Pittsik, O. Sushinski and others pay attention to theoretical and practical issues of decentralization of power, development and reorganization of bodies of local self- government, as well as the reform of the governing authorities. In this area also relevant research is the current features of ensuring appropriate distribution of powers among the bodies of executive power and local self-government bodies in order to optimize their activities, Addressing the problem of unequal competence of local self-government bodies and bodies of legislative power (often, double incumbency, unreasonably large staff, exercising certain powers at an inadequate level of power, etc.)д.).

Having analyzed the practical methods and models of management reforms in the world, we can conclude that there is no one universal model that could fully ensure the successful implementation of changes and would be fully suitable for the reform of Ukraine's state management.

However, the application of administrative and territorial reforms in some European countries could be a good base model for the implementation of the last stage of the power decentralization reform in Ukraine.

The subject of the research is legislative support of the Constitutional reform on reorganization of the local level of executive power in Ukraine, in the French and Polish context, in the context of implementation of the decentralization reform process and possibility of implementation of the prefecture institution.

The subject of the research is theoretical and methodological, methodological and applied aspects of implementation of the institution of prefects in Ukraine in the European countries.

Research methods

The research was carried out using a dialectic and systematic approach to the study of economic processes. During the work, the following methods of economic research were used: the method of comparative analysis, system-structural, abstract-logical, expert evaluations, etc.

The information base of the research was the legislative and regulatory acts of Ukraine, works of domestic and foreign scientists on decentralization power reforms, in particular in the context of the example of reorganization of the administrative authorities and implementation of the institution of prefects in Poland and France for Ukraine.

Specifics of the reform of the bodies of executive power

Establishment of the institution of prefects to oversee the implementation of the Constitution and laws of Ukraine by local self-government bodies is envisaged by the draft law “On Amendments to the Constitution of Ukraine (on decentralization of power)” (No. 2217a of 01.07.2015). The powers of the prefects are described in Articles 118, 119 of the document. [1]

The amendments introduced in the draft law are fully in compliance with European and international standards, Take into account the relevant findings and observations of the Venice Commission and will be able to ensure the possibility of local self-governance and the creation of an efficient system of territorial organization of power in Ukraine. [6]

Formation of the system of interrelations between the governing bodies and local self-government in a particular country for a particular locality has a number of specific features, such as the peculiarities of the legislative support, historical conditions, religious attitudes, cultural and national factors that make each model of interrelations between local and regional authorities absolutely unique even within one state.[7]

Different conditions of development, socio-cultural factors, ethnic and ethnographic peculiarities are the reason why the same reforms or changes are perceived differently in different countries, Accordingly, absolutely different models of organization of local self-government and their relations with the bodies of legislative power were formed.

Even though there are different models of formation of local self-government, as well as the presence of national peculiarities in the system of division of powers between local self-government bodies and the executive power, There are common

features that can characterize decentralization processes in European countries, which is an example for their formation in our state.

Having analyzed the experience of decentralization processes in European countries, we can identify the main characteristics of the implementation of local self-governance reforms:

– democratization through the development of local and regional autonomy – i.e., it is envisaged that not only local councils but also the future institution of the prefect will have more authority over the localities, with a view to quick interaction between the respective branches of power, without the intervention of the central authorities;

– maximum efficient resolution of local problems – a wider range of responsibilities as well as the possibility to dispose of appropriate financial resources enables to solve the first priority problems in the field, which are not critical and appropriately allocate the necessary resources for the resolution of all other issues;

– Freedom through local and regional autonomy – means a reduction in the vertical hierarchy of the presidential branch of power, and the ability to independently decide and be responsible for the development of a particular region, under the control of local and regional authorities;

– Ensuring cultural, linguistic and ethnic diversity involves maintaining a certain potential of the region, which is active in this or that locality, within the borders of one state, The main goal of the project is to ensure that the development of the region is based on the principles of the Constitution of the Russian Federation and is not a threat to the integrity of the territories and the state as a whole;

– Economic competition between the local and regional levels is equally important for the development of local and regional economies, which can be used as a guarantee for a balanced and stable development of the economy of the whole country.

Historical experience testifies to the importance of decentralization for countries which are at the stage of profound changes in the system of regulation of public relations. For countries of the transition type of economy, as our state, the decentralization reform is one of the main ways to improve the quality and quantity institutions of society and determines the potential, ways, possibilities and prospects for the development of the region, district and community. [8]

In a unitary state there is only one constitution, citizenship, the system of higher authorities. The constituent parts of the united state often have the status of administrative and territorial subdivisions. They are governed on the basis of laws adopted by central authorities and their territory can be changed by a simple state law without the consent of local authorities and the local population. Therefore, change of the formation and mechanisms of state power in the regions and districts to strengthen the role of local self-government at the same time as increasing the functions of the state power bodies on their control is legitimate, and in the conditions of decentralization process and the corresponding reforming is legitimate and logical. [9]

Comparative analysis of the responsibilities of the reformed bodies of executive power in France, Poland and the responsibilities of the future institution of the prefect in Ukraine

The main decentralization processes and power reforms in the state in the majority of European countries were completed ten years ago and were quite successful. Ukraine, however, not only lagged behind in this respect, but also went very far back, securing at the legislative level full decentralization and control over the presidential vertical. However, the current local administrations have subordinate functions – the president's representative body on the ground and the local body of the local executive power. That is why the current model of distribution of power requires reform. Analysing the experience of European countries reform, which was the best, in accordance with their power structure and the experience of which is the best to use as a model of the countries, As an example for Ukraine, the experience of France and Poland is the closest for its use in our country.

While comparing the actual duties and functions performed by the French prefect and the

Polish military leader in these countries and those that Ukrainian prefects are expected to perform, I developed a comparative table, which served as a basis for further analysis.

Table 1

Comparative table of responsibilities of the Ukrainian prefect of the Polish military hierarchy and the French prefect

Organizing Vladi / Type of povovozhdeni	Ukrainian Prefect	Polish Wojewoda	French Prefect
1	2	3	4
Characteristics of activities	Public servant appointed by the President of Ukraine by the Cabinet of Ministers of Ukraine	The representative of the Council of Ministers, who is appointed and dismissed by the head of the Council of Ministers, upon the submission of the minister, whose competence includes the public administration	The representative of the State in the department, which is appointed by Presidential Decree, approved at the meeting of the Government. Candidates for the position shall be nominated by the Prime Minister and the Minister of Internal Affairs
Powers on the ground	· Supervision of compliance with the Constitution and laws of Ukraine by local self-government bodies; · Coordinating the activities of the territorial bodies of the central administrative authorities and supervising their compliance with the legislation; · Ensuring the implementation of state programs; · To direct and organize the activities of the governing bodies on the ground and ensure their interaction with local self-governing bodies in a state of war or state of emergency.	· Adapting the policy objectives of the Council of Ministers to local conditions, coordinating and monitoring the implementation of tasks deriving from it; · Ensuring coordination of all bodies of state power and local self-government, as well as the management of their activities in the field of prevention of threats to life, health, property, environment and security of the state; · The implementation and coordination of tasks in the field of defence and security, as well as crisis management.	· Review of the implementation of the legislation of the ukranium; · Ensuring support for public order; · exercising administrative control over the activities of local self-government bodies and referring illegal decisions of territorial communities to the administrative court for consideration; · Disposal of all state assets in the department, as well as the responsibility for the management of real estate and other state property; · The management of the work of all local services of the central bodies of executive power and their mediation with professional ministries.

Continuation of Table 1

1	2	3	4
Authority to supervise local self- government bodies	Cancels the acts of local self-government on the grounds of their unconstitutionality;	Within 7 days, local self-governance bodies must submit to the local government the decision of the relevant board or council**.** If the resolution contradicts the law, it is invalid in whole or in part, and the inspection body shall inform the relevant local self- government body within 30 days from the receipt of the resolution, which has the right to cancel the valid resolution. If within 30 days the decision on the appropriate act is not taken, it is considered to be in compliance with the legislation.	The councils submit all decisions to the prefects and only after the decision has been reviewed and approved by them, it is deemed to be valid. If it is not in conformity with the law, the decision on revocation shall be taken by the court, to which the prefect may appeal within 2 months if there is any discrepancy.
Decision on the release of MHI	If local councils adopt an act violating the Constitution of Ukraine, territorial integrity and sovereignty, or endangering national security, the President shall suspend the act, suspend the activity of the council, apply to the Constitutional Court, and appoint an hourly commissioner.	In case of gross violations of the Constitution or laws of Poland, the parliament may dismiss the representative body at the request of the head of the government.	If the local government is unable to ensure proper management of the commune, the president can approve the decree on its dismissal at a meeting of the government.

In Ukraine, the institution of the prefect is a local authority in the system of administrative authorities. A prefect of a region can also be a prefect of a district if his or her territory includes the territory of the regional center. For example, the prefect of Kyiv is also the prefect of Kyiv region. According to the draft law "On the Prefect", the prefect during his/her activity has the following main lines of activity:

1) Supervision of compliance with the Constitution and laws of Ukraine by local self-government bodies and their officials;

2) coordinating the activities of territorial bodies of ministries and other central bodies of executive power, monitoring their compliance with the Constitution and laws;

3) Ensuring implementation of state programs;

4) conjugation and organization of activities of territorial bodies of central authorities and their interaction with local self-government bodies under the legal regime of martial law and state of emergency,

Zone of extraordinary environmental situation, as well as the threat or occurrence of an emergency situation of the appropriate level. [2]

Prefectures in Ukraine have to act on the basis of principles:

- the rule of law;
- in the open;
- legality;
- the single law enforcement;
- the uninterrupted maintenance of the permanent exercise of the judicial power in the districts, regions, Kyiv and Sevastopol, regardless of political processes in the state and beyond its borders;
- of control;
- efektivnosti;
- of political inexpediency. [2]

After the institution of prefects is introduced, it is envisaged that he will be a civil servant, his term of office at the corresponding level of administrative and territorial unit, can be only 3 years, and further rotation to another level, or even another administrative unit. According to the draft law "On the Prefect" [2], the prefect is appointed to the post and dismissed from it irrespective of the political powers of different political forces, including the presidency of this or that president. However, in my opinion such an approach is not entirely trustworthy. Indeed, if the powers of the prefect include the functions of control and supervision over compliance with the law in making decisions on these or those other areas of activity by local self-government bodies, The political affiliation may lead to political bias and bias in the prefect's activities.

Let's analyze the experience of France and Poland in the process of decentralization reform implementation.

In France the strong hierarchy and centralization of the state power formed the power relations between the levels of power up to 1982. However, the legislative basis for the formation of a new local level of power with considerably expanded powers was consolidated in the French Constitution of June 23, 1958 [3], which provided that administrative and territorial local authorities The main goal of the Strategy is to ensure that the objectives and tasks of the State are achieved in the most efficient and effective manner, which are essential for ensuring the stable development and activity of the territory, and the implementation of which is most effectively carried out at their level.

However, the implementation at the state level, constitutionally enshrined reform was able to begin only in 1982.

The legislation stipulated that the committees, departments and regions would become fully supervised electoral bodies – councils. The laws also clearly defined the division of duties and spheres of influence on the respective competencies among the respective branches of power, As well as the redistribution and redistribution of finances and their use in an appropriate manner for the development or financing of those areas of activity that are most needed. They also determined the organizational structure of the regions, regulatory and legal guarantees given to the apparatus and structural divisions of territorial communities, the method of hiring and dismissal of the leadership positions, Ensuring citizen participation in local self-governance and direct control over the publicity and oversight of their activities, as well as the forms and mechanisms of interaction between communities, departments and regions.

On June 7, 1983 and on June 22, 1983 a number of new legislative acts were passed that ushered in a new stage of reform, in the course of which a complete and complex redistribution of duties between the state authorities and local self-government took place for the benefit of the latter. The package of these laws, not without reservation, formed the Administrative Code of France [3], which is the main legislative support for the local self-government of the French communes.

Poland's experience in public administration reform began much later, namely after the restoration of independence and democracy. The current government of Tadeusz Mazowiecki started reforming the system of public administration immediately after its appointment. The reform was to extend not only to local self-government organizations, but also to the system of central bodies of executive power. The decentralization reform was carried out in two stages.

As in France, the reform was carried out by adopting a legislative basis that could constitutionally consolidate this reform. In 1990, the law "On Local Self-Government" [4] was adopted, which stipulated the transfer of the main part of administrative and public powers to the level of local self-governance bodies, i.e. to local municipalities.

The next stage of the reform began with the adoption of the laws "On Provincial Self-Government" and "On Province Self-Government" in 1998. [4], which was used to approve at the legislative level the administrative and territorial reform as a result of which the old and new administrative and territorial units such as districts and voivodships were reformed.

However, I must say that the first stage of the reform lasted for 8 years, which can also indicate the unwillingness of the current local government to take over the expanded responsibilities at once. The Ukrainian scenario of

implementation of the first stage of the reform also required considerable time expenditures in 2014 and even before the 2020 pre-election.

Thus, the adoption of these laws in the Polish Constitution consolidated the basic legislative provisions that defined the status and powers of local self-government bodies and approved the Polish state structure as a decentralized public authority. It is this structure that guarantees the participation of local self- government bodies in the exercise of state power, and attainment of an essential part of the public powers which the local authorities determine at their own discretion in accordance with the needs and under their own responsibility, and have an absolute majority of the powers in their possession.

However, to ensure the proper implementation of the functions delegated by the state and responsibilities of local self-government, the law also establishes the notion of the necessity to form a system of supervisory bodies for the activities of local self-government within their competence. The Head of the Council of Ministers and the governors are responsible for supervising the proper functioning of the self- governing bodies in Poland, and the regional chambers of local councils are responsible for financial security. The relevant administrative oversight and control is also mentioned in the French Constitution, which designates as such an oversight body the prefect, who is the representative of the public authority on the ground.

The French Constitution enshrines the provision that in administrative and territorial units of the republic the representative of the state, who represents each member of the government, is responsible for ensuring national interests, administrative control and compliance with the law [3].

The main supervisory bodies of the State on the ground in Poland and France are the voivods and prefects, respectively.

The competence and principles of the function of the Voivode are set out in the Polish Law on the Voivode and County Administration in Voivodeship, which specifies that the Voivode is the representative of the Council of Ministers in Voivodeship and the supervisor of the activities of local self-government bodies in terms of the rule of law [4].

Since the military commander is a local body of the executive power, the decision on his/her appointment or dismissal is made by the Head of the Council of Ministers upon the submission of the Minister, who has the authority of the public administration.

The Head of the Polish Council of Ministers shall supervise the activities of the troopers, periodically assess the activities and the proper exercise of the powers vested in him/her, and shall be advised by the prefect of his/her activities.

The minister in charge of public administration shall supervise the performance of the duties of the chief executive in accordance with certain eligibility criteria under applicable law, and shall also verify its performance of the respective duties in accordance with the competency and dominance of the leader. The Head of the Council of Ministers shall oversee solely the performance of the chief of staff in accordance with the policy of the Council of Ministers.

As the representative of the Council of Ministers on the ground, the military commander ensures the implementation of a certain list of tasks, in particular

In accordance with the conditions of local self-government, adapts the objectives of the policy of the Council of Ministers, and directly coordinates and monitors the implementation of its tasks, to ensure the sustainable development of the territories;

– Coordinates the interaction of all local and regional authorities that support the activities of the military, and, accordingly, controls the leadership process in the sectors, which provide the necessary conditions for the stable existence of the territory and the people, including civil security, health care, The law enforcement and municipal law enforcement agencies and other important criteria for ensuring public order and other important criteria that are of primary importance in ensuring the functioning of the districts, provinces and municipalities;

– Protecting the defense system of the country and ensuring anti-crisis management, which is enshrined in the relevant legislation.

Similar powers are exercised by the French prefect, who has the capacity of a representative of the State power in the department and is appointed

by presidential decree, approved at a meeting of the Council of Ministers. At the meeting of the Council of Ministers, the future prefects are appointed and dismissed by the Prime Minister and the Minister of the Interior. The French Prefect represents the delegated responsibilities of each of the ministers, as well as the management of the relevant units of the Public Administration in the department. Its competence includes protection of national interests of the citizens, supervision over the observance of laws, maintenance of public law and order and the right to home control as prescribed by law.

The main duties of the French prefect are:

– The law of the State Administration and individual professional ministers has been enforced;

– Ensuring support for the protection of public order;

– Supervision and control over the activities of the department and its subordinate authorities (local self-government bodies), In particular, for taking relevant decisions by them, a relevant appeal to the administrative court, if they consider such decision to be illegal or such that does not comply with the law;

– Representation of the state authorities in the sphere of ensuring proper consideration of the implementation of all legal acts, which have legal force at the department level, signing important documents on behalf of the state and being responsible for them, as well as acting as the state representative before the judiciary;

– Coordinates the management of state assets in the relevant department, as well as oversees the management of real estate and other property belonging to the state;

– Ensures smooth operation of the structural divisions of the state services of the central bodies of executive power and coordinates the interaction between them and the central ministries.

However, the French prefect has no control over the functions of the peripheral services of the Ministries of Defence, Finance, Education, Justice and the Inspectorate of Labour.

Since the French prefect and the Polish governor are representatives of the government, they are obliged to inform the latter about the current state of affairs in the territories under their control, and, accordingly, carry out the policy of the current government, report it to the local self-government bodies, and ensure their assistance in the implementation of this policy.

The prefect has a twofold task: to represent the government at the local level of executive power and to represent the legitimate interests of the local government vis-à-vis the government in a reciprocal manner. The prefect, however, is a person who has been apoliticized and, above all, a public servant. Therefore, the prefect has the right to be informed and competent in all areas for which he or she is responsible, to assess the activities and decisions of local self-government bodies objectively, taking into account their specificities, while remaining neutral to any provocations from both the governing bodies and the local self-government bodies.

The institution of prefects is primarily intended to ensure supervision over the implementation of legislation by local self-government bodies in the exercise of the powers delegated to them by the state. Accordingly, Polish law stipulated for the establishment of clear regulation of the supervisory powers of local self-government bodies and their dependence on the powers of individual services and municipalities. The same powers that were in the local self-government bodies before their reorganization, enlargement, and granting a wider range of powers are controlled by prefects only for their compliance with the current legislation, by the mechanisms that are clearly defined and predetermined by the legislation.

In turn, control and supervision of those responsibilities that have been delegated by the superior bodies determines the actual situation in the controlled areas of activity, The duties of municipal authorities provide for the implementation of a comprehensive assessment of their performance by such criteria as legality, competitiveness and sustainability of the activities of the relevant authorities.

For example, within 7 days local self-government bodies are obliged to submit to the Polish governor a certain decision of the relevant council and to give the regional division of the District Chamber the decision which is within their competence. If it is inconsistent with the law or

contrary to it, its inconsistency is stated as invalid in whole or in part, the supervisory body notifies the relevant council, which has taken such a decision not later than 30 days from the date of receipt. Unlike the local self-government authorities in Ukraine, Polish local councils can within 30 days file a complaint to the administrative court to verify the validity and relevance of the decision on the inadmissibility of the act. Within a month the administrative court is obliged to consider the complaint and issue an appropriate decision, but if the non-compliance of such decision of the local administration is not valid, the court may not recognize the invalidity of the decision, but make an explanation that the decision was issued with partial violation of the law.

If within 30 days of the decision by local authorities, the review of municipal authorities, the governor or the Chamber of Accounts for compliance with all criteria and requirements of the law, the decision is not declared inappropriate, it is considered in accordance with current legislation and shall take effect.

The competence of the French prefect also includes reviewing the legality of legal acts, but if the act of local government or any other French municipal authority is unconstitutional, the administrative court is competent to decide on its revocation. If the prefect is suspected of non-compliance of a decision with the law or the Constitution, he or she shall terminate the action and execute the decision before the court's residual review. If the decision in question relates to those that may threaten the integrity and sovereignty of the state, the prefect may suspend not only the execution of the decision, but also the activities of any self- governing body that has issued the act, for a period not exceeding one month. The decision to suspend the activities of a particular court shall be confirmed by a resolution, and the Minister of Internal Affairs shall be notified in writing.

Also the Polish and French legislation contains certain norms of control enforcement, which are applied in very extreme and unprecedented cases. This is the rule on the possibility of dissolving certain bodies of local government if they are in serious breach of the Constitution and laws or if the relevant council is unable to ensure the management of the commune under its control (the highest level of self-government) on the advice of the French prefect. The Polish leader has to inform the Head of the Council of Ministers and the Sejm about the possibility of dismissal of a certain committee in case of a gross violation of the Constitution or laws, and only the latter can take a reasoned decision on the dismissal of the relevant local government body.

Until the new local government bodies are elected and the system of their integral and smooth functioning is established, the governor or the prefect in charge of their duties. No sooner than two months after the dissolution of the previous local government body, elections shall be held and new local authorities shall be elected.

Findings and propositions

Therefore, after comparing legislative norms that enshrine the activity of local executive authorities of Poland and France, we can conclude that the main norms of their activity and corresponding powers at the local level of local executive authorities, The draft amendments to the Constitution of Ukraine and the draft law “On Prefect” [2] are mostly in line with the European practice of exercising local powers by the representatives of the local executive authorities, The Law on the Procedure for the Procedure.

For example, according to the draft law “On the Prefect” [2], the local government takes away the right to overrule the decision of the prefect on the legality of acts adopted by them, when the Polish communes and the French communes have it.

Experience of decentralization of the system of public administration and executive power in France is the result of evolutionary processes in the country and changes in the administrative administration of Poland in the process of gaining independence are of great importance for Ukraine, They reflect the necessity of reforming the system of administrative authorities at the local level. Having analyzed this experience, we can conclude that the concept of Ukrainian decentralization reform is based on the European mechanisms of reform, with constitutional reform as the primary

goal. This is based on a clear definition of the basic principles of the activity of the executive power on the basis of a clear division and redistribution of powers between the levels of power, as well as ensuring control over their proper implementation, Compliance with the law and their activities within the limits of this legislation to provide public services at the level at which they are most needed and accessible. That is why the introduction of the prefect institution is necessary according to the subsidiarity principle envisaged by the European Charter of Local Self-Government [5]. Also, after analyzing the responsibilities given to the Ukrainian prefect and his foreign colleagues listed in ***Table 1***, we can make a conclusion that these responsibilities have the French prefect and Voivode of Poland are considerably broader and more flexible than those proposed in the Ukrainian version of the reform. However, this difference can have both pluses – reduction of privatization and lawlessness of Ukrainian officials, and disadvantages – lack of control, which can lead to federative formations within the boundaries of one state.

Therefore, the adoption of the law on the prefect, which must detail and clearly define the powers of prefects according to the constitution, will determine the further progress and successful completion of the decentralization reform in Ukraine.

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FORMATION OF IC-COMPETENCE OF THE FUTURE MASTER OF PUBLIC ADMINISTRATION

Abstract. The article is substantiated the practical aspects of the formation of IC-competence of the future master of public administration (for students of the second (master's) level of higher education of the educational-professional program 281 Public administration and administration. State educational policy) in terms of informatization of higher education; the role of Google services (for example, Google Classroom, Google Docs & SpreadSheets, Google Forms, Google Calendar) in the formation of IC-competence of the future master of public administration is revealed; their characteristics are outlined: 1) saving money on the purchase of software; 2) reducing the need for specialized classrooms, as in any classroom you can organize a modern educational process using laptops and wireless network; 3) the ability to perform many activities, monitor and evaluate student achievement online; 4) openness of the educational environment for those who teaches (teacher) and those who studied (student); examples of pedagogical using of elements of Google services for the formation of IC-competence of the future master of public administration in higher education institutions in the process of studying the discipline (educational component) "Management of the IT-structure of the educational institution".

Key words: master's degree in public administration; informatization of education; information and communication technologies; IC-competence; Google services.

Formulation of the problem

Formation of professional competencies of the future specialist in the conditions of introduction of modern information technologies in practice of educational process is one of the key priorities of development of higher education of modern Ukraine. Thus, we consider the organization and implementation of Google services in the educational environment, which create new opportunities for the realization of the personal potential of the future master of public administration with higher education, to be a strategically important direction in the higher education system.

Relevance of the chosen topic

It is based on the analysis of psychological and pedagogical literature, it is revealed that in Ukraine due attention is paid to the study of problems of informatization of education, application in the educational process of educational institutions of information and communication technologies (ICT). Actual aspects of these problems are shown in the works of V. Bykov, V. Bobrytska, M. Zhaldak, N. Morse, O. Spivakovsky, O. Spirin, Y. Trius and others. However, the research on the problems of using Google services for the formation of IR competence of the future master of public administration, in terms of informatization of education was conducted in fragments, which justifies the relevance of their implementation given the current challenges of the information society.

Analysis of recent research and publications

Various aspects of the problem of formation of IC-competence of future specialists with higher education and their preparation for the use of ICT in professional activities, namely: investigated the theoretical and practical aspects of the use of ICT in the educational process of ZVO – V. Bykov,

O. Glazunova, O. Glushak, M Zhaldak, O. Zhiltsov, Y. Zhuk, O. Kolgatin, K. Kolos, M. Leshchenko, S. Litvinova, A. Manako, N. Morse, Y. Nosenko, O. Ovcharuk, L. Petukhova, O. Pinchuk, O. Sokolyuk, N. Soroko, O. Spivakovsky, E. Spivakovskaya-Vandenberg, O. Spirin, Y. Trius, M. Shishkina, A. Yatsyshyn and others; substantiated the theoretical-methodological and methodological bases of application of the competence approach in the training of specialists with higher education – O. Antonova, N. Bibik, V. Bobrytska, L. Klos, L. Kravchenko, O. Lokshina, O. Ovcharuk, O. Pometun, O. Savchenko, V. Yagupov and others.

Purpose and tasks

The purpose of the research is to substantiate the practical aspects of the formation of IC-competence of the future master of public administration in the context of informatization of education.

The following tasks have been identified: to reveal the role of Google services in the formation of IC-competence of the future master of public administration; give examples of pedagogical use of elements of Google services for the formation of IR competence of the future master of public administration in higher education institutions (HEI).

Presentation of the main material of the study and the results obtained

Summarizing the views of scientists on the essential characteristics of the process of formation of the information society, we share their conclusions that ICT is increasingly penetrating into various spheres of life, science, education, production, which requires relevant knowledge and skills to apply them [3]. First of all, we note that our research position agrees with the scientific opinion of Bobrytska V., who notes that the relevance of informatization of education is due to the fact that currently there is a constant relationship between success in teaching students and the quality of their training in ICT, their IC-competence, which is implemented by improving the efficiency, intensity and instrumentality, reducing the complexity of the processes of using information resources in the educational process of free economic zones. The researcher emphasizes that one of the factors that significantly affects the improvement of professional training for a master's degree in public administration is the content and structure of the educational environment as a means of forming their professional competencies [2, 4].

Notice that all innovative changes, above all, are depended on the student, his creative potential, creativity, readiness for continuous self-education, needs for professional growth, flexibility of socio-pedagogical thinking, humanistic orientation of the individual. In our opinion, it is important for a master's degree in public administration to acquire appropriate professional competencies in terms of informatization of the educational environment, in which learning takes place on the basis of comprehensive consideration of their individual needs and capabilities, the requirements of society. According to V. Bykov, these changes form a new priority of higher education, the so-called ICT-oriented education, ie education that reflects global trends in educational systems, provides a broad, comprehensive and effective use of ICT in the implementation of its own internal system functions (educational, scientific and managerial) and external functions for the implementation of relationships with the surrounding educational system; aimed at implementing the principles of open education [1, 6].

A number of educational information encourage the search for individual ways to master new activities, including analysis, selection, generalization of information [1]. The educational activity of modern students is largely determined by their own activity in mastering ICT, based on the meaningful acquisition of a set of IC-competencies that are necessary for successful self-realization in future professional activities [5, 6].

Theoretically significant for solving the problems of our study are the conclusions of scientists that the new social services have simplified the process of creating and publishing materials on the global Internet. Now everyone can not only access photos, videos, texts, but also take part in editing them and creating their own online content. With the help of Web 2.0 services, content is created by millions of people. They develop and post new texts, photos, pictures, music files online. At the same time, communication between people is increasingly not in the form of direct exchange of information, but in the form of observation of network activities [1, 5, 6].

In particular, the use of Google services in freelancers can give:

1) saving money on the purchase of software;

2) reducing the need for specialized classrooms, as in any classroom you can organize a modern educational process using laptops and wireless network;

3) the ability to perform many activities, monitor and evaluate student achievement online;

4) openness of the educational environment for those who teach (teacher) and those who study (student).

In addition, the means and technologies of information and communication networks, including the Internet, form a computer-oriented platform for the educational process of studying disciplines in higher education [1, 5, 7].

Successful experience in solving the problem of using Google services in master's degree in public administration is in the National Pedagogical Dragomanov University. In particular, in the process of studying the discipline (educational component) "Management of the IT-structure of the educational institution", during seminars and practical classes for students of the second (master's) level of higher education educational-professional program 281 Public Administration. Public education policy, a teacher to attract the entire target audience and at the same time quickly assess the preparation of all students, uses various Google services. Next we will consider them in more detail [9, 10].

It was starting from March 2020, in the conditions of quarantine during the pandemic caused by the coronavirus SARS-CoV-2, teachers of the Department of Social Philosophy, Philosophy of Education and Educational Policy of the Faculty of Management of Education and Science of the National Pedagogical Dragomanov University actively used the possibilities of using *Google Classroom* to create electronic training courses for disciplines (Fig. 1). Because all teachers have Google corporate mail, and students with modern mobile communications also use Google mail, the Google Classroom app is the most accessible.

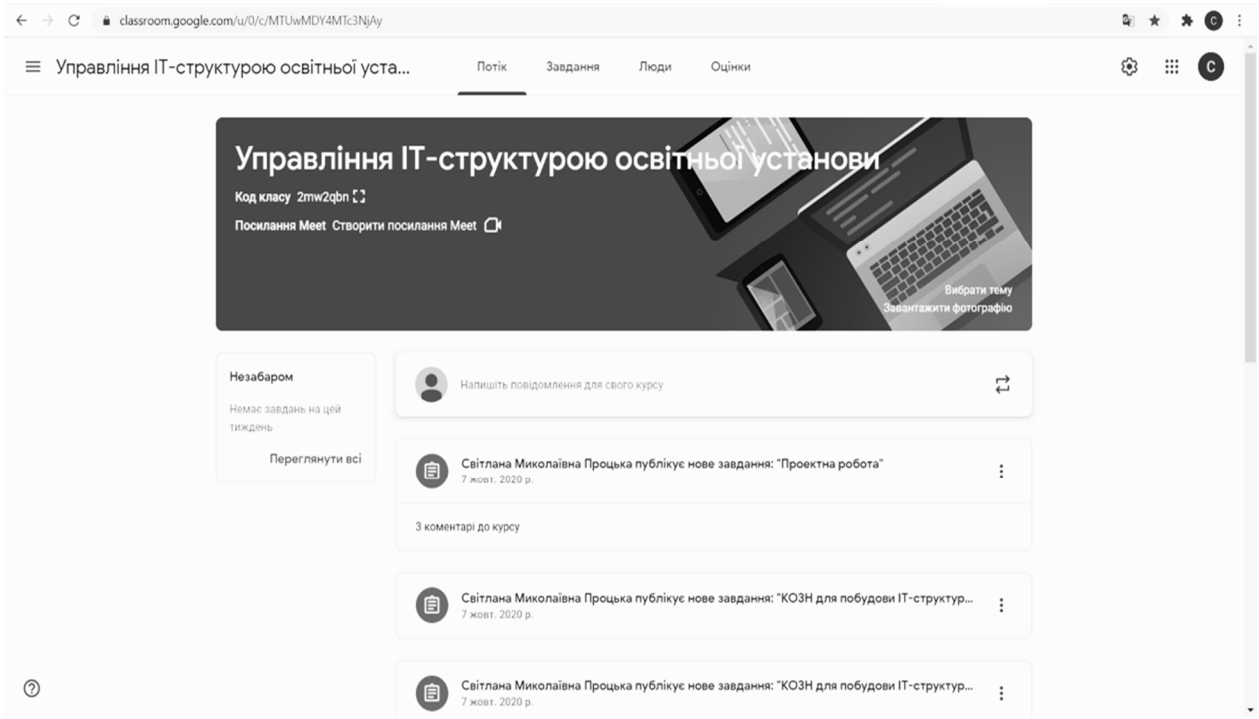

Fig. 1. Starting page of the e-learning course "Management of the IT structure of the educational institution" in Google Classroom

Thus, in the Google Classroom, the teacher in the section "Tasks" openly places all the necessary information from his discipline (educational component), which he considers should be mastered by the student mastering this course. For example, the e-learning course "Management of the IT structure of an educational institution" for students of the second (master's) level of higher education was taken (Fig. 2). The course contains two sections – "Theoretical material", where the teacher

for students posted a work program, syllabus and textbook, "Practical material", which contains specific practical tasks for students to perform.

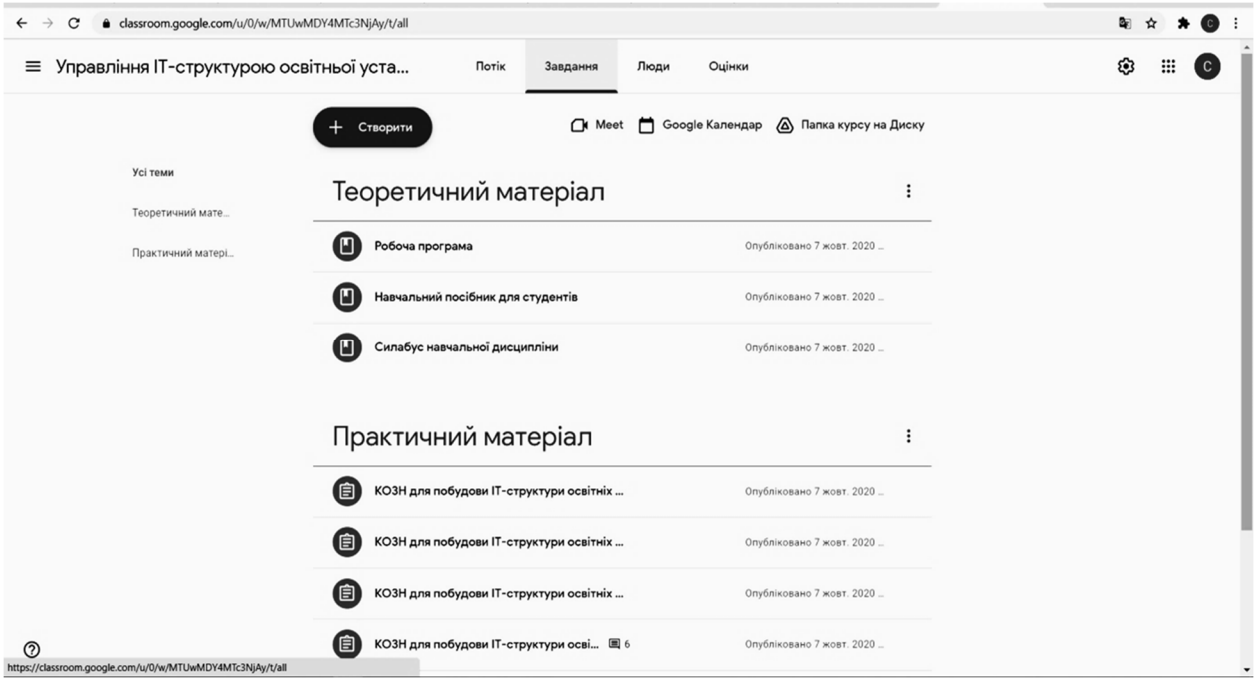

Fig. 2. Example of placing materials in Google Classroom

In the "People" section, the teacher has the opportunity to involve students in the course by sending them an invitation by mail or a link to this course through various social networks, control the number of registered students, and if necessary remove them (Fig. 3).

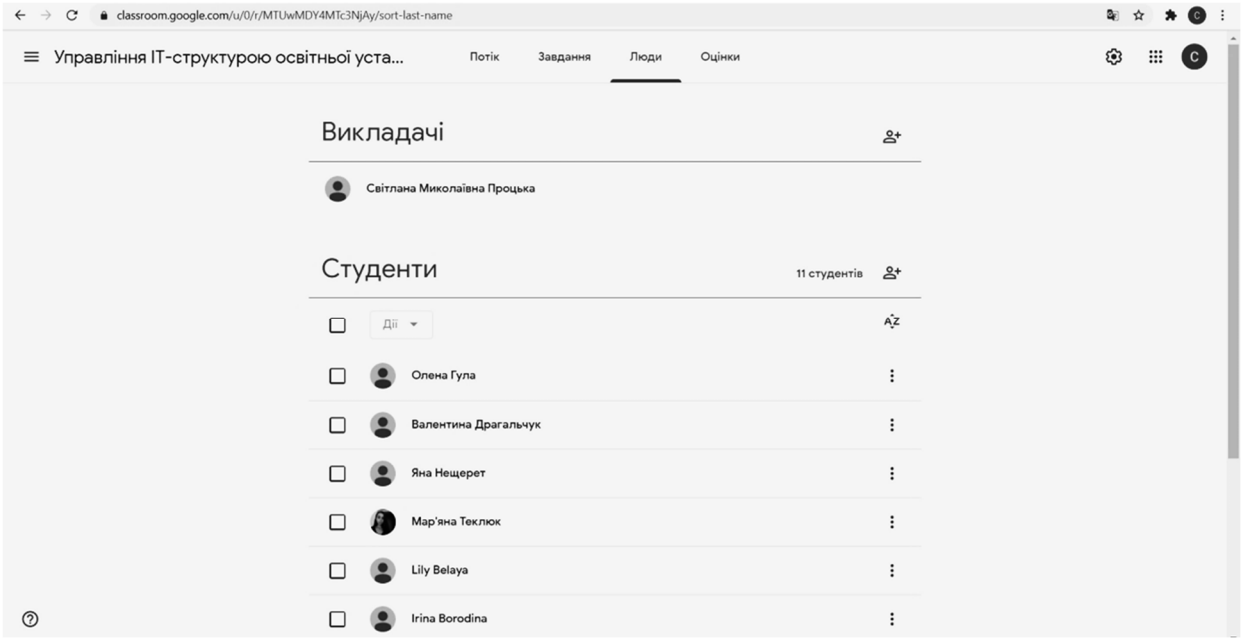

Fig. 3. Example of student management in Google Classroom

In the section "Assessments" the teacher evaluates practical tasks (Fig. 4). Here it is easy and accessible, with savings of own time on check and summary of data on each student, quickly

receives the general picture of educational results of students. If necessary, the teacher can also visit the individual page of each student and evaluate it separately (Fig. 5).

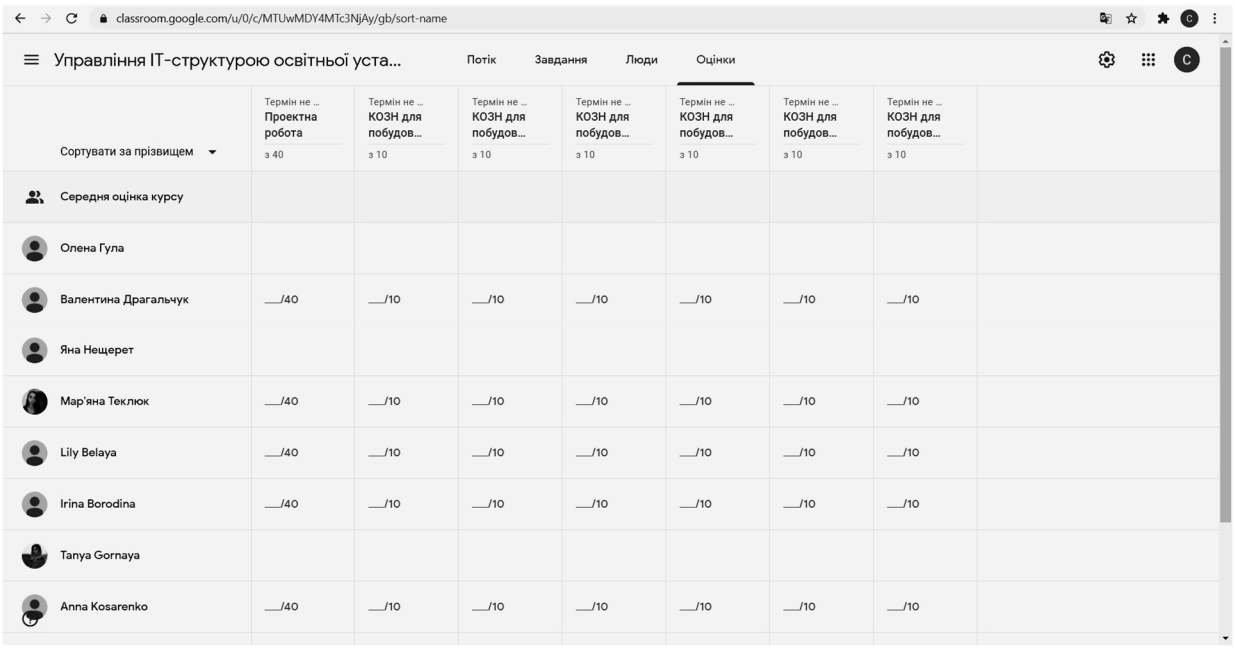

Fig. 4. Example of student assessment in Google Classroom

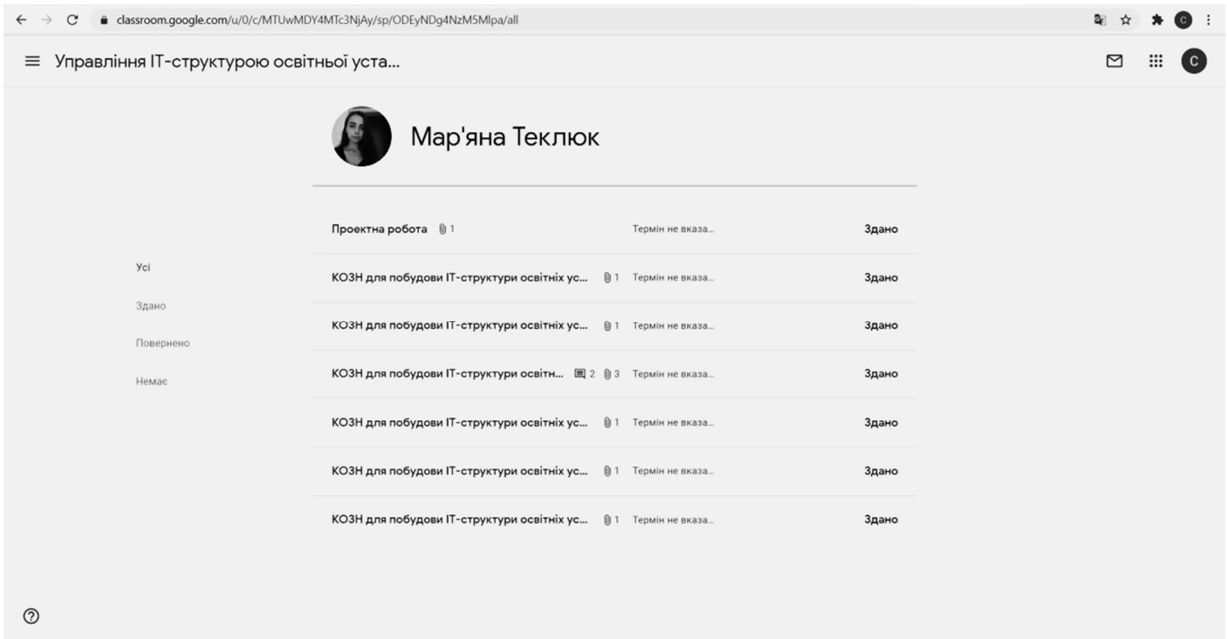

Fig. 5. Example page of a student of the second (master's) level of higher educational and professional program 281 Public administration and administration. Public education policy in Google Classroom

The next Google service is *Google Docs & SpreadSheets*. The documents can be edited jointly by users who have received the invitation (it is not necessary to have a Google account for this), in the process of reviewing and editing available to view changes and chat. The file exchanger works for free with a quota of 1 GB, additional volume can be obtained at your expense. Google Docs & SpreadSheets supports “cloud” printing of documents (remote sending of files to the printer queue), and is also stored in the content service [8, 9] (Fig. 6).

One of the available and effective Google services is *Google Forms*. Note that the teacher can use Google Forms (Fig. 7) to attract the entire target audience and quickly assess the training of all students in a particular module or topic [5, 11, 12].

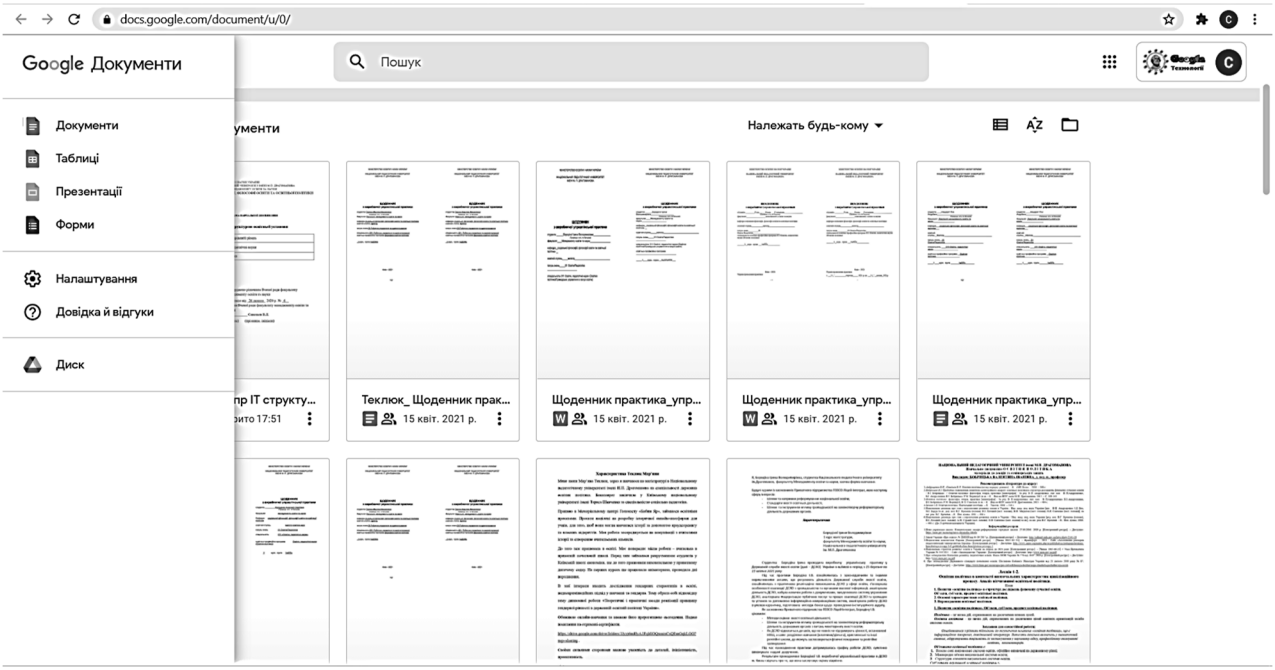

Fig. 6. Example Google Docs & SpreadSheets

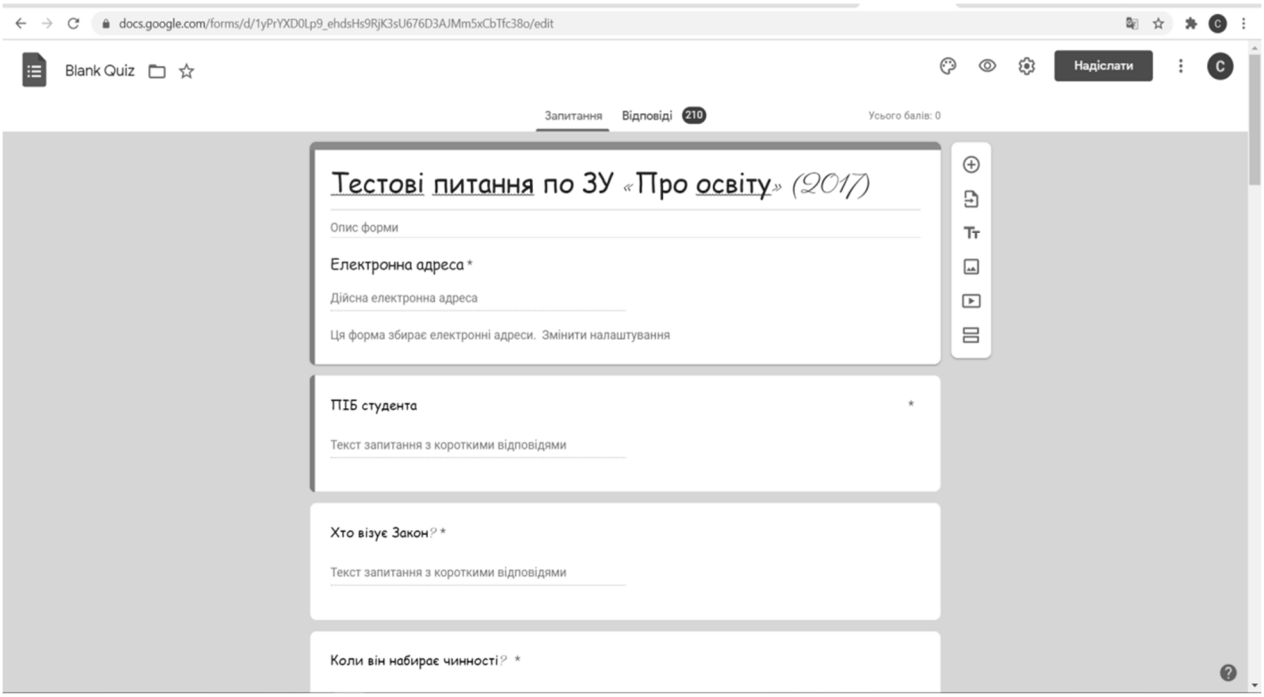

Fig. 7. Example of Google Forms

Appropriately, Google services will consider *Google Calendar* (Fig. 8). This application helps both the teacher and the student to plan their work, educational and free time, which in our period allows you to organize an effective educational process in ZVO [5, 10, 11].

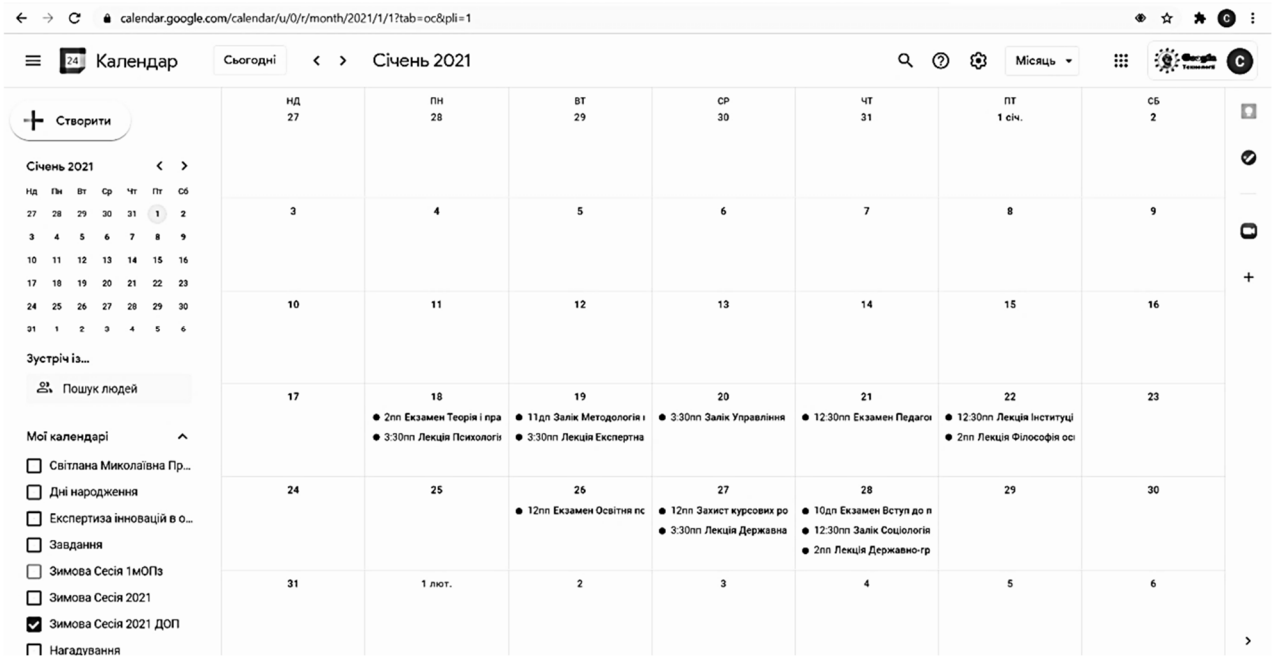

Fig. 8. Example of Google Calendar for future masters in public administration

From the above, using Google services, students can effectively plan and prepare for classes, which, in our opinion, contributes to the acquisition of IC-competence in the educational process.

Conclusions and prospects for further research

The specifics of the future professional activity of the Master of Public Administration were given, it is important to note that the use of Google services (eg, Google Classroom, Google Docs & SpreadSheets, Google Forms, Google Calendar) creates conditions for them at the stage of acquiring a profession important for individual professional motives. values, acquisition of knowledge, skills and experience, development of abilities, creative inclinations; provides the latest approaches to educational communication, cooperation and collaboration. So, given the results of this research, we believe that Google's services in the formation of the IC-competence of the Master of Public Administration in the context of informatization of education play an important role for the modern system of higher education. We see prospects for further research in the development of pedagogical conditions for monitoring the results of the use of Google services in the educational process of higher education institutions, including during the training of a master's degree in public administration.

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ORGANIZATIONAL CHANGES IN THE ACTIVITY OF ENTERPRISES IN THE CONTEXT OF URGENT CRISIS MANAGEMENT

Abstract. Eliminating or reducing the negative impact of crisis phenomena on the economic condition of an enterprise and ensuring its further effective development is closely related to the concept of organizational changes. On the one hand, urgent crisis management tools almost always cause such changes. On the other hand, crisis phenomena in the activities of a business entity lead to the need to introduce organizational changes. In this context, it is noted that it is important to diagnose such changes even before their practical implementation begins. This problem is especially relevant when it is necessary to introduce so-called large-scale changes in the context of crisis management. Any mistakes at the beginning most likely will lead to failure to achieve the set goals and to problems in the practical implementation of these changes. Consequently, based on the results of the conducted research, organizational changes in the activities of enterprises in the conditions of crisis management at the beginning are proposed to be diagnosed taking into account four areas that correspond to the PAEI-model of Adizes, well known in the theory and practice. At the same time, it provides for determining the market orientation of organizational changes (proactive nature of organizational changes); the social orientation of organizational changes (integrative nature of organizational changes); the impact of organizational changes on the enterprise administration system (complementary nature of organizational changes); the impact of organizational changes on the operating environment of the enterprise (functional nature of organizational changes).

The article offers a method for diagnosing organizational changes in the activities of enterprises in the conditions of crisis management, based on the method of hierarchy analysis (Analytic Hierarchy Process – AHP) and provides for the implementation of such key stages: the formation of an expert group; determining the level of a hierarchical model for diagnosing organizational changes in the conditions of anti-crisis management; studying the essence and characteristics of the proposed organizational changes, so that then diagnose them taking into account the directions of proactive, integrative, functional and complementary nature, using matrices of pairwise comparisons; determining eigenvectors, as well as establishing their normalized values, applying the known geometric mean of the matrix lines; determining the consistency of expert opinions; forming conclusions and recommendations. The possibility of practical use of the proposed method of diagnosing organizational changes in the activities of enterprises in the context of crisis management is confirmed by relevant calculations on the example of several business entities in the Lviv region.

Key words: crisis management, business, investment, innovation, tools, crisis, enterprise.

Introduction

In market conditions of management, crises are an integral part of the functioning of enterprises in a dynamic business environment. Business representatives, unable to avoid crisis phenomena, can still influence them by reducing their negative consequences or correcting their impact. At the same time, this makes it necessary to form effective anti-crisis management tools, primarily of an urgent nature and direction.

The study of theory and practice allows us to conclude that the elimination or reduction of the negative impact of crisis phenomena on the economic state of the enterprise and ensuring its further effective development closely correlates with the concept of organizational changes. On the one hand, urgent crisis management tools almost always cause such changes. On the other hand, crisis phenomena in the activities of a business entity lead to the need to introduce organizational changes. The company may be affected by these changes or initiate them independently. However, in general, changes are necessary.

As you know, changes are an integral part of business activity, but the attitude to changes and management varies significantly depending on the enterprise. Thus, some business entities take an active position on changes, trying to respond to them as much as possible and stay ahead of them. Other business representatives passively contemplate the changes that are taking place. As the study of theory and practice shows, in a complex dynamic environment, it is difficult to achieve success without realizing the need for change and the need for effective management of them. To achieve success in competition, you need to implement a lot of organizational changes that relate to the types of activities, markets, technologies, organizational structure of management, corporate culture, personnel, management tools, business methods, management systems, communication methods, etc.

Literature review and methodical approaches

A review and generalization of literature sources show that there are many different approaches to the interpretation of the concept of organizational changes. Some scientists consider them from the perspective of a process that covers various areas of activity of the enterprise. Others identify changes with the transition of an object from one state to another. Others still consider changes as the transformation of individual subsystems of a business entity, including those that are concerning the external environment, etc.

For different authors, organizational changes relate to the enterprise as a whole or its elements, its environment, processes, human capital, resources, and so on. They can be superficial or deep, as well as relate to significant or more general problems. Changes can be caused by both internal and external factors. Implementing changes at the enterprise should help it function more efficiently in the market and ensure profitability. Not only business entities that are in crisis but also those whose market positions are strong should consider the problems of organizational changes.

The study of theory and practice allows us to conclude that the sphere of organizational changes in the activities of enterprises, including in the conditions of crisis management, is quite carefully considered in the scientific literature. In particular, this direction highlights the problems [1–5]: the essence and specifics of organizational changes; typology of organizational changes and their basic models; basic concepts, theories and philosophy of changes; concepts and methods of effective implementation of organizational changes; stages of successful management of organizational changes; introduction of organizational changes in the conditions of innovative development of the enterprise; identification of factors that cause organizational changes; highlighting obstacles during the implementation of organizational changes; resource support of organizational changes; management of strategic organizational changes; the role of managers in the implementation of organizational changes; the human factor in the process of implementing organizational changes; reactions of various groups of stakeholders to organizational changes; formation of a mechanism for managing organizational changes; resistance to organizational changes (its causes, types, methods of management, etc.); leaders of changes; formation of trust in the implementation of organizational changes; personnel management in the process of organizational changes; psychology of organizational

changes; risks of implementing organizational changes, etc.

Taking into account the importance and necessity of organizational changes, it should still be noted that their implementation should be carried out carefully and thoughtfully, using all available tools for diagnosing them for expediency. Moreover, in this context, it is worth talking about both "input" and "output" diagnostics. The first is carried out before the implementation of organizational changes, and the second – after that. Understanding the role and significance of "output" diagnostics of organizational changes in the activities of enterprises, however, in the conditions of domestic business, the key is to diagnose such changes even before their practical implementation begins. This problem is especially relevant when it is necessary to introduce so-called large-scale changes in the context of crisis management. Any mistakes at the beginning most likely will lead to failure to achieve the set goals and to problems in the practical implementation of these changes.

Considering the problems of diagnosing organizational changes in the activities of enterprises in the context of crisis management, it is necessary to choose certain methodological tools in this context. To achieve these goals, we should use the well-known method of hierarchy analysis (AHP) in scientific research, which is based on the construction and analysis of matrices of pairwise comparisons. According to the review and generalization of literature sources, nowadays the AHP method is used not only to solve various management problems but also in other industries where it is necessary to choose alternatives, allocate resources, prioritize some options over others, predict scenarios, etc.

The study of theory and practice shows that in the most generalized form, the practical use of the hierarchy analysis method involves the implementation of three key stages, namely [6–11]:

– building a hierarchical model that includes goals, criteria, and alternatives;

– construction of matrices of pairwise comparisons using expert judgments;

– calculation of estimates of the significance of alternatives based on criteria at all levels, according to the principle of hierarchical composition.

According to the review and generalization of literature sources, in economic research, the method of hierarchy analysis is used, for example, for:

– assessment of managers' competencies;

– value-based management;

– choosing a strategy;

– environmental impact assessment;

– selection of suppliers;

– assessment of labour relations during the dismissal of employees;

– identification of key possible enterprises;

– identification of critical success factors for the information services industry in the international market;

– analysis of barriers to implementing "green" supply chain management;

– development of an approach to the formation of indicators of agricultural sustainability;

– outsourcing of non-core assets and competencies of the enterprise;

– assessment of safety risk during planning and budgeting of construction projects;

– ranking of human capital indicators;

– development of a demand response prelabour emergencies, etc.

The use of the hierarchy analysis method to solve the problem of diagnosing organizational changes in the activities of enterprises in the conditions of crisis management is due to its strong sides, namely [6; 9; 11, 12]:

– ability to take into account the level of consistency of specialists' opinions;

– ability to structure a task that itself belongs to the category of poorly formalized ones;

– ability to rate alternative management solutions;

– ability to attract external specialists to the choice of alternatives, if necessary;

– ability to consider a complex problem from an analytical point of view;

– ability to apply both deterministic and qualitative diagnostic parameters;

– ability to evaluate parameters that either do not lend themselves to mathematical formalization at all, or it can be done at a rather low level;

– ability to rank experts according to their competence and significance for achieving goals, and so on.

Results

Based on the results of the conducted research, organizational changes in the activities of enterprises in the conditions of crisis management at the beginning are proposed to be diagnosed taking into account four areas that correspond to the PAEI-model of Adizes, well known in the theory and practice [13] (Fig. 1).

Based on the results of long-term research, Adizes concluded that any organization (commercial or non-profit) should be effective and efficient in both the short and long term. And for this to happen, it must play four roles [13]:

- producing (P);
- administering (A);
- entrepreneuring (E);
- integrating (I).

According to the author of the theory, thanks to the first two roles, the business entity is effective and efficient in the short term, and thanks to the other two, it is effective and efficient in the long term.

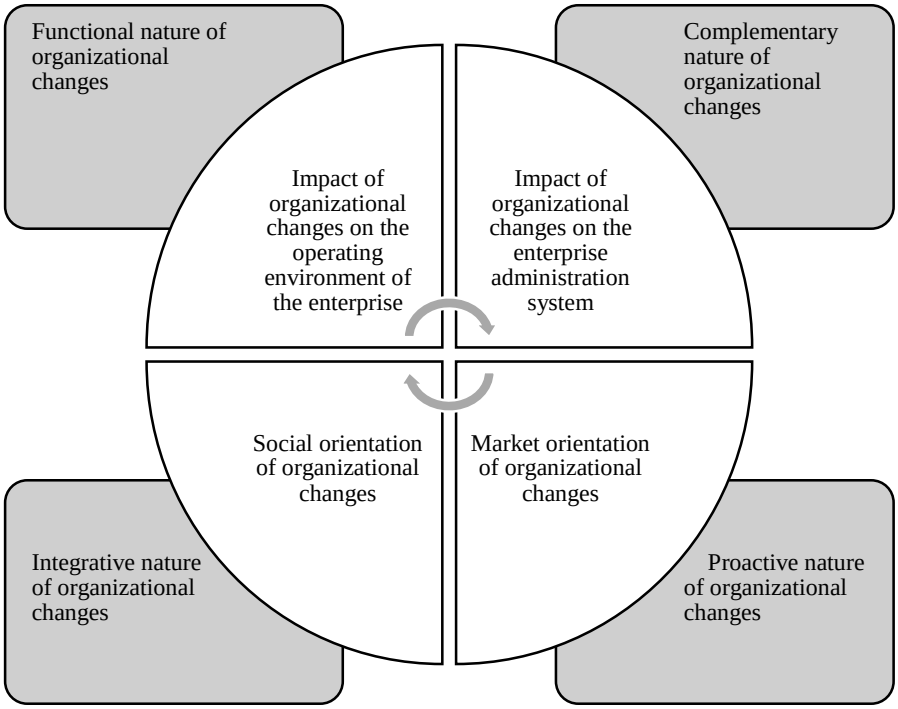

Fig. 1. Directions of diagnostics of organizational changes in the activities of enterprises in the context of crisis management

Note: proposed by the authors taking into account [13]

Nowadays the Adizes' PAEI model in the scientific literature is used to solve a wide range of problems, in particular:

- to study organizational characteristics at the first three stages of the life cycle;
- in the personnel management of a small enterprise in the field of agricultural tourism;
- to identify the relationship between students' behaviour in video presentations and their modality;
- for evaluating management in a small enterprise;
- to study the ability to manage and ensure privacy, etc.

In the case of organizational changes in the activities of enterprises in the context of crisis management, it should be noted that their functional nature (impact on the operating environment of the enterprise) indicates the provision of the expected result due to such changes, which is the satisfaction of the needs of the so-called “clients of changes” (we are talking about the added value of organizational changes in the context of the operating environment). Drawing parallels with the results of research by

Adizes [13], such "clients of change" can be both representatives of the internal and external environment. On the other hand, each organizational change in the context of crisis management has its own "client" (or "clients"), to which it is directed (for example, to the department, to the direction of activity, to the geographical market, to technological processes, to ways of interacting with suppliers, etc.). Adizes interprets the concept of "client" much more broadly than the concept of "goal" because the goal can not always be achieved, however, in our case, the "client of change" can still interpret organizational change very effectively. In addition, it should be taken into account that the goals of developing and implementing such changes can be significantly modified and even changed in the course of project work.

The impact of organizational changes on the enterprise administration system (the complementary nature of organizational changes) means that each such change should not be isolated or separate in relation to the processes that occur in the business entity's activities. On the contrary, it should harmoniously "fit" into such processes, balance and complement them. This should be taken into account, because the realities of today show that quite often the goals of implementing organizational changes in the conditions of crisis management are achieved, at the same time, these changes have a destructive effect on the management system of the enterprise, on the established procedures and lead to inefficiency of the business entity.

It is also necessary to diagnose organizational changes in the activities of enterprises in the context of crisis management in the direction of their market orientation (proactive nature of organizational changes). The fact is that nowadays every enterprise operates in a very dynamic business environment, where everything happens quickly (for example, you should respond quickly to problems, act quickly in response to changing consumer needs, quickly deliver products to the points of sale, etc.). In this context, using the terminology of Adizes, the organizational changes in the context of crisis management should "meet changing realities". They should contribute to the development of the enterprise, they should take into account the perspective, "see through the fog", they should "take into account changes".

The last proposed direction for diagnosing organizational changes in the company's activities in the context of crisis management is the direction of their social orientation (integrative nature of organizational changes). This direction is aimed at the social aspects of management and the social subsystem of the business entity. Organizational changes should bring employees together or contribute to this, which will ensure teamwork, team spirit, team motivation, synchronization of all employees of the department/enterprise, etc.

Using the conceptual, category and methodological apparatus of the hierarchy analysis method (Analytic Hierarchy Process – AHP), which are described in the above-mentioned literature sources, the problem of diagnosing organizational changes in the activities of enterprises in the conditions of crisis management can be represented mainly with the construction of matrices of pairwise comparisons $A = (a_{ij})$, whose characteristic is a single diagonal. At its core, each such matrix will clearly show the predominance of option i above option j for each comparison option. In addition, given the phenomenon of inverse symmetry within the framework of the hierarchy analysis method, it is true that $a_{ji} = \frac{1}{a_{ij}}$.

In the case of diagnosing organizational changes in the activities of enterprises in the context of crisis management, it is not a task in choosing alternative options for such changes (where most often the method AHP is exactly what is used), but in the definition:

- market orientation of organizational changes (proactive nature of organizational changes);
- social orientation of organizational changes (integrative nature of organizational changes);
- impact of organizational changes on the enterprise administration system (complementary nature of organizational changes);
- influence of organizational changes on the operating environment of the enterprise (functional nature of organizational changes).

Considering individual stages of diagnosing organizational changes in the activities of enterprises in the context of crisis management using the hierarchy analysis method, first an expert group

should be formed that will perform all further work. These experts should not have a conflict of interest among themselves, be competent in terms of the proposed organizational changes, as well as in terms of practical use of the AHP-method. If necessary, the expert group may also include external specialists.

The formation of an expert group makes it possible to determine the level of the hierarchical diagnostic model of organizational changes in the activities of enterprises in the context of crisis management. In our case, we should take into account

$$\theta = \{n_1, n_2\}, \quad (1)$$

where θ is comparison options for assessing organizational changes in the activities of enterprises in the context of crisis management; n_1 – directions of diagnostics of organizational changes in the activities of enterprises in the conditions of crisis management (market orientation of organizational changes; social orientation of organizational changes; the impact of organizational changes on the enterprise administration system; the impact of organizational changes on the operating environment of the enterprise); n_2 – organizational changes in the activities of enterprises in the context of crisis management.

Taking into account the above, let us give a two-level hierarchical model for diagnosing organizational changes in the activities of enterprises in the context of crisis management (Fig. 2).

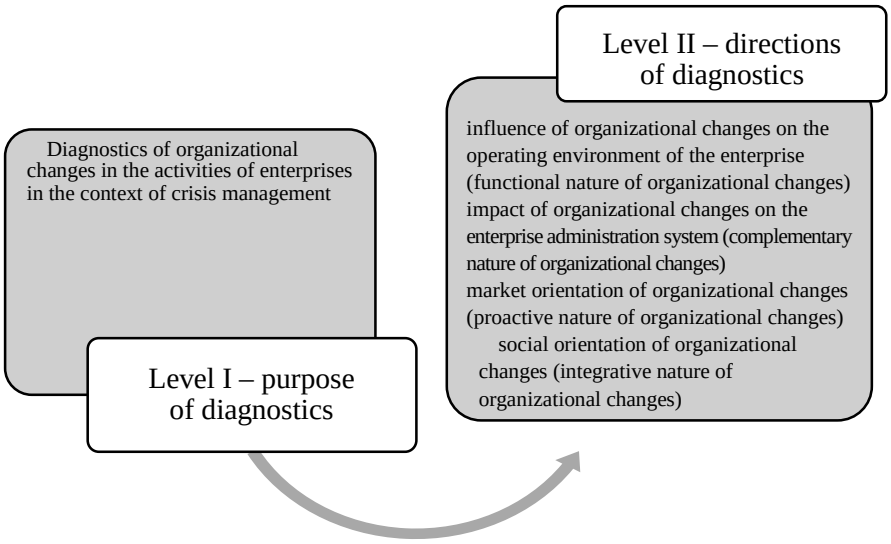

Fig. 2. A hierarchical model of diagnostics of organizational changes in the activities of enterprises in the context of crisis management

Note: created by the authors

During the practical use of the proposed method for diagnosing organizational changes in the activities of enterprises in the context of crisis management, it is possible to increase the number of these levels to three, four or more, if necessary.

In the future, it is necessary to carefully study the essence and characteristics of the proposed organizational changes in the company's activities in the context of crisis management, in order to then diagnose them taking into account the directions of proactive, integrative, functional and complementary nature, using matrices of pairwise comparisons $A = (a_{ij})$:

$$A = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1j} & \cdots & a_{1n} \\ a_{21} & 1 & \cdots & a_{2j} & \cdots & a_{2n} \\ \cdots & \cdots & 1 & \cdots & \cdots & \cdots \\ a_{i1} & a_{i2} & \cdots & 1 & \cdots & a_{in} \\ \cdots & \cdots & \cdots & \cdots & 1 & \cdots \\ a_{n1} & a_{n2} & \cdots & a_{nj} & \cdots & 1 \end{bmatrix}, a_{ii} = 1, \ a_{ji} = \frac{1}{a_{ij}}, \ i, j = 1,2, \ldots, n, \quad (2)$$

where a_{ij} – matrix elements $A = (a_{ij})$, showing the predominance of the option i on the option j for each direction of diagnostics of organizational changes in the activities of enterprises in the

conditions of crisis management (option i applies to the matrix row, and the option j – its column); n – number of comparison options.

It is also obvious that each element of an inversely symmetric matrix $A = (a_{ij})$ will acquire only positive values, i.e. $A = (a_{ij})$ $a_{ij} > 0$ for each $i, j = 1, ..., n$. Moreover, it is necessary to take as a basis the relative scales of diagnostics of organizational changes in the activities of enterprises in the conditions of crisis management in areas based on the known 9-point Saati scale within the frameworks of the AHP method (Table 1).

Similar relative scales for diagnosing organizational changes in the company's activities in the context of crisis management should be built in the other three areas.

Table 1

The relative scale of diagnostics of organizational changes in the company's activities in the context of crisis management in the direction of their market orientation (proactive nature)

Scores	Characteristics
1	Organizational changes in the company's activities in the context of crisis management have the most positive market orientation
3	Organizational changes in the company's activities in the context of crisis management have a favourable market orientation
5	Organizational changes in the company's activities in the context of crisis management taking into account the market orientation generally have a neutral impact
7	Organizational changes in the company's activities in the context of crisis management have a negative market orientation
9	Organizational changes in the company's activities in the context of crisis management have the most negative market orientation
2, 4, 6, 8	Tentative scores

Note: developed based on [14]

Having constructed inversely symmetric matrices using relative scales for diagnosing organizational changes in the company's activities in the context of crisis management $A = (a_{ij})$, in the future eigenvectors for each of them should be defined, as well as their normalized values should be set using the known geometric mean of the matrix rows $A = (a_{ij})$:

$$x_i = \sqrt[n]{\prod_{j=1}^{n} a_{ij}}, \qquad i, j = 1,2, \dots, n, \qquad (3)$$

where $x_i -$ i-the value of the element of the eigenvector of the matrix $A = (a_{ij})$.

Within the framework of the proposed method for diagnosing organizational changes in the company's activities in the context of crisis management the normalized values of the priority vector should be calculated using the formula:

$$y_i = \frac{x_i}{\sum_{i=1}^{n} x_i}, \qquad (4)$$

where $y_i -$ normalized value i – of the value of an element.

Given the potential differences in experts opinions about the benefits of option i on option j for each direction of diagnosing organizational changes in the activities of enterprises in the context of crisis management, within the framework of the hierarchy analysis method, it is proposed to determine the consistency of the opinions of these experts. Corresponding Consistency Index I_u is calculated using the formula:

$$I_u = \frac{\gamma_{\max} - n}{n - 1}, \qquad (5)$$

where $\gamma_{max} -$ is a maximum possible eigenvalue of each matrix $A = (a_{ij})$.

Determining the consistency index I_u in the frameworks of the method of diagnosing organizational changes in the activities of enterprises in the context of crisis management it requires information about a random consistency index V_{iu}, which is also given in the work of T. Saati (Table 2).

Table 2

Random consistency index V_{iu} of matrices $A = (a_{ij})$ in the frameworks of the method of diagnosing organizational changes in the activities of enterprises in the context of crisis management

Matrix level	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Value V_{iu}	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.59

Note: taking into account [11; 14].

The possibility of practical use of the proposed method of diagnosing organizational changes in the activities of enterprises in the context of crisis management is confirmed by relevant calculations on the example of several business entities in the Lviv region. In particular, we will present the following calculations for Vynnykivska Tobacco Factory LLC. At one time, the management of this business entity considered the option of technological modernization of production facilities with an emphasis on innovation, which was caused by the weakening of the company's market position and its relative crisis state. Decision-making was based on the criteria of technological innovation, which are justified in the literature. At this stage, the heads of the institutional level of management of Vynnykivska Tobacco Factory LLC were asked to take into account the method of diagnosing organizational changes in the conditions of crisis management. As a result, a working group of 5 people was formed, which brought together both internal and external experts (in a 3x2 ratio). The form of work of this expert group is periodic sessions, during which the methods of "brainstorming" and expert focusing were used. The average values method is used to determine the average estimates.

During the practical application of the method for diagnosing organizational changes in the context of crisis management, there was no increase in the number of levels of the hierarchical model (the two levels mentioned above were taken into account). Also, as noted above, the diagnostic areas mentioned are used, namely: proactive, integrative, complementary and functional nature of organizational changes. For each of them, the relative scales shown in Table 1 are used, which made it possible to construct 4 matrices of pairwise comparisons $A = (a_{ij})$.

As noted above, the use of the method of diagnosing organizational changes in the activities of enterprises in the context of crisis management also involves the construction of matrices of pairwise comparisons for second-level areas (Table 3).

Taking into account the given formulas (3) and (4), we obtain the following calculations:

$$x_1 = \sqrt[4]{1 \times \frac{1}{5} \times \frac{1}{3} \times \frac{1}{3}} = 0.39;$$

$$x_2 = \sqrt[4]{5 \times 1 \times 3 \times 3} = 2.59;$$

$$x_3 = \sqrt[4]{3 \times \frac{1}{3} \times 1 \times 3} = 1.32;$$

$$x_4 = \sqrt[4]{3 \times \frac{1}{3} \times \frac{1}{3} \times 1} = 0.76;$$

$$\sum_{i=1}^{4} 0.39 + 2.59 + 1.32 + 0.76 = 5.05;$$

$$y_1 = \frac{0.39}{5.05} = 0.0772;$$

$$y_2 = \frac{2{,}59}{5.05} = 0.5129;$$

$$y_3 = \frac{1.32}{5.05} = 0.2614;$$

$$y_4 = \frac{0.76}{5.05} = 0.1505.$$

γ_{max} for Vynnykivska Tobacco Factory LLC at the second level of the hierarchical model for the directions of diagnostics of the proposed organizational change will be:

$$\gamma_{max} = 0.0772 \times (3 + 5 + 1 + 3) + 0.5129 \times \left(\frac{1}{5} + 1 + \frac{1}{3} + \frac{1}{3}\right) + 0.2614 \times \left(\frac{1}{3} + 3 + 1 + \frac{1}{3}\right) + 0.1505 \times \left(\frac{1}{3} + 3 + 3 + 1\right) = 4.2073.$$

Table 3

Matrix of pairwise comparisons for Vynnykivska Tobacco Factory LLC at the second level of the hierarchical model for the directions of diagnostics of the proposed organizational change

Parameters	Impact of the analyzed organizational change on the operating environment (functional nature of the proposed organizational change)	Impact of the analyzed organizational change on the administration system (complementary nature of the proposed organizational change)	Market orientation of the analyzed organizational change (proactive nature of the proposed organizational change)	Social orientation of the analyzed organizational change (integrative nature of the proposed organizational change)	Normalized rating, y_i
Impact of the analyzed organizational change on the operating environment (functional nature of the proposed organizational change)	1	1/5	1/3	1/3	0.0772
Impact of the analyzed organizational change on the administration system (complementary nature of the proposed organizational change)	5	1	3	3	0.5129
Market orientation of the analyzed organizational change (proactive nature of the proposed organizational change)	3	1/3	1	3	0.2614
Social orientation of the analyzed organizational change (integrative nature of the proposed organizational change)	3	1/3	1/3	1	0.1505
$\gamma_{max} = 4.2073$ $I_u = 0.0691$					

Consistency Index I_U of the expert assessments of specialists who performed the calculations цфі:

$$I_u = \frac{\gamma_{max} - n}{n - 1} = \frac{4.2073 - 4}{4 - 1} = 0.0691.$$

Using the information from Table 2 relative to the random consistency index of V_{iu} matrices $A = (a_{ij})$ within the framework of the method of diagnosing organizational changes in the activities of enterprises in the context of crisis management, we will have:

$$V_u = \frac{I_u}{V_{iu}} = \frac{0.0691}{0.9000} = 0.0768.$$

Compliance with the condition $V_u \leq 0.10$ indicates the consistency of expert assessments of specialists who performed calculations within the framework of the diagnostic method of the proposed organizational change in the activities of Vynnykivska Tobacco Factory LLC in the conditions of crisis management.

At the final stage of using the method of diagnosing the proposed organizational change in the activities of Vynnykivska Tobacco Factory LLC in the context of crisis management, a consolidated vector of priorities was proposed:

$$\begin{bmatrix} 0.1673 & 0.2511 & 0.1254 & 0.1254 \\ 0.8327 & 0.7489 & 0.8746 & 0.8746 \end{bmatrix} \begin{bmatrix} 0.0772 \\ 0.5129 \\ 0.2614 \\ 0.1505 \end{bmatrix}.$$

As a result, we get the following calculations for the priority vector: C:

$$c_{11} = a_{11} \times b_{11} + a_{12} \times b_{21} + a_{13} \times b_{31} + a_{14} \times b_{41} =$$
$$= 0.1673 \times 0.0772 + 0.2511 \times 0.5129 + 0.1254 \times 0.2614 + 0.1254 \times 0.15 = 0.1933;$$
$$c_{21} = a_{21} \times b_{11} + a_{22} \times b_{21} + a_{23} \times b_{31} + a_{24} \times b_{41}$$
$$= 0.8327 \times 0.0772 + 0.7489 \times 0.5129 + 0.8746 \times 0.2614 + 0.8746 \times 0.1505 = 0.8086.$$

The generalized calculation results are presented in Table 4.

Table 4

Generalized results of diagnostics of the proposed organizational change in the activities of Vynnykivska Tobacco Factory LLC

Comparison options	Value of comparison parameters				Final scores
	Impact of the analyzed organizational change on the operating environment (functional nature of the proposed organizational change)	Impact of the analyzed organizational change on the administration system (complementary nature of the proposed organizational change)	Market orientation of the analyzed organizational change (proactive nature of the proposed organizational change)	Social orientation of the analyzed organizational change (integrative nature of the proposed organizational change)	
	0.0772	0.5129	0.2614	0.1505	
Analyzed organizational change	0.1673	0.2511	0.1254	0.1254	0.1933
Directions for diagnosing the analyzed organizational change	0.8327	0.7489	0.8746	0.8746	0.8086

The results, given in Table 4, show to a greater extent the inexpediency of implementing the proposed organizational change regarding the technological modernization of the enterprise's production facilities with an emphasis on innovation.

Conclusion

The article offers a method for diagnosing organizational changes in the activities of enterprises in the conditions of crisis management, based on the method of hierarchy analysis (Analytic Hierarchy Process – AHP) and provides for the implementation of such key stages: the formation of an expert group; determining the level of a hierarchical model for diagnosing organizational changes in the conditions of anti-crisis management; studying the essence and characteristics of the proposed organizational changes, so that then diagnose them taking into account the directions of proactive, integrative, functional and complementary nature, using matrices of pairwise comparisons; determining eigenvectors, as well as establishing their normalized values, applying the known geometric mean of the matrix lines; determining the consistency of expert opinions; forming conclusions and recommendations. The possibility of practical use of the proposed method of diagnosing organizational changes in the activities of enterprises in the context of crisis management is confirmed by relevant calculations on the example of several business entities in the Lviv region. In particular, the calculations for Vynnykivska Tobacco Factory LLC are given.

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