МЕНЕДЖМЕНТ ТА ПІДПРИЄМНИЦТВО: ТРЕНДИ РОЗВИТКУ

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THE IMPLICATION OF LEAN PROCESS INDUSTRY 4.0 ON SERVICE COMPANY: MOTIVATION ON MARKETER PRODUCTIVITY ENHANCEMENT

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Abstract. Industry 4.0 is known as a continuous industrial revolution which has made rapid development through optimization processes supported by technological innovations since the end of the 1970's. It has made the manufacturing industry become more productive with efficient operational costs through continuous technology information applications supported by the communication systems of futuristic technology. However, obstacles were often found in the early phases of the implementations, such as the low number of acquired accounts and average balances of new acquired customers in the months measured by marketers' productivity in field. One of the factors that influenced the employee productivity level was motivation. Motivation is considered as a power that forces employees to reach specific goals and targets in organizations. This study **aimed to** determine the factors that influence working motivation in the financial service sector industry based on mobile banking applications. It also sought to find how far motivation influences employees' working performance. A regression analysis approach was applied as **method** to find the effect of employee's motivation on working performance by adding other variables. Then, the variable was analyzed whether it had a positive and significant correlation with the performance productivity variable. The **result** showed that there was a significant and positive correlation between motivation and marketers' performance productivity. The other two variables gave a different response. Therefore, it can be **concluded** that industry differentiation on product, working pattern, and employee's background were affecting the suitability result between employee's motivation and produced performance level.

Keywords: industry 4.0, motivation, rewards, promotion, people development, performance, productivity performance.

JEL Classification: L1, M1, M21.

INTRODUCTION

In the industry 4.0 era, the service sector of banking should be able to adapt to the rapid technology development, especially in digital technology. The survey of the State of Banking Innovation on 2016 stated that the main point mentioned by respondents from senior bankers was the need for mobile-based financial technology for future banks. B Bank is one of the foreign

exchange banks with a capital core of more than 100 trillion rupiah that launched a mobile-based banking product called 'G-Apps' in 2016. G-Apps is a digital banking application, which enables customers to manage their finances using their mobile phones. G-Apps succeeded in garnering more than 350,000 new customers). G-Apps also connected with the national banking ecosystem under the national banking ecosystem under the supervision of national banking and financial regulator.

G-Apps have greatly increased the number of new accounts (opening account) with a target exceeding one million accounts by the end of 2018. However, B Bank has some troubles in enhancing marketers' productivity since the competition among banks in Indonesia are getting tight. It is seen on the different productivity levels in some points of sales (PoS). Even though the PoS have same infrastructure number in both system and total and composition of the marketers. The competition makes productivity need level to be stronger, yet it depends on the survival of business organizations in the middle of the competition (Smith, 1994).

A motivated employee is very necessary to keep the business in a growth phase. With more efficient and effective ways, the employee's motivation aspect could be monitored and maintained. It is also necessary to know the factors expected by employees to help decision maker in giving the right response. According to Duicâ (2008), motivation is defined as the whole driving force, either internal or external, which makes an individual have the willingness to do a job that is oriented on a certain goal. Deci and Gagne (2005) asserted that there is a correlation between motivation and work performance.

Therefore, this study aimed to know the positive and significant correlations of motivation variables, rewards and promotions, people development, with employee performance productivity in the banking business sector, particularly for marketers of mobile banking products who had applied the lean strategy pattern of management industry 4.0. Moreover, the research sought to determine the right strategy to optimize the marketers' productivity performance level.

METHODOLOGY

1. Research Strategies

This research strategy used descriptive research as an approach. The researcher gave explanations on the findings of correlation between variables, and did not make any judgment or interpretation on the conditions during the test (Creswell, 1994). The test itself was done using hypothesis verification on intended conditions. This research strategy used information accumulation of the basic problem experienced by offline units within the G- Apps product structure. The activity of account acquisition on and current account saving accounts (CASA) within the product structure was becoming the main target which influenced the key performance indicators of the unit. The general structure of the product development unit of G-Apps can be seen in Figure 1 below:

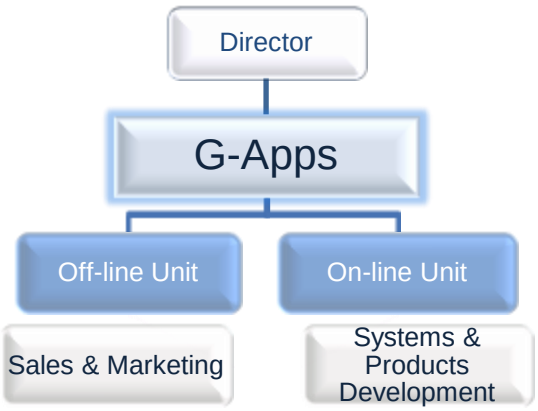

Figure 1. G-Apps' Functional Structure – B Bank

Hence, the offline unit was fully responsible for the sales targets, including marketing activity. The operational strategy within the selling and new bank customer acquisition aspects divided the total of 250 marketers among three big cities: Jakarta and its surroundings, Bandung and Surabaya, with an 80:10:10 ratio spread over five sales points, namely: office to office, mall 1, mall 2, guerrilla, and communities. Each sales point was given one crew team consisting of a leader and two or three members. The description on the operational strategy can be seen in Figure 2 below:

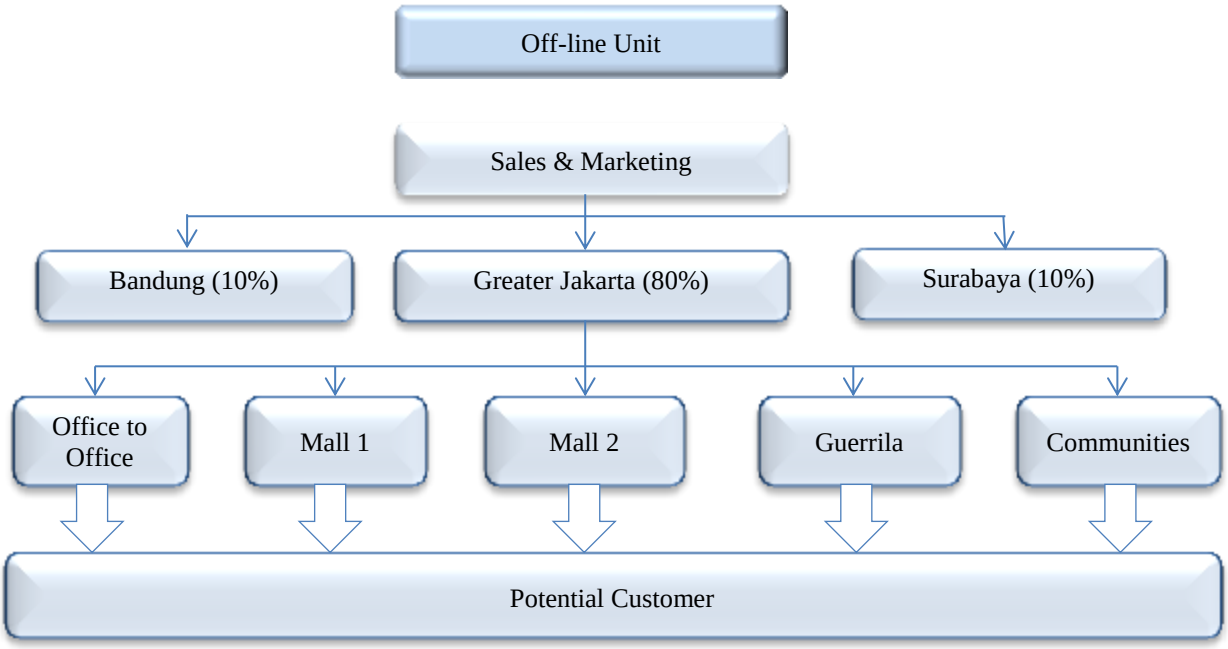

Figure 2. Operational Strategy in Placing the Marketers

2. Sample Data

The data collection planning was conducted considering the secret boundaries of bank data which had been managed in the agreement (NDA). This also affects the depth of data observation levels. The summary on data boundaries and type can be seen below:

a. Scope: the account acquisition process, which started from the registration process until card issuance through the perspective of operation process due to marketers' productivity enhancement.

b. Sample: three sub-channels PoS of mall 1 and mall 2: PoS 1 central Jakarta, PoS 2 south Jakarta, PoS 3 Bekasi. Also 3 sub-channels PoSv of mall 1 and mall 2; PoSv 1 south Jakarta, PoSv 2 south Jakarta, and PoSv 3 central Jakarta. Thus, the researcher could samples from 3 sub-channels that represent the average performance (on par), above average, and below average. The period on primary data observation was July till September 2018. The field survey was done on October week 4 until November week 1, 2018

c. The total respondent: the total of marketer population in each point was 33 people (the total resource per point was 5–6 people).

3. Instruments and Measures

There were two main objectives in measuring the survey. The first objective was finding the connection between different variables which triggered from the predictor variables of motivation, trust and satisfaction. The second was digging up information on different respondent data characteristics to know the variation patterns that probably create different results from previous modeling series.

In order to discuss those two main objectives, a questionnaire model was arranged and grouped based on the variable category. The questionnaire was arranged under the adaption model which replicated from the literature. The first variable was employee motivation with six items obtained from Chang and Cehn (2008); the next variable was the employee performance with three items from Chen's (2010) research result. Then, recognition or promotion variable with five items was gathered through Patterson and Spreng (1997). The last variable which was tested was people development with four items taken from Armstrong and Kotler's (2009) work. Table 1 below shows questionnaire summary which was based on variable categories:

Table 1

Questionnaire summary table with four variables

Number	Variable	Items	Reference
1	Employee motivation	1. I feel a sense of personal satisfaction when I do this job well 2. My opinion of myself goes down when I do the job badly 3. I take pride in doing my job as well as I can 4. I feel unhappy when my work is not up to usual my standard 5. l like to look back at a day's work with a sense of a job well done 6. I try to think if ways of doing my job effectively	(The McKinsey Quarterly, 2006)
2	Employee performance	1. My performance is better than that of my colleagues with similar qualifications 2. I am satisfied with my performance because it's mostly good 3. My performance is better than that of bankers with similar qualifications in other banks	Bishop, 1987
3	Intrinsic reward	1. The organization allow them to grow as a person, improve self confidence overcome the weakness, mature foster their self esteem 2. Their activity in the organization matches/it's their ethics and moral values. 3. The organization environment, in which their activity is embedded is cooperative, and foster mutual respect, and there is friendship and interpersonal trust among employees 4. The organization is fair regarding internal management procedures/method 5. They have sense of belonging regarding organization themselves a part of organization are loyal/faithful to the organization	Frey (1997)
4	Employee perceived effectiveness	1. My company provides me the opportunity to improve my skills 2. There is lot of chance to learn new things in this company 3. My company frequently arranges training programs of the employees 4. Doing job in this company will benefit to me	(Chiaburu and Tekleab, 2005)

4. Extent of researcher interface

In this study, the researcher was involved as a moderate interference. A moderate interference has the job of ensuring the ratio correlation on causal relationships between (as-is) process which

was done by the marketer's productivity results. It had a strong correlation by abandoning the other aspects which were considered as having weak relationships.

5. Extent of Researcher Interference

In this study, the researcher became the moderate interference who was ensuring the ratio correlation on causal relationship between the (as-is) process. It was done by the marketers' productivity result as strong correlation by ignoring the other aspects.

6. Study Setting

The samples were taken from some points of sales in Jakarta and its surroundings with field studies as a research design.

7. Unit of Analysis (Population to be Studied)

Based on the configuration of the marketers placement in every sales point as shown in Figure 3, then the unit of analysis was in the form of groups without considering the equality of the marketers' numbers.

8. Time Horizon

This study used longitudinal studies as the research time horizon since it was limited on the observation period to July, August and September 2018.

9. Proposal Sampling Method and Process

Through the total number of 250 marketer crews, around 50 – 60 sales group were spread to five sub channels (office to office, mall 1, mall 2, guerrilla and communities) in three big cities. The sampling process was done by taking three groups in every sales point with target performance category as: 1 on par average, 1 above average, and 1 below average in Jakarta and Bekasi. The sampling proposal was conducted in the mall 1 and mall 2 group in five different locations: booths at PoS 1 (central Jakarta), PoS 2 (south Jakarta), PoS3 (Bekasi), PoSv 2, and PoSv 3. Since every element was assumed in having population representation element, then the sampling design used in this study was probability sampling. To test the difference performance of each group, disproportionate stratified random sampling was used.

10. Proposed Data Collection Technique

Since this study used descriptive research, a questionnaire was used as the data collection technique. As respondents the marketers and customer in some PoS in every city were involved. It had the purpose of supporting the observation on goodness of data with quantitative aspects, such as demography of the respondents (long work period, work position, work group) and employee moral engagement (motivation, work life), customer satisfaction and others. The question format was arranged based on a Likert scale with 5 lines (ranging from strongly disagree to strongly agree). The question pattern was arranged using multiple questions with some open-ended question in the last part.

Proposed Statistic Analysis

From the data collection process, the analysis focused on the aspect of goodness of the data with descriptive statistic approach, such as: central tendency, correlation and projection analysis between the two predictor variables. ANOVA and multiple regression was used to test the hypothesis and make the final projection result based on time series. The measurement used scaling with interval scale and ratio scale types. The interval scale was used for measuring the reliability variable, while the ratio scale was for measuring the productivity.

RESULTS AND DISCUSSION

The onboarding process of G-Apps of B Bank customer was started from a registration process and data validation on mobile phone guided by the marketer in every point of sale. Then the CMS system generated the card activation process as the final activation process if the registration was approved. In the final process, the marketer gave directions on the advantages and benefits to

bank customers. For customers who wanted to recharge or top up on the same day they made sure the registration could use the account directly for saving money or other payment processes. Through the three points of sales (PoS 2, PoS 1, and PoS 3), in the three months of observation (July, August, September, 2018), the data were finally obtained as seen in Figures 3 and 4 below:

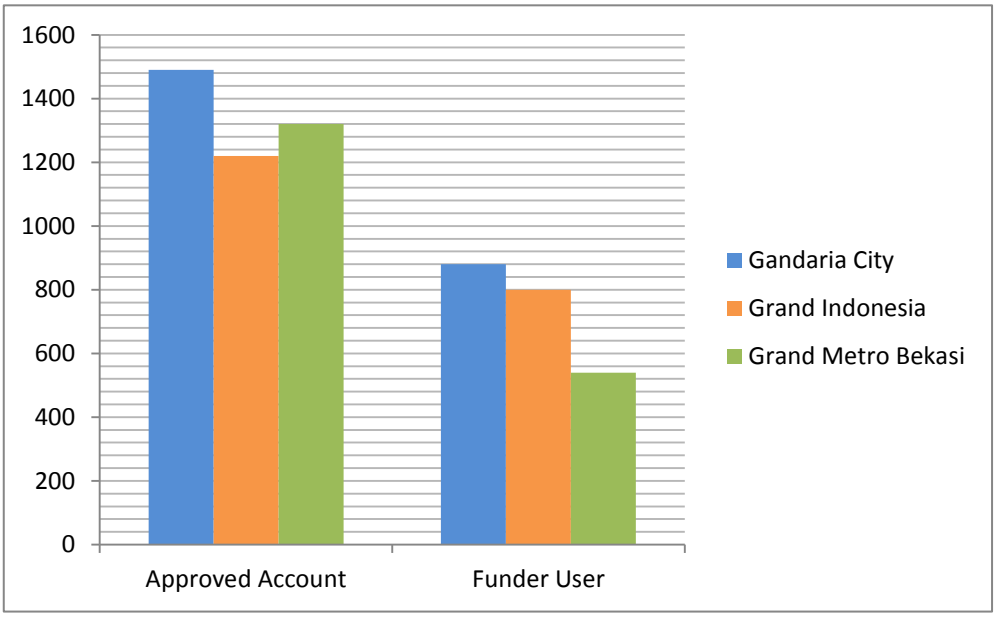

Figure 3. Graphic of Approved Accounts and Funded Users

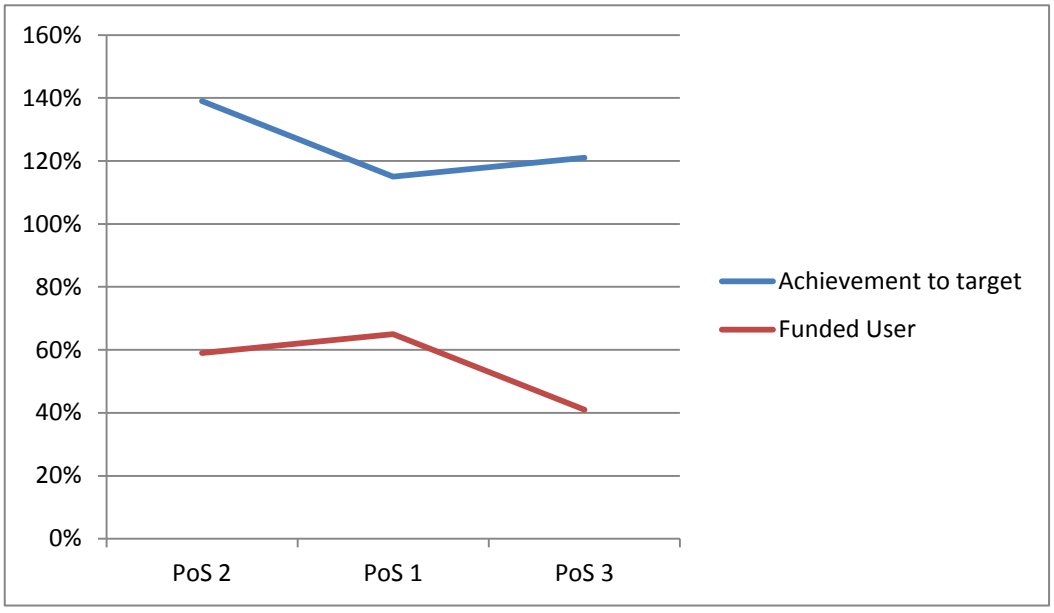

Figure 4. Graphic of Target Achievements and Funded Users

From the figures above, it could be seen that the tendency of approved accounts from the three points of sales had an average score above target (1.088 account/month/PoS) for 120% per PoS. PoS 1 had a low percentage of the achievement than the other two PoS. However, from the funded user category, the ratio of PoS 1was on top of the achievements for about 70%

and 59% for recharging on the same day. Based on the marketers' SOP (Standard Operating Procedures), the productivity of marketers could be assumed as good.

ANALYSIS

1. Respondent profile

This study was conducted on 33 respondents. The respondents were observed based on demography level, such as respondent's job position (leader and crew), job function (sales, service, or other), point of sales or service (PoS 1 central Jakarta; PoS 2 south Jakarta, PoS 3 Bekasi, PoSv 1, and PoSv 3), the respondent's working period (less than 6 months until 12 months, and more than 12 months), working experience, and respondent's role in taking decision. All of the respondents gave responses on the survey without missing data.

The respondent profile on job position showed 93.3% worked as crew and 6.1% as leader. The job function was dominated by sales (63.6%), service (33.3%), and others (3%). The total respondents based on region were 33.3% in PoS 2, 27.3% in PoS 3, 18.2% in PoSv 1, 15.2% in PoS 1and 6.1% in PoS 3. The respondent's working period for more than 12 months was 36.4%, between 6 until 12 months was 36.4% and less than 6 months was 27.3%. Most of the respondents (60.6%) were experienced in their field, while the rest of (39.4%) were new in their field. Meanwhile, the respondent's profile based on the decision-maker role showed that there were 48.5% of respondents who were active, 30.3% were active if asked or needed, 18.2% were less involved, and the rest (3%) were not involve in making decisions.

2. Validity and Reliability Analysis

The validation and reliability test were done on a trust level of 95% and error level of 5% for all measured instruments from all variables. The motivation variable was measured with six survey questions; there were three questions for performance variable, five questions for promotion recognition variable, and four questions for personal development variable.

The validation test result on the motivation variable (MOT) had a KMO score of >0.6 with a significance score of 0.000 < 0.05. The communalities and matrix component showed > 0.5 which meant the instrument used valid measurements in presenting the construct variable. Meanwhile, the reliability test showed a Cronbach's Alpha score of 0.714 > 0.7 and a matrix correlation for all instruments had a score of > 0.5 which meant that the instrument was reliable for construct variable measurement.

The validation test result on performance variable (PER) had a KMO score measuring 0.618 > 0.6 with a significance score of 0.000 < 0.05. The communalities and matrix component showed > 0.5 which meant the instrument was valid measurement in presenting the construct variable. Meanwhile, the reliability test showed the Cronbach's Alpha score of 0.768 > 0.7 and the matrix correlation for all instruments showed a score of > 0.5 which meant the instrument was reliable in construct variable measurement.

The validation test result on recognition promotion variable (PR) had a KMO score of 0.724 > 0.6 with a significance score of 0.000 < 0.05. The communalities and matrix component showed > 0.5 which meant the instrument used was a valid measurement in presenting the construct variable. Meanwhile, the reliability test showed the Cronbach's Alpha score of 0.76 > 0.7 and matrix correlation for all instruments for > 0.5 which meant the instrument was reliable in construct variable measurement.

The validation test result on personal development variable (PDV) had a KMO score of 0.649 > 0.6 with significance score of 0.000 < 0.05. The communalities and matrix component showed > 0.5 which meant the instrument used was a valid measurement presenting the construct variable. Meanwhile, the reliability test showed the Cronbach's Alpha score for 0.850 > 0.7 and matrix correlation for all instruments for > 0.5 which meant the instrument was reliable in construct variable measurement.

Therefore, the whole measurement instruments were valid and reliable enough in conducting measurement of the variables.

3. Hypothesis Testing

The hypothesis testing was done using regression multivariate analysis on a trust level of 95% and error of 5%. Based on Figure 1 above, the construct correlation test was done in multivariate way between variable rework promotion (RP), people development (PDV), and motivation (MOT) in productivity performance (PER).

Model Summary[b]

Mode	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.386[a]	.149	.061	.65931

a. Predictors: (Constant), MOT, RP, PDV
b. Dependent Variable: PER

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.386	0.149	0.061	0.65931

a. Predictors: (Constant), MOT, RP, PDV
b. Dependent Variable: PER

Figure 5. R Square Model

From Figure 5 above it could be seen that the correlation score on predictor variables (RP, PDV, MOT) only described the contribution of 14.9% towards dependent variable PER. It meant that there was 85.1% of other variable factors which cannot be defined yet. In recap, all of the data from the regression test of data multivariate variables can be seen in Figure 9 below:

Hypothesis	Independent Variable	Dependent Variable	Estimate	T-Value	Sig.	Result
H1	MOT	PER	0.641	2.004	0.050	Supported
H2	RP	PER	0.340	0.928	0.361	Not Supported
H3	RP	MOT	0.039	0.189	0.852	Not Supported
H4	PDV	MOT	0.325	2.205	0.035	Supported
H5	PDV	PER	-0.408	-1.466	0.153	Not Supported

Figure 6. Hypotheses Model

H1: Motivation gave a positive impact on marketers' productivity level for 64.1%. This first hypothesis test showed the relation between motivations as a mediating variable on productivity performance was significant enough. It had a significance score of 0.05 (<0.05) and a t-value score for 2.004 (>1.96).

H2: Recognition or promotion made a positive impact on marketers' performance productivity level for 34%. However, the result of the regression analysis on this hypothesis showed the relationship between recognition promotion and productivity was insignificant. A significance score measured 0.361 > 0.05 and a t- value score of 0.928 (< 1.96).

H3: Recognition or promotion made a small positive impact on marketers' motivation for 3.9%. The hypothesis result showed the relationship between recognition promotion and motivation was also insignificant, in which the significance score measured was 0.852 > 0.05 and the t-value score was 0.189 (<1.96).

H4: People development programs made a positive impact on marketers' motivation level for 32.5%. The hypothesis result showed that the relation between people development and motivation was significant enough with positive direction with a significance score of 0.035 < 0.05 and a t-value of 2.205 (> 1.96).

H5: People development program made a negative impact on marketers' productivity level which decreased 40.8%. The hypothesis result showed that the relation between people development and productivity level was insignificant, with a significance score of 0.153 > 0.05 and t-value for -1.466 (<1.96).

Therefore, it could be seen that from some constructed variables of productivity performance, the mediating motivation variable (MOT) made a positive impact and was quite significant. Meanwhile, from the two predictor variables, reward promotion (RP) and people development (PDV) did not give any positive impact and significance on productivity performance dependent variable (PER). However, specifically, people development could make a positive and significant impact on mediating motivation variable (MOT).

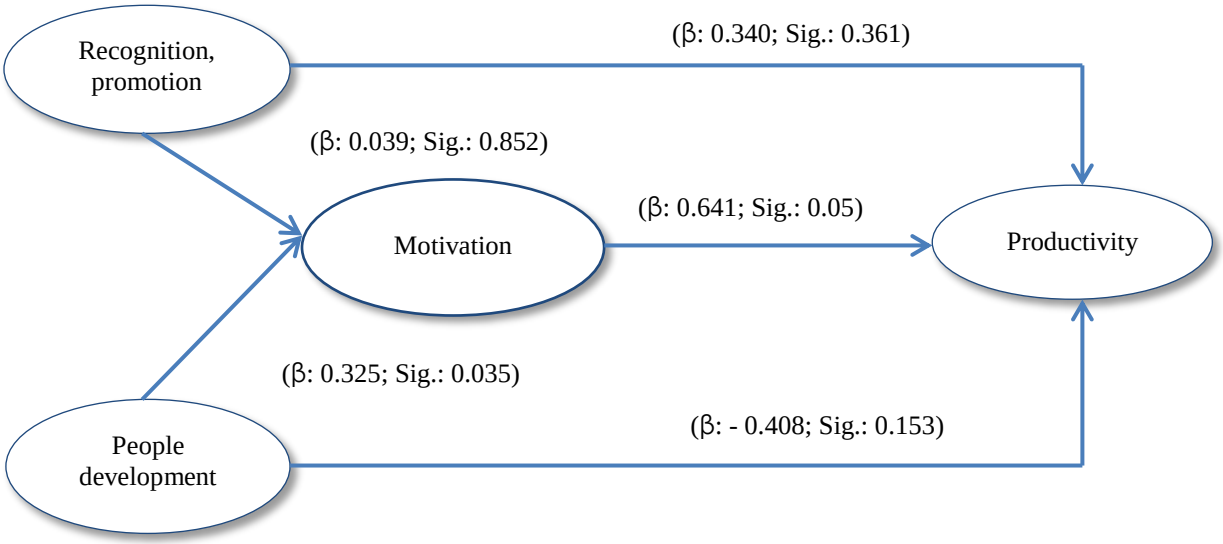

Figure 7. The Results of the Multivariate Correlation Test

The hypothesis test result showed that not all of the predictor variable components (recognition promotion and people development) were able to make a positive impact on the productivity performance rather than the mediating variable (motivation). However, people development also had a positive impact on marketers' motivation which then influenced the productivity performance.

From the respondent demography aspect, generally, the respondents performed well and were satisfied with the working result which showed an average score of 3.9 (scale 5). A few of respondent (9%) felt doubt and were not yet satisfied with the worker results. These 9% of the respondents were coming from the service crew position who worked for more than 12 months in Pondok Indah Mall and Lotte Avenue PoS. Respondents of sales leader position who worked for less than 12 months agreed and strongly agreed with the job satisfaction and productivity.

CONCLUSIONS

Based on the results, the person in charge of the product was hoped to make a concept of productivity measurement construction that focused on the effort of non-intrinsic refinement. It was an implementation of the employee's development program either in the short term such as regular sales clinics, training programs based on function level and periodic rotation from each PoS or a service, especially for a certain region with different market segmentation challenges (Jakarta vs Bekasi). Moreover, for service areas, it was recommended to immediately develop the comprehensive measurement and monitoring concept toward the productivity level. Since the marketer was dominated by the millennial generation with working periods of less than a year, then it needed a certain approach to keep the continuity through an interesting retention program.

SUGESSTION

This study has identified the relation between motivation factors as a mediation variable with productivity performance variables in some PoS from the mobile banking product G-Apps . Even though the scope of this study was small and limited on five points of sales and services in Jakarta and Bekasi, in general the researcher could have conducted a multistage study by taking a bigger sample from various cities and the operational strategy of the marketers' placement. Thus, for further research the researcher suggests to increase the sample numbers in order to increase the variation of the results for every possibility.

The results of this study found that there was a necessity to define another motivation factor that was probably noticed by the marketers and could affect their productivity performance levels. Considering other motivations which were not mentioned in this study, then it is expected for further research to add some factors such as the employee's satisfaction factor, self-leadership, interest or enthusiasm, or some other intrinsic and non-intrinsic factors. These were expected to influence the moderation effect and increase the R square ratio or the adjusted score toward the predictor variables of productivity performance.

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ВПРОВАДЖЕННЯ ОЩАДЛИВОГО ВИРОБНИЦТВА ТА КОНЦЕПЦІЇ INDUSTRY 4.0 НА СЕРВІСНОМУ ПІДПРИЄМСТВІ ЯК МОТИВАЦІЯ ПІДВИЩЕННЯ ПРОДУКТИВНОСТІ МАРКЕТЕРА

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Промисловість 4.0 відома як безперервна промислова революція, яка відрізняється швидким розвитком завдяки оптимізаційним процесам, підтримуваним технологічними інноваціями з кінця 1970-х. Це зробило обробну промисловість більш продуктивною з ефективними експлуатаційними витратами завдяки безперервним інформаційним додаткам технологій, що підтримуються комунікаційними системами футуристичної технології. Однак на ранніх етапах впровадження часто зустрічалися перешкоди, такі як занадто низькі показники рахунків та дуже посередня кількість нових клієнтів за час, відзначений високою продуктивністю маркетологів у цій галузі. Одним із факторів, що вплинули на рівень продуктивності працівника, була мотивація. Мотивація розглядається як сила, яка змушує працівників досягати конкретних цілей і завдань в організаціях. Проведене дослідження мало на меті визначити чинники, що впливають на мотивацію роботи в галузі фінансових послуг на основі мобільних банківських додатків. Воно також було спрямовано на визначення рівня впливу мотивації на робочу ефективність працівників. Для визначення рівня ефекту мотивації працівника на робочу ефективність як метод застосовувався підхід регресійного аналізу шляхом додавання інших змінних. Таким чином, змінна була проаналізована на предмет наявності позитивної та значної кореляції зі змінною продуктивністю. Результат показав, що існувала значна позитивна кореляція між мотивацією та продуктивністю маркетерів. Дві інші змінні дали різну відповідь. Також в результаті дослідження було виявлено необхідність визначення іншого фактора мотивації, який, як вбачається, має значний вплив на рівень продуктивності маркетерів. Таким чином, можна зробити висновок, що розрізнення галузей за продуктом, робочою схемою та фоном працівників впливає на результат придатності між мотивацією працівника та рівнем продуктивності.

Ключові слова: індустрія 4.0, мотивація, винагорода, просування, розвиток персоналу, підвищення продуктивності.

ВНЕДРЕНИЕ БЕРЕЖЛИВОГО ПРОИЗВОДСТВА И КОНЦЕПЦИИ INDUSTRY 4.0 НА СЕРВИСНОМ ПРЕДПРИЯТИИ КАК МОТИВАЦИЯ ПОВЫШЕНИЯ ПРОИЗВОДИТЕЛЬНОСТИ МАРКЕТЕРА

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Промышленность 4.0 известна как непрерывная промышленная революция, которая отличается быстрым развитием благодаря оптимизационным процессам, поддерживаемым технологическими инновациями с конца 1970-х. Это сделало обрабатывающую промышленность более продуктивной с эффективными эксплуатационными затратами благодаря непрерывным информационным приложениям технологий, поддерживаемых коммуникационными системами футуристической технологии. Однако на ранних этапах внедрения часто встречались препятствия, такие как слишком низкие показатели счетов и очень посредственное количество новых клиентов за время, отмеченное высокой

производительностью маркетологов в этой области. Одним из факторов, повлиявших на уровень производительности работника, была мотивация. Мотивация рассматривается как сила, которая заставляет работников достигать конкретных целей и задач в организациях. Проведенное исследование имело целью определить факторы, влияющие на мотивацию работы в области финансовых услуг на основе мобильных банковских приложений. Оно также было направлено на определение уровня влияния мотивации на рабочую эффективность сотрудников. Для определения уровня эффекта мотивации работника на рабочую эффективность как метод применялся подход регрессионного анализа путем добавления других переменных. Таким образом, переменная была проанализирована на предмет наличия положительной и значительной корреляции с переменной производительностью. Результат показал, что существовала значительная положительная корреляция между мотивацией и производительностью маркетеров. Две другие переменные дали разные ответы. Также в результате исследования была выявлена необходимость определения иного фактора мотивации, который, видимо, имеет значительное влияние на уровень производительности маркетеров. Таким образом, можно сделать вывод, что разделение отраслей по продукту, рабочей схеме и фоном работников влияет на результат пригодности между мотивацией работника и уровнем производительности.

Ключевые слова: индустрия 4.0, мотивация, вознаграждение, продвижение, развитие персонала, повышение производительности.

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MANAGEMENT PRACTICES ON STRATEGIC HUMAN RESOURCE TOWARDS EMPLOYEE PERFORMANCE THROUGH ORGANIZATIONAL COMMITMENT

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Abstract. Indonesia has entered international competition in regional sector due to the change on various business structures and behavior in globalization era. The international competition does not merely limit on the product competition but also on the human resource management. The enhancement on competition intensity has influenced the need escalation for organizations to keep improving their management organization performance, especially in human resource's ability. It emphasized on the strategic approach which involved the relationship between company and its human resource management within the field of structure, culture and development. This study **aimed to** identify the influence of management practices on strategic human resource, including training selection, empowerments and performance appraisal, toward employee performance through organizational commitment. **The methodology** used in this study was quantitative methodology using survey questionnaire to the 145 employees of PT Petrokimia Gresik as the sample study. **The findings** of the study showed that management practices on strategic human resource had either direct or indirect positive influence towards the employee performance through organizational commitment. **In conclusion**, the organizational commitment and employee performance could be increase if the management practices on strategic human resource are good. Moreover, the enhancement of organizational commitment could affect the employee performance improvement.

Keywords: management practice on human resource, employee performance, organizational commitment.

JEL Classification: L22, M54, P47.

INTRODUCTION

In globalization era, Indonesia has entered the international competition in regional sector due to the change on the various business structures and behavior. The competition did not merely limit on the product competition but also on the human resource management. The competition intensity has influenced the need escalation for every organizations or companies to keep improving their management organization performance, especially in human resource's ability aspect. It emphasized on the strategic approach which involved the relationship between company and its human resource management within the field of structure, culture and development. According to Kochan and Dyer

(1993), the practice of strategic human resource's policy would give effect in organization performance improvement. Katidjan et al (2017) said that if the quality level of human resource within a company is high then the employee performance level would be easier to increase and vice verse.

PT Petrokimia Gresik was one of the fertilizer company subsidiaries of BUMN Company of PT Pupuk Indonesia Holding Company which had a thousand of employees from various functions and positions. With huge number of employees, assuredly might cause the company in having complex problems, particularly related to its management. However, the practice of strategic human resource management became very important to be done. In this study, the phenomenon of globalization and competitive competition on human resource triggered PT. Petrokimia Gresik to increase the implementation of management practice on strategic human resource related to the organizational commitment and employee performance.

Alwi (2001) stated management practice on strategic human resource as an effort to provide human resource with high competence and motivation through the practices of human resource management functions. In strategic management's perspective, it was a part of implementation process of business strategy. It was formulated and done synchronously within the whole context of strategy in functional level, including; marketing, finance, production and others. The strategic human resource management was lie on the empowerment efforts, developing and maintaining human resource within organization due to optimal contribution toward the organization goals based on skill, knowledge and ability. Human resource management activity was the application of human resource functions referred to the external environment condition which developed and interacted with organization environment (Assauri, 2000; Simamora, 2004). Some variables on practice of strategic human resource management by experts could be seen below:

Table 1

Variables on practice of strategic human resource management

Wanet et al, 2002	Herel and Tzafrir, 1999	Delaney and Huselid, 1996	Wahyuni, 2009; Widyawati, 2010
Extensive training	Training	Training	Training
Selection	Selection	Empowerment	Selection
Empowerment	Compensation	Performance appraisal	Empowerment
Performance evaluation	Participation		Performance appraisal
Extensive job	Internal labor market		
Performance wage	Recruitment		

Based on the arguments above, this study adopted four variables; training, selection, empowerment and performance appraisal, since these variables were representing the management practice on strategic human resource within organization.

LITERATURE REVIEW

Practice Relation – Management Practice on Strategic Human Resource to Employee Performance

According to Hatani (2010), training, in partial, had significant influence on working achievement. If an organization wanted to increase its employee performance, then doing training was the main priority within the strategic human resource. Delery and Doty (1996) said that management strategy of human resource which described on management practice on strategic human resource was training with direct influence on the enhancement of organization performance. It was in accordance with Wan et al (2002) and Herel and Shay (1999) arguments that

said the management practice on strategic human resource was seen through the training indicators and other management practices with significant influence on company performance.

A research by Widyawati (2010) claimed that: (1) the management practice on strategic human resource, including; selection, training, empowerment, performance appraisal, had positive and significant influence toward the employee performance, (2) management practice on strategic human resource (selection, training, empowerment, performance appraisal) had positive and not significant influence toward company performance, (3) employee performance had positive and significant influence on company performance, (4) management practice on strategic human resource (selection, training, empowerment, performance appraisal) had indirect and significant influence on company performance through employee performance.

A partial empowerment had significant influence on working achievement (Hatani, 2010). Supported by the universalistic theory which stated that empowerment could give direct influence for organization performance improvement (Delery and Doty, 1996). Wan et al (2002) and Herel and Shay (1999) also stated that empowerment had significant effect on company performance.

Yanti in Widyawati (2010) said that performance appraisal had significant influence and direct effect on employee performance. The effectiveness of the use of performance appraisal in pushing the employee performance was caused by the function and role from the performance appraisal itself. Since the performance appraisal process was done to define the total amount of compensation which given and as a basic for company to decide the employee promotion policy. Thus, the performance appraisal process was able to support the accomplishment of strategic organization goals. Similar to Wan and Kok (2002) and Locher and Teel (1977) who also stated that performance appraisal affected on the employee performance.

Relation between Organizational Commitments on Employee Performance

Suswati and Busianto (2013) stated that affective commitment and continuance commitment partially had positive and significant influence on employee performance. This was in accordance with Shaw et al (2003) that within the commitment dimension, affective commitment was determined as individual performance. Individual with high affective commitment had firm emotional closeness toward organization (Suswati and Budianto, 2013). It meant that individual would have motivation and desire to contribute against organization rather than individual with low affective commitment.

Suswati and Budianto (2013) stated that normative commitment had no significant influence on employee performance. Winner stated that normative commitment toward organization could be developed during the socialization process and within the organization (Suswati & Budianto, 2013). Bilmovena (2005) stated that organization commitment had significant influence on employee performance. This was also similar to Rodwell (1998) who stated that the positive influence of organizational commitment on employee performance was either partial or significant.

The organizational commitment could influence the performance significantly since the employee with high commitment was active in giving the whole effort for the success of organization. Ivancevich et al (2006) said that an employee with high organization commitment would perceive his and the organization objectives as a private thing. So, committed employee would feel that the company's behalf as his behalf too, also the problem faced by company was his problem.

Practice Relation – Management Practice on Strategic Human Resource to Organizational Commitment.

Paul and Anantharaman (2004) had done a research on professionals in India, they found that training had positive relation on organizational commitment. Training became the most favorite factors which able to improve the affective commitment, high loyalty and reduce the early retirement (Herrbach, 2009). Lamba and Choudhary (2013) stated that in banking sector, training was also one of the factors with significant role affecting the organizational commitment. In informational technology sector, the employee commitment was influenced by training. Training activity was not merely build and improve employee ability but also improve the working satisfaction and commitment to organization (Choi and Yoo, 2014; McEvoy, 1997; Herel and Tzafrir, 1999; Kalleberg and Moody, 1994).

Chew (2005) claimed that selection was one of the practices which influenced the commitment more than the other practices. Placing the employee in a right position would build high commitment on organization. A good selection result would create employee satisfaction and reduce the desire to quit from the organization. In opposite, employee that came from bad selection would have bigger desire to quit the organization. Some researcher, such as Weiner, Guest, Caldwell, Iles, Meyer & Allen, Storey, Tepstra in Mathebula (2004), were identified the relation between selection and organization commitment development. The candidate would develop the organization commitment if the selection procedure was accurate and fair. It also found positive correlation between the selection process and normative commitment.

Organizational commitment would increase along with the enhancement of the influence of empowerment variable. Delaney and Huselid (1996) stated that empowerment had influence on organizational commitment. Empowerment was the most dominant variable and had direct influence on organizational commitment (Nursyamsi, 2012). Empowerment gave strength to make decision, thus employee had the feeling of belonging on their job which then influence their affective and continuant commitment.

A study stated that performance appraisal was correlated with the organization commitment of employee significantly (Jaiswal, Ogilvie and Sigh in Choi and Yoo, 2014). Supported by Paul and Anantharaman (2004) that developmental oriented appraisal showed positive correlation with employee's organizational commitment. A good quality of performance appraisal could enhance the commitment and effectiveness of organizational (Fletcher and Williams in Krisma, 2011). It led to the confidence of the employee that affect on the higher organizational commitment (Sweeney and McFarlin in Krisma, 2011).

From the statements above, it showed that the management practices on strategic human resource had influence on the enhancement of employee and company performance. The management practices on strategic human resource were able to increase the capability of human resource, also able to produce uniqueness as strength in facing the competition and transformation of desire and market need. The hypotheses were seen as follow:

H1 : Training had influence on organizational commitment
H2 : Selection had influence on organizational commitment
H3 : Empowerment had influence on organizational commitment
H4 : Performance Appraisal had influence on organizational commitment
H5 : Training had influence on employee performance
H6 : Selection had influence on employee performance
H7 : Empowerment had influence on employee performance

H8 : Performance Appraisal had influence on employee performance

H9 : Organizational Commitment had influence on employee performance

H10 : Training had indirect influence on employee performance through organizational commitment

H11 : Selection had indirect influence on employee performance through organizational commitment

H12 : Empowerment had indirect influence on employee performance through organizational commitment

H13 : Performance Appraisal had indirect influence on employee performance through organizational commitment

Variable Identification

The variables were divided into three parts;

a. Independent Variable (Exogenous)

The independent variables in this study were the management practices on strategic human resource (X), including training (X1), Selection (X2), Empowerment (X3), and Performance Appraisal (X4).

b. Intervening Variable

The intervening variable was Organizational Commitment (Y)

c. Dependent Variable (Endogenous)

The dependent variable was Employee Performance (Z)

Variable Operational Definition

a. Management practices on strategic human resource (X)

1. Training (X1) is a systematic process of employee's behavior transformation to a certain direction due to increase the organizational objectives, with indicator as below (Wan et al, 2002);

- Training Model (X1.1)
- Training Opportunity (X1.2)
- Training Process (X1.3)
- Training Characteristic (X1.4)

2. Selection (X2) is an election process from a group of applicants who were fulfilled the selection criteria for the available position within a company, with indicator as follow;

- Selection Criteria (X2.1)
- Employee Selection (X2.2)
- Selection Advantage (X2.3)

3. Empowerment (X3) is employee's character building which delegate the power within working environment in order to facilitate the employee to work and to have private action and behavior that produce positive contribution for organization

- Individual Initiative (X3.1)
- Participation Level (X3.2)
- Problem Solving Involvement (X3.3)

4. Performance Appraisal (X4) is an approach in doing the working performance appraisal of the employee.

- Performance Appraisal for Promotion (X4.1)
- Personality Development (X4.2)

b. Organizational Commitment (Y)

Organizational commitment was defined as a condition in which an employee who, psychologically, showed his partisanship on a company along with the objective and his desire to withstand in the company. The indicator was referred to Meyer and Allen (2007); affective commitment (Y1), continuant commitment (Y2), normative commitment (Y3)

c. Employee Performance (Z)

Employee performance was identified as employee's achievement level from organization in doing their job within a certain period. According to Wahyuni (2009) the indicator of employee performance could be seen through; working quantity (Z1), time management (Z2), working quality (Z3), and working initiative (Z4).

METHODOLOGY

This study used explanatory research with quantitative approach as the methodology. Explanatory research explained on the variables position and the relation between one variable and the other variables. This study was held in PT. Petrokimia Gresik, Kebomas, Gresik, East Java as one of the fertilizer company subsidiaries of BUMN PT. Pupuk Indonesia Holding Company. The samples were the employees of PT. Petrokimia Gresik from Eselon V until Eselon III that has working time for more than 2 years. The samples were taken using stratified random sample based on the certain layers that give the same chance to every stratum. The samples obtained were 145 employees. The data were collected using questionnaire and interview and measured using Likert scale.

RESULT AND DISCUSSION

a. Validity, Reliability and Linearity Test

If the correlation result (r) ≥ 0.30 then the test was a strong construct due to its ability to describe the instrument ability in revealing the data from observed variables. The coefficient score had validity bigger than the critical point (0.30). Thus, it can be said that the whole variables were valid.

Reliability was a standard for precision and accuracy which showed by the research instrument. A construct or variable could be said reliable if it gives alpha score bigger than 0.6. The score of reliability coefficient on each variable was bigger than the critical score for 0.60 which make the whole variables reliable.

b. Path Analysis

The calculation of path coefficient used in this study was the standardized regression analysis by looking at the impact both simultaneously and partially for each similarity. The relation among variables was described in table 2 below:

Table 2

Standardized Regression Weights among Variables

Variable		Beta Coefficient		Partial Hypothesis	Notes
Free	Bound		t	Sig.	
1	2	3	4	5	6
Training (X1)	Organizational Commitment (Y)	0,274	3,764	0,000	Sig
Selection (X2)		0,208	3,173	0,002	Sig
Empowerment (X3)		0,170	2,671	0,008	Sig
Performance Appraisal (X4)		0,340	5,224	0,000	Sig

Table 2 continuation on the next page

Table 2 continuation

1	2	3	4	5	6
Training (X1)	Employee Performance (Z)	0,228	3,325	0,001	Sig
Selection (X2)		0,134	2,198	0,030	Sig
Empowerment (X3)		0,153	2,610	0,010	Sig
Performance Appraisal (X4)		0,202	3,162	0,002	Sig
Organizational Commitment (Y)		0,289	3,807	0,000	Sig

c. Hypothesis Test Result

The hypothesis test result could be seen in table 3 below:

Table 3

Influence among Variables

Path	Direct Influence	Indirect Influence through Y	Total Influence	Hipothesis		Note
				t	Sig	
X1 to Y	0,274	-		3,764	0,000	Sig
X2 to Y	0,208	-		3,173	0,002	Sig
X3 to Y	0,170	-		2,671	0,008	Sig
X4 to Y	0,340	-		5,224	0,000	Sig
X1 to Z	0,228	0,274 x 0,289 = 0,079	0,307	3,325	0,001	Sig
X2 to Z	0,134	0,208 x 0,289 = 0,06	0,194	2,198	0,030	Sig
X3 to Z	0,153	0,17 x 0,289 = 0,049	0,202	2,610	0,010	Sig
X4 to Z	0,202	0,34 x 0,289 = 0,098	0,300	3,162	0,002	Sig
Y to Z	0,289	-		3,807	0,000	Sig

The hypothesis result showed that:

H1 : Training had significant influence on organizational commitment. A wide chance to join the training and a support from director made PT. Petrokimia Gresik employees feel recognized and appreciated. The test result showed that a high training influence would make the organizational commitment of the employee high.

H2 : Selection was influenced on the organizational commitment. Some factors, including the duration of selection stage, information on compensation or intensive, comfortable workplace, facility, and career development, influence PT. Petrokimia Gresik employee's organizational commitment. If the selection was good, then the employee's organizational commitment for organization was also good. It indicated that the selection process had direct influence on the enhancement of organizational commitment.

H3 : Empowerment had significant influence on organizational commitment. PT. Petrokimia Gresik has been noticed the aspiration from the employee in making decision. The higher impact on empowerment made the higher impact to the organizational commitment of the employees.

H4 : Performance Appraisal had significant influence on organizational commitment. Pt Petrokimia Gresik has been done the working evaluation by the director and partner. The result was used as the basic character development of employees. The objective result influenced the employee's commitment within the company. If the performance appraisal influence was high then the organizational commitment was also high.

H5 : Training had significant influence on employee performance. PT. Petrokimia Gresik did the training process based on the competition gap among the employees. The facilities and infrastructures were directly supported the continuity of learning process. If training brought good influence then the employee performance would be good too.

H6 : Selection had significant influence on employee performance. PT. Petrokima Gresik had set a high standard and strict selection stages due to get the quality employee. If the selection influence was good, the employee performance would be good too.

H7 : Empowerment had significant influence on employee performance. PT. Petrokimia Gresik had facilitated the employees to deliver their idea and had applied the employee's idea within the working process; hence it had positive impact on employee performance. This was indicating that the high influence on empowerment could lead to a good employee performance.

H8 : Performance Appraisal had significant influence on employee performance. PT. Petrokimia Gresik has been done the working evaluation by the director and partner. The evaluation mechanism could trigger the employee to show their best performance. Therefore, the high influence on performance appraisal could lead to a good employee performance.

H9 : Organizational commitment had significant influence on employee performance. The employee of PT. Petrokimia Gresik felt hard to leave the company which proved by the low turnover level. The employee was tried to show their best performance due to their desire in spending their career within the company. It indicated that a high organizational commitment could affect the higher working performance of the employees.

H10 : Training had indirect influence on employee working performance through organizational commitment. It showed that the higher training influence on organizational commitment could affect the higher employee working performance. If an organization wanted to increase their employees' performance then training could become the main priority. Generally, PT. Petrokimia Gresik had been implemented training system to cover the competency gap among the employees due to support the employee performance, thus the employee feel appreciated and needed by the company.

H11 : Selection also had indirect influence on employee performance through organizational commitment. As long as the selection had higher influence on organization commitment, then the employee performance could increase. A long and strict selection stages on recruiting new employee, information on compensation or intensive, comfort working place, facility, and career development were the factors that influence the organizational commitment on PT. Petrokimia Gresik employees. Employees with high commitment on company would give their best performance.

H12 : Empowerment had indirect influence on employee performance through organizational commitment. It meant that the higher the empowerment influence the organizational commitment, then the higher the employee performance. Company appreciated and had been applied employees' notion in working process. Employee who had their notion applied would be more committed and passionate in working.

H13 : Performance appraisal also had indirect influence on employee performance through organizational commitment. This meant that the higher performance appraisal on organizational commitment could affect the enhancement of employee performance. An objective performance appraisal had positive influence on employee commitment within the company. This was supporting the target achievement on Individual Performance Target which had been arranged in the early year.

The practical implication of this study was every company had strategy to enhance the employee performance in order to make employee keep on building, improve and keep the organizational commitment high by doing the management practice on strategic human resource which include training, selection, and empowerment and performance appraisal.

CONCLUSIONS

In conclusion, if the management practices on strategic human resource, including; training, selection, empowerment, and performance appraisal are good then the organizational commitment

and employee performance could be increased. Also the enhancement of organizational commitment could affect the employee performance improvement. This study was limit on some management practices on strategic human resource which tested for the impact toward the employee performance. However, this study had limited time in observation, thus there were only 4 management practices which could be observed. For further study, another management practices are recommended.

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ВПЛИВ ЗАСТОСУВАННЯ ПРАКТИК УПРАВЛІННЯ СТРАТЕГІЧНИМИ ЛЮДСЬКИМИ РЕСУРСАМИ НА РЕЗУЛЬТАТИВНІСТЬ ПРАЦІ В ОРГАНІЗАЦІЇ

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В умовах епохи глобалізації Індонезія вступила в міжнародну конкуренцію в регіональному секторі через зміни, що відбулися в різноманітних бізнес-структураї та , як наслідок, зміни в їх поведінці. Міжнародна конкуренція не обмежується лише конкуренцією по відношенню до продукції, а й по відношенню до управління людськими ресурсами.

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Підвищення інтенсивності конкуренції вплинуло на необхідність нарощування потреб організацій продовжувати покращувати свою діяльність в організації управління, особливо – в управлінні можливостями людських ресурсів. Воно акцентувло увагу на стратегічному підході, який передбачав взаємозв'язок між компанією та управлінням людськими ресурсами у сфері структури, культури та розвитку організації. Це дослідження спрямоване на виявлення впливу управлінських практик на стратегічні людські ресурси, включаючи відбір та навчання кадрів, розвиток людських ресурсів та оцінку ефективності діяльності працівників завдяки такому поняттю як організаційна прихильність. Методика, що використовується в цьому дослідженні, є кількісною методологією з використанням анкети із запитаннями для опитування 145 працівників PT Petrokimia Gresik в якості вибіркового дослідження. Результати дослідження показали, що практики управління стратегічними людськими ресурсами мали прямий чи опосередкований позитивний вплив на результативність діяльності працівника через організаційну прихильність. Практики управління стратегічними людськими ресурсами змогли підвищити спроможність людських ресурсів, а також створити унікальну систему протистояння конкуренції та відповідності потребам ринку. В результаті дослідження було зроблено висновки про те, що організаційна прихильність та працездатність працівників можуть бути збільшені, якщо практики управління стратегічними людськими ресурсами є дієвими та впроваджуваними вчасно. Більше того, посилення організаційної прихильності може вплинути на підвищення продуктивності працівника.

Ключові слова: управління людськими ресурсами, результативність праці, організаційна прихильність.

ВЛИЯНИЕ ПРИМЕНЕНИЯ ПРАКТИК УПРАВЛЕНИЯ СТРАТЕГИЧЕСКИМИ ЧЕЛОВЕЧЕСКИМИ РЕСУРСАМИ НА РЕЗУЛЬТАТИВНОСТЬ ТРУДА В ОРГАНИЗАЦИИ

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В условиях эпохи глобализации Индонезия вступила в международную конкуренцию в региональном секторе из-за изменений, произошедших в различных бизнес-структурах и, как следствие, изменениях в их поведении. Международная конкуренция не ограничивается конкуренцией по отношению к продукции, но и по отношению к управлению человеческими ресурсами. Повышение интенсивности конкуренции повлияло на необходимость наращивания потребностей организаций продолжать улучшать свою деятельность в организации управления, особенно – в управлении возможностями человеческих ресурсов. Оно акцентувло внимание на стратегическом подходе, который предусматривал взаимосвязь между компанией и управлением человеческими ресурсами в сфере структуры, культуры и развития организации. Это исследование направлено на выявление влияния управленческих практик на стратегические человеческие ресурсы, включая отбор и обучение кадров, развитие человеческих ресурсов и оценку эффективности деятельности работников благодаря такому понятию как организационная приверженность. Методика, используемая в этом исследовании, является количественной методологией с использованием анкеты с вопросами для опроса 145 работников PT Petrokimia Gresik в качестве выборочного исследования. Результаты исследования показали, что практики управления стратегическими человеческими ресурсами имели прямое или косвенное положительное влияние на результативность деятельности работника посредством организационной приверженности. Практики управления стратегическими человеческими ресурсами смогли повысить способность человеческих ресурсов а также создать уникальную систему противостояния

конкуренции и соответствия потребностям рынка. В результате исследования были сделаны выводы о том, что организационная приверженность и работоспособность работников могут быть увеличены, если практики управления стратегическими человеческими ресурсами являются действенными и внедряемыми вовремя. Более того, усиление организационной приверженности может повлиять на повышение производительности работника.

Ключевые слова: управление человеческими ресурсами, результативность труда, организационная приверженность.

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OPTIMIZATION MANAGEMENT OF INVESTMENT FOR COAL MINES BASED ON NEURAL NETWORK MODEL

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Abstract

The main **objective** of the paper is to develop a system of economic and mathematical models for managing the investment activity of the coal mining enterprise, including improving the principles and methods for analyzing the profitability of investment projects and the optimal allocation of investments. Therefore, the article addressing the following issues:

– to determine the objectives of investment activity in coal mining enterprises;
– to systematize and identify statistically significant factors influencing investment activity in coal mining enterprises - affecting investment in coal mines;
– to form an economic-mathematical model for determining the amount of money that a coal-mining enterprise can allocate to investing;
– to form an economic-mathematical model for determining the enterprises profit as a result of the investment project implementation;
– to demonstrate expediency and perspective of the complex of developed model's implementation, to check their practical efficiency;

With the help of neural networks, a model was built based on 12 kinds of investment (9 kinds of investments into equipment, capital investment, portfolio investment, intangible assets investments) which are the most typical for a coal-mining enterprise.

The **method** of optimization of investment allocation on a coal mine was developed, which, in contrast to the existing ones, determines the optimal investment volume, which helps to maximize profits for 12 investment models.

As a **result** the method of optimization of investment allocation on a coal mine was developed, which, in contrast to the existing ones, determines the optimal investment volume, which helps to maximize profits for 12 investment models.

Keywords: coal industry, investments, statistically significant factors, economic and mathematical models, neural networks, optimization.

JEL Classification: C45, E22, L72.

INTRODUCTION

Nowadays an insignificant investment activity in the Ukrainian coal-mining industry can be noticed. Therefore, in the period of limited investment resources, the effectiveness of their rational use comes to the fore. To solve such tasks, an improved methodology for optimal distribution of

limited investment resources is needed, which is tailored specifically to the coal mining industry and takes into account those characteristics that can influence the efficiency of investments. It indicates the relevance of the problems that are posed and solved in the research.

The questions of investment activity are studied by many scientists all over the world, but their research does not exhaust the whole complex of issues related to this problem.

In 1959, the first official standard methodology - the definition of the economic efficiency of capital investments, which was the subject of mandatory application in all branches of the national economy, was approved in the USSR.

Instead of the old methods of calculating the efficiency of investments that were used during a planned economy, the methods of calculating the economic efficiency of investments that were used in industrialized countries were borrowed at the initial stage of Ukraine's restructuring.

But, despite the fact that the methods of assessments of investment processes as well as the conditions for their application are defined and worked out by international practice of developed countries, one should not rely on their versatility and perfection. Many Ukrainian economists and scientists believe that it is unsuitable for use without a thorough study of specific conditions and taking into account the specifics of socio-economic processes that are characteristic for Ukrainian society (Pavlenko, 2017; Maidukova, 2010; Amosha et al., 1999).

At present, the economic justification of investment projects in mines is a multidimensional space consisting of natural and cost indicators (Pavlenko, 2017).

In summarizing all the approaches to optimizing the methods of determining the effectiveness of investment projects, we see that they all consist in changing the interpretation of the main indicators of determining the effectiveness of investment and in modifying these indicators, as well as in changing the set of indicators involved in assessing the effectiveness of the investment project (Amosha et al., 1999; Vorontsovsky, 2016; Purayev, 2015; Damodaran, 2016; Bryntsev, 2017; Stanislavchik, 2017; Stanislavchik, 2017). The method proposed for use in any enterprise. Consequently, they do not take into account the peculiarities of the functioning of the structure to which they are applied.

In the process of creating the optimal investment plans for mining companies it is nessesary to take into account all parts of the mine. The financial performance of the mine and its investment needs affects a large number of factors - from the financial and economic to geological conditions. Therefore, the determination of factors that are directly dependent on the performance of investment activities is relevant (Sally et al., 2002; Trifonova et al., 2005).

METHODOLOGY

Setting objectives. It is necessary to form a complex investment project, the realization of which will have a positive impact on the profit increase of coal mining enterprises. Investments are presented in 12 types most characteristic for coal-mining enterprises of Ukraine:

A. material investments: investments in mine winders; investments in fan units; investments in compressor units; investments in pump stations; investments in transport installations; investments in decontamination plants; investments in thermal power units; investments in the mine surface plant; investments in electrical installations; other capital investments;

B. financial investments: portfolio investments;

C. intangible investments: training, research and development.

Regarding the source of the project's investment, the task is that solved within the framework of this work involves increasing the efficiency of the use of the company's own funds.

Solving this task will answer the following questions:

1. What is the amount of money that can be allocated to investing in coal mining enterprises?

2. What level of profit will be obtained by a coal-mining enterprise in the case of realization of a particular investment project?

3. How to allocate between the 12 types of investment funds allocated for investing in order to maximize profits?

Stages of solving the problem:

Stage 1. Development of an economic-mathematical model for determining the volume of investment in a coal-mining enterprise.

The purpose of the model is to determine the amount of money that a coal-mining enterprise can allocate to investing at its own expense.

Stage 2. Development of the economic-mathematical model for determining the profit of a coal-mining enterprise depending on the volume of investments by means of neural networks.

The purpose of the model is to determine how the level of investment affects the profit of the coal mining enterprise.

Stage 3. Development of a model for determining the optimal volume of investment in a coal mining enterprise. Make a breakdown of investments by 12 types of investment, which will help to maximize the profit of the coal mining enterprise. The economic-mathematical model for determining the optimal amount of investment combines the results of the work of the models mentioned in the previous two stages.

Stage 4. Verification of the model of determining the optimal investment volumes using the classical methodology for evaluating the effectiveness of investment projects.

1. Data collection

An analysis of literary sources on the issue of identifying factors (Pavlenko, 2017; Maidukova, 2010; Amosha et al., 1999; Vorontsovsky, 2016; Purayev, 2015; Damodaran, 2016; Bryntsev, 2017; Stanislavchik, 2017; Stanislavchik, 2017; Sally et al., 2002; Trifonova et al., 2005) that have an impact on investment activity has revealed many indicators, proposed as priority, and which refer to specific directions.

Data on investment activity in mines for 13 of their associations was collected, each of which consists of 3 to 7 privately owned mines, for the period of 2003 - 2011. The total amount of the data in the table is 132 lines and 12 columns, so it will not be posted here.

To verify the influence of the selected factors, a correlation analysis was performed on the collected data. Correlation coefficients are presented in the form of a triangular matrix in table 1.

Table 1

Correlation matrix

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
X_1	1,0															
X_2	0,4	1,0														
X_3	0,1	0,0	1,0													
X_4	1,0	0,4	0,1	1,0												
X_5	0,3	0,7	0,1	0,2	1,0											
X_6	0,3	0,8	0,0	0,3	0,5	1,0										

Table 1 continuation on the next page

Table 1 continuation

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
X_7	0,2	0,8	0,0	0,3	0,4	0,9	1,0									
X_8	0,3	0,8	0,1	0,3	0,5	0,9	0,8	1,0								
X_9	0,3	0,6	0,1	0,3	0,6	0,7	0,7	0,5	1,0							
X_{10}	0,3	0,8	0,1	0,3	0,5	0,9	0,8	0,9	0,6	1,0						
X_{11}	0,3	0,9	0,1	0,3	0,6	0,7	0,6	0,7	0,4	0,6	1,0					
X_{12}	0,3	0,8	0,0	0,4	0,3	0,8	0,8	0,8	0,5	0,8	0,6	1,0				
X_{13}	0,3	0,9	0,1	0,4	0,6	0,7	0,6	0,7	0,4	0,7	0,9	0,6	1,0			
X_{14}	0,3	0,9	0,0	0,3	0,6	0,7	0,6	0,7	0,4	0,7	0,9	0,6	0,9	1,0		
X_{15}	0,4	0,3	0,2	0,4	0,1	0,2	0,2	0,2	0,3	0,3	0,2	0,4	0,3	0,2	1,0	
X_{16}	0,3	0,4	0,1	0,4	0,3	0,3	0,2	0,4	0,4	0,4	0,4	0,3	0,4	0,3	0,6	1,0

Symbols in the table: X_1 - Income; X_2 - Profit; X_3 - Average wholesale price; X_4 - Coal production volume; X_5 - Mine winders; X_6 - Fan units; X_7 - Compressor units; X_8 - pump stations; X_9 - Transport installations; X_{10} - Decontamination plants; X_{11} - Thermal power units; X_{12} - Mine surface plant; X_{13} - Electrical installations; X_{14} - Other capital investments; X_{15} - Investments in the financial portfolio; X_{16} - Intangible investments.

As can be seen from the table, factors such as average wholesale price, coal production volume, investment in the financial portfolio and intangible investments almost do not affect profit. Therefore, these factors were excluded from the general data array when creating coal mine investment models.

In addition to the financial indicators, production parameters were added to the input factors, such as: residual reserves in million tonnes, average geological thickness of the coal seams, maximum operating depth in meters, length of mine workings in km, incident angle of the coal seams, production (designed) capacity in million tonnes per year. As well as physical and mechanical parameters of coal produced at these mines: average ash content%, average moisture content%, average sulfur content%.

2. Neural network model construction

At the stage of making a decision on the appropriateness of an investment project, there are two main questions:

1) what volume of investments will be optimal for a particular investment project in the given parameters of the enterprise - profit, production volumes, geological factors;

2) what will be the economic effect of a certain amount of investment, that is, the level of profit.

To answer the above questions, building a model by means of neural networks is required.

The most acceptable in this case is the choice of a two-layer perceptron and an algorithm for the reverse error propagation.

This type of neural networks is well-researched and described in the scientific literature. A similar network can simulate functions of almost any degree of complexity, and the number of layers and the number of elements in each layer determine the complexity of the function.

As a function of activation, the sigmoid was chosen, which is very commonly used for multilayer perceptrons and in other networks with continuous signals:

$$OUT = sigm(NET) = \frac{1}{1+e^{-NET}} \quad (1)$$

where:

OUT – network output

NET – the weighted average amount obtained in the first stage of calculating the output value of the neuron.

Sigmoid function is often used for multilayer perceptrons and other networks with continuous signals, because it has such positive qualities as:

– smoothness;

–continuity of function;

–the continuity of the first derivative, which allows to train the network.

In order to increase the adequacy of the model before the training of the perceptron, the input and output data were centered and normalized according to the following rule:

– updated standardization of input data:

$$x = \frac{X - m_x}{8\sigma_x} + \frac{1}{2} \quad (2)$$

where:

m_X – average value *X*;

σ_X – mean square deviation *X*.

The obtained value belonged range of -4 to 4 with a probability of 0.99. In order to obtain data in the range from 0 to 1, assuming that the distribution law for the factors X and Y is normal, the following formulas have been made:

– updated standardization of input data:

$$y = \frac{Y - m_y}{8\sigma_y} + \frac{1}{2} \quad (3)$$

where:

m_Y – average value *Y*;

σ_Y – mean square deviation *Y*.

The training error was calculated using the formula of the cumulative quadratic deviation between the desired (y) and the actual output at the network (OUT) signals for all sets of the training set:

$$E = \frac{1}{2}\sum_{k=1}^{P}(y_k - OUT_k)^2, \quad (4)$$

where:

E – total squared error (training criterion),

P – number of examples in the training set,

y_k – desired output value,

OUT – really got the output of the network,

k – example number.

Since all calculations of weighting factors were made in the integral system for complex statistical analysis and processing in the Windows environment – Neuro Excel, all further explanations for the calculations are given in the terminology of this particular application.

2.1 Modeling of the investment volume

For this modeling, a dual-layer neural network was built that has 11-3-12 architecture (number of inputs – the number of neurons in the first layer - the number of outputs) and the following parameters:

a number of layers without input (Number of layer) = 2;
a number of inputs (Number of inputs) = 11;
a number of neurons in the first layer (Layer1, neurons) = 3;
an order of non-linearity of the first layer (order) = 1;
a type of output function of the first layer (function) = sigmoid;
a number of neurons in the second layer (neurons) = 12;
an order of non-linearity of the second layer (order) = 1;
a type of output function of the second layer (function) = linear.

The neural network was trained using the following settings: the nature of the test sample is set to Random, because the random selection of the test set is the most significant for the approximation problems; initial error of elements (Initial delta) = 0,1; minimum error (Minimal delta) = 1 × 10-8; maximum error (Maximal delta) = 10; decrease step Nu (-) = 0,5; increment step Nu (+) = 1,2.

At the first step, the training was completed when it reached the number of 1000 epochs. The training error 0.07 was received, which was stabilized when the mark reached 886 epochs. Small deviations of the real data line from the data provided by the network were obtained graphically. In other words, the network produces the same set of data that was given as the input with a possible error of no more than 1%. If the network is not trained to make accurate predictions on the numerical values at which the training was conducted, it will lead to significant errors in prediction on a new selection of numerical values (fig. 1).

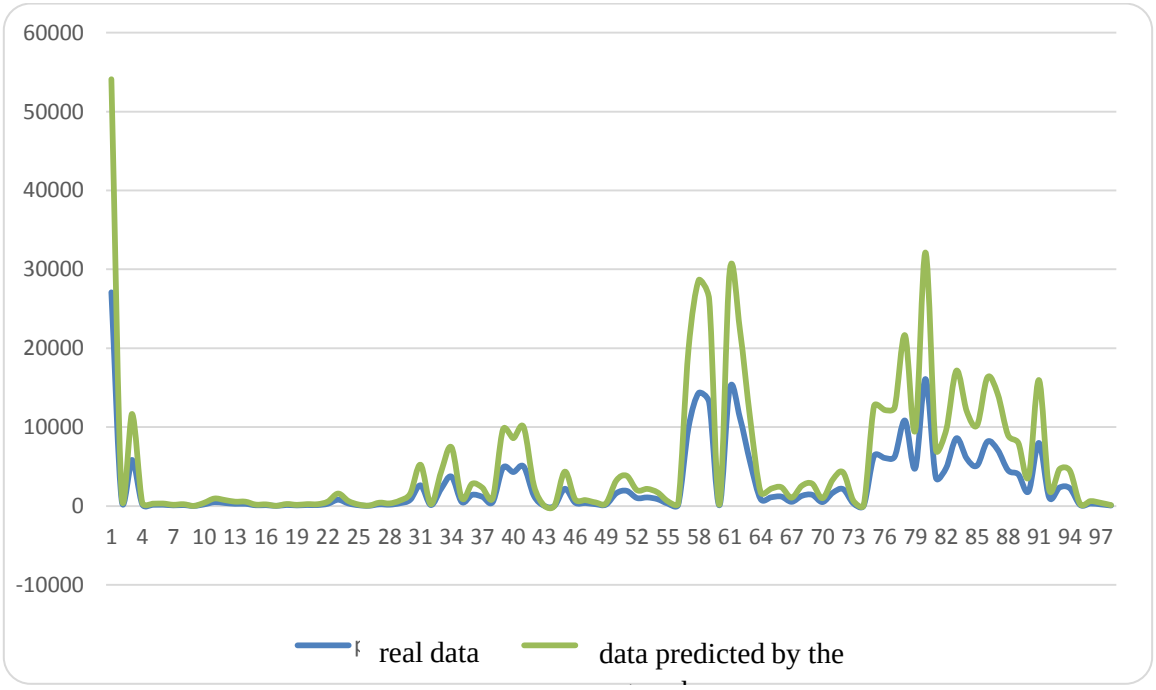

Fig. 1. The result of the neural network training – the line of real data and the line of the network response

Source: *compiled by authors*

The authors conducted an experiment to study the network with the use of other architectures. During the experiment it was determined that the architecture network 11-3-12 has the slightest error and better predictive capabilities.

The work of such a network is described by the formula (5):

$$OUT = sigm(\lambda_2 \sum_{j=1}^{3}(sigm(\lambda_1 \sum_{i=1}^{11} x_i w_{ij}^1) \cdot w_{jk}^2)) \quad (5)$$

where:

OUT – investments in mine winders; investments in fan units; investments in compressor units; investments in pump stations; investments in transport installations; investments in decontamination plants; investments in thermal power units; investments in the mine surface plant; investments in electrical installations; other capital investments; portfolio investments; intangible investments;

x_i – profit; volume of production; average ash content of coal; average moisture content of coal; average sulfur content; residual reserves in million tonnes; average geological thickness of the coal seams; maximum operating depth in meters; length of mine workings in km; incident angle of the coal seams; production (designed) capacity in million tonnes per year.

w_{ij}^1 – the weight coefficient of i-th input of the neuron number *j* in the *l* layer;

w_{ik}^2 – the weight coefficient of *j*-th input of the neuron number κ in the 2 layer i $\lambda > 0$ – the steepness coefficient of a continuous function *f* (net), approximate net = 0.5.

The total number of scales of the 11-3-12 network is 69. Based on the fact that the sample size is 132, the neuron-based network is capable of modeling.

2.2 Modeling the dependence of the profit from investment

For the construction of the neural network, a statistical sample of 132 data units from mines were used, where 131 data units for the period of 2003-2011 were used at the stage of neural network training and data on the OJSC "Pavlogradvygillya" for 2012 was used as data for testing of network forecasting properties, as in the previous sub-paragraph. The purpose of this model of the neural network will be to determine the profit of mines, taking into account a certain level of investment by type of investment.

Unlike the model developed in the previous subsection, the input data here will be investments by type (material, financial, intangible). Also, the geological factors were added, including the main characteristics of coal mined. The profits of the coal mining enterprise are taken as input data.

To solve this problem, a two-layer perceptron was developed, where the input was the value of investment volumes according to the enterprises, geological factors and technical properties of coal, and the forecast on the profit as an output parameter was made. The construction of the neural network was carried out according to the algorithm used in paragraph 2.2.1.

To determine the significance of the inputs used for the given outputs, the satisfactory ratio between average and dispersion was calculated:

X1=1,67/0,13=12,8.

At the first stage, a two-layer neural network was constructed with 21-3-1 architecture (the number of inputs - the number of neurons in the first layer - the number of outputs) and the following parameters:

a number of layers without input (Number of layer) = 2;

a number of inputs (Number of inputs) = 21;

a number of neurons in the first layer (Layer1, neurons) = 3;

an order of non-linearity of the first layer (order) = 1;

a type of output function of the first layer (function) = sigmoid;
a number of neurons in the second layer (neurons) = 1;
an order of non-linearity of the second layer (order) = 1;
a type of output function of the second layer (function) = linear.

The neural network was trained using the following settings: the nature of the test sample is set to Random, because the random selection of the test set is the most significant for the approximation problems; initial error of elements (Initial delta) = 0,1; minimum error (Minimal delta) = 1 × 10-8; maximum error (Maximal delta) = 10; decrease step Nu (-) = 0,5; increment step Nu (+) = 1,2.

At the first step, the training was completed when it reached the number of 1000 epochs. The training error 0.01, was received, which was stabilized when the mark reached 728 epochs. Small deviations of the real data line from the data provided by the network were obtained graphically. In other words, the network produces the same set of data that was given as the input with a possible error of no more than 1%. If the network is not trained to make accurate predictions on the numerical values at which the training was conducted, it will lead to significant errors in prediction on a new selection of numerical values (fig. 2).

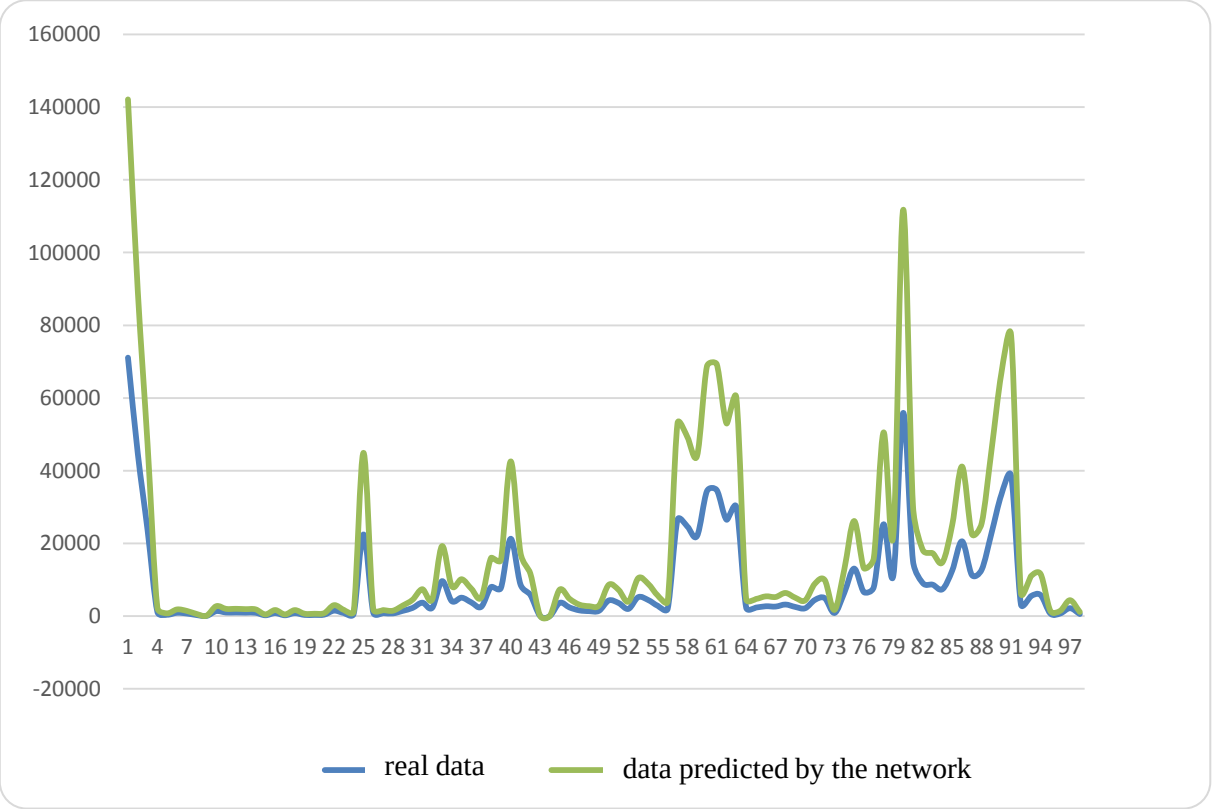

Fig. 2. The result of the neural network training – the line of real data and the line of the network response

Source: *compiled by authors*

The authors conducted an experiment to study the network with the use of other architectures. During the experiment it was determined that the architecture network 21-3-1 has the slightest error and better predictive capabilities.

The work of such a network is described by the formula (6):

$$OUT = sigm\ (\lambda_2 \sum_{j=1}^{3} (sigm\ (\lambda_1 \sum_{i=1}^{21} x_i\, w_{ij}) w_j) \qquad (6)$$

where:

x_i – input factors: investments: mine winders; fan units; compressor units; pump stations; transport installations; decontamination plants; thermal power units; mine surface plant; electrical installations; other capital investments; portfolio investments; intangible investments; average ash content of coal; average moisture content of coal; average sulfur content; residual reserves in million tonnes;

geological factors: average geological thickness of the coal seams; maximum operating depth in meters; length of mine workings in km; incident angle of the coal seams; production (designed) capacity in million tonnes per year.

w_{ij} – weight coefficient of the *i*-th input of the neuron number *j* in the first layer

w_j – weight coefficient of *j*-th input of neuron of the second layer,

OUT – output signal of the neural network - profits of the coal mining enterprise,

$\lambda 1$ and $\lambda 2$ – coefficients of steepness of the sigmoids of the first and second layers, $\lambda 1$ and $\lambda 2$ were approximately 0.5.

Thus, the total number of scales of the 21-3-1 network is 66. Based on the fact that the sample size is 132, the neuron-based network is capable of modeling.

2.3 Investigation of predictive properties of the obtained models

In order to establish the modeling properties of neural network models developed in paragraphs 2.2.1 and 2.2.2, testing of the training quality using test set is required.

At this stage, the generated primary model is further tested as a prognostic tool on a series of test data that were not included in the training sample. In this way, the test set should be different from the training one. To this end, data on the performance of OJSC "Pavlogradvygillya" for 2012, which was not taken for the neural networks training, was used.

To test the "Modeling the volume of investment" neural network, developed in paragraph 2.2.1. the inputs of the network were prepared, among which there are the values of profit, volumes of production, technical properties and geological factors of coal at OJSC "Pavlogradvygillya" in 2012. With the help of the NeuroExcel add-in, based on the already trained neural network, the modeled output data was received, including the volumes of investment by types presented in table 2.

Table 2

Results of quality assurance of forecasting of the investment volume model

	Indicators															
Real data	104,80	22,10	65,40	158,90	256,80	4,50	68,80	99,70	45,40	38,40	38,80	354,70	2,00	10,90	24,10	2,80
Data predicted by the network	104,70	22,54	64,30	158,85	256,60	4,40	68,20	97,60	45,28	36,50	39,20	354,72	1,94	10,80	24,01	3,00
Deviation	0,1	-0,44	1,1	0,05	0,2	0,1	0,6	2,1	0,12	1,9	-0,4	-0,02	0,06	0,1	0,09	-0,2

Symbols in the table:
1 - investments in mine winders;
2 - investments in fan units;
3 - investments in compressor units;
4 - investments in pump stations;
5 - investments in transport installations;
6 - investments in decontamination plants;
7 - investments in thermal power units;
8 - investments in the mine surface plant;
9 - investments in electrical installations;
10 - investments in other capital investments;
11 - portfolio investments;
12 - intangible investments.

Consequently, the level of investment obtained as a result of the modeling almost coincides with the actual data, taking into account a slight deviation.

Graphically, the result of testing the neural network is shown in fig. 3, which represents the coincidence of the line of real and predicted data.

So, we can conclude that a trained neural network of "investment volume determination" can show high accuracy of the investments modeling for mines in Ukraine with minimum error rate.

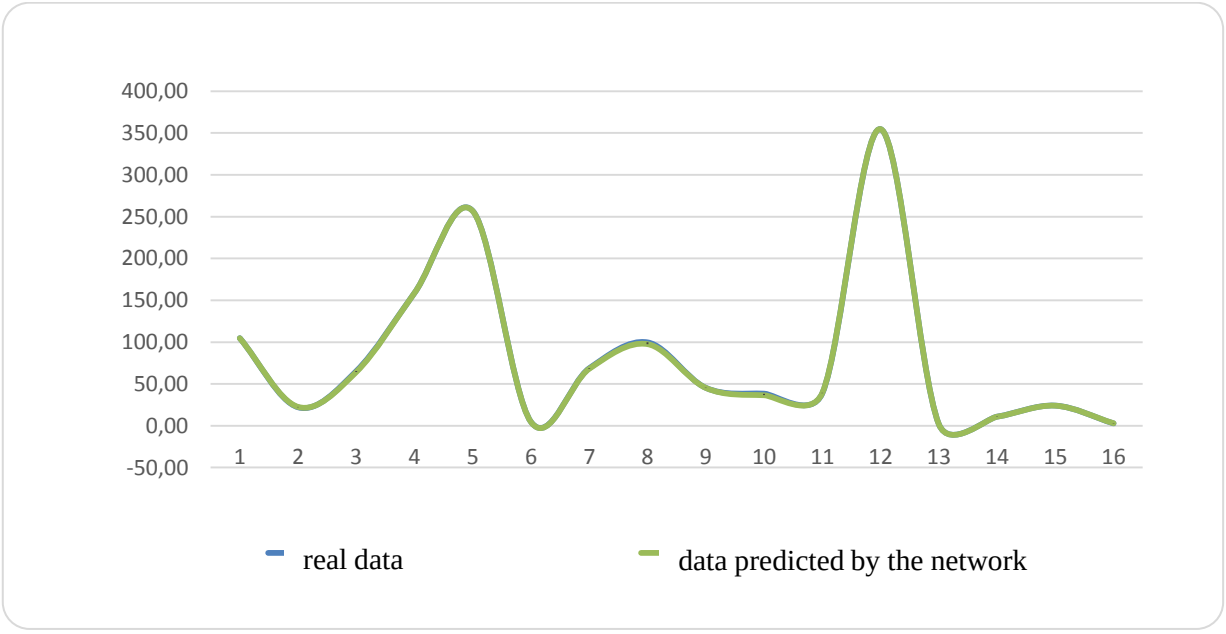

Fig. 3. Research results of modeling properties of neural network modeling for investment volumes

Source: *compiled by authors*

In order to test the "Modeling of mine profit from investments" neural network, developed in paragraph 2.2.2. the inputs of the network were prepared, among which there are value of investments by type (material, financial, intangible), technical properties and geological factors of coal at OJSC "Pavlogradvygillya" in 2012. With the help of the NeuroExcel add-in, based on the already trained neural network, the modeled output data was received, including the level of profit, which is 52106.4 thousand UAH, the real profit received by OJSC "Pavlogradvygillya" is 52089.00 thousand UAH. The deviation of the real indicator from the modeled one was 17.4 thousand UAH, which is an error of only 0.00028%.

Churikanova, O. and Lysenko, M. (2019). "Optimization management of investment for coal mines based on neural network model", *Management and entrepreneurship: trends of development*, 3(09), pp. 33-51. DOI: https://doi.org/10.26661/2522-1566/2019-3/09-03

3. Optimization of investment

For the formulation and solution of an optimization task, the purpose of which is to maximize profits of a coal mining enterprise, the already built economic and mathematical models based on the application of neural networks have been taken as the basis:

–a model for determining the amount of investment in a coal mining enterprise;

–economic-mathematical model for determining the profit of a coal mine from investments.

Thus, the optimization task is a synthesis of the developments on the above-mentioned models in order to maximize profits.

In the set task of optimization it is chosen:

unknown *x1* - *x12* - standardized by (2) the value of investment in: investments in mine winders (*X1*); investments in fan units (*X*2); investments in compressor units (*X3*); investments in pump stations (*X4*); investments in transport installations (*X5*); investments in decontamination plants (*X6*); investments in thermal power units (*X7*); investments in the mine surface plant (*X8*); investments in electrical installations (*X9*); other capital investments (*X10*); portfolio investments (*X11*); intangible investments (*X12*).

The average indicators of coal technical characteristics and geological factors are constant values according to a separately investigated coal-mining enterprise, that is standardized for (2): residual reserves in million tonnes (*X13*), average geological thickness of the coal seams (*X14*), maximum operating depth in meters (*X15*), length of mine workings in km (*X16*), incident angle of the coal seams (*X17*), production (designed) capacity in million tonnes per year (*X18*). As well as physical and mechanical parameters of coal produced at these mines: average ash content% (*X19*), average moisture content% (*X20*), average sulfur content% (*X21*).

$X_{13}, X_{14}, X_{15}, X_{16}, X_{17}, X_{18}, X_{19}, X_{20}, X_{21}$ are constants,

Target function will look like:

$$OUT \rightarrow max.$$

Limitations on:

а) the total amount of investments should not exceed the amount that the coal-mining enterprise has allocated for the development of each type of investment. So:

$$(x_i - \frac{1}{2})8\sigma x + m_x \le (OUT - \frac{1}{2})8\sigma y + my,$$

i=1..12;

б) investment volumes by the type of investment must be inalienable:

$$(x_i - \frac{1}{2})8\sigma x + m_x \ge 0,$$

i=1..12;

в) At the request of the enterprise, additional restrictions are imposed by type of investment in case of necessity to purchase equipment, etc.:

$$(x_i - \frac{1}{2})8\sigma x + m_x \le Z_i,$$

i=1..12,

where Z_i – amount of investment that an enterprise needs to invest in a certain type of investment.

As a result of solving the optimization task, the amount of investment investment for each type of investment is found, which increases the profit of the considered enterprise. Thus, the

solution of the optimization task makes possible to make an investment plan for a specific coal mining enterprise, taking into account the peculiarities of its work and the experience of other mines in Ukraine. The solution of this optimization task can be done using Microsoft Excel tools, which is convenient for mining enterprise management that has only Microsoft Office programs.

The calculations were performed using Excel spreadsheets by the Newton method. The optimal investment project for OJSC "Pavlogradvygillya" for one year was calculated, using the model of determining the optimal investment volumes presented in table 3.

Table 3

The optimal investment plan for a coal mine

Investments by type	Thousand UAH
Mine winders	58,4
Fan units	46,7
Compressor units	35,1
Pump stations	31,2
Transport installations	50,6
Decontamination plants	31,2
Thermal power units	39
Mine surface plant	50,6
Electrical installations	46,7
Other capital investments	146,1
Investment portfolio	92,1
Intangible investments	29,2
Total:	656,9

RESULTS AND DISCUSSIONS

Based on the results of the allocation of investment resources identified in the solution of the optimization task, the total amount of investments for 2012 amounted to 656.9 thousand UAH, which is 66.9 thousand UAH. more than suggested by the company's management. Moreover, the model proposed to increase the investment of money in research and development, training, securities. According to the main types of equipment, the model provides the same investment amounts as in the investment project of "Pavlogradvygillya" OJSC. Reduction of investments by the model is proposed in direction of other capital investments and for certain types of equipment. The financial indicators proposed by the neural network and obtained as a result of the implementation of the investment project of the company with the definition of absolute growth, are given in Table 4.

Table 4

Dynamics of the main financial indicators as a result of the investment project implementation, UAH ths.

	FI 2011.	PFI 2012	FIE_1 2012 ,	FIM_2	AGE	AGM
Profit	2210,00	2275,00	2270,00	2523,00	65,00	313,00

where:

FI – financial indicators;

PFI – planned financial indicators;

FIE_1 – financial indicators received by the neural network as a result of the implementation of the investment project proposed by the enterprise;

FIM_2 – financial indicators for 2012, obtained as a result of the investment project implementation after solving the optimization task;

AGE – absolute growth from the realized investment project planned by the enterprise;

AGM – the absolute growth from the investment project implementation after solving the optimization task.

Perform a comparison. As can be seen from Table. 4, both investment projects - the optimization investment project and the plan of management of the coal mining enterprise - proved to be effective and have a positive impact on the increase of the main financial indicators compared to the previous ones in 2011. But the project, obtained as a result of the solution of the optimization problem, more intensively affects the increase of the main financial indicators of the coal mining enterprise. The profit, obtained as a result of the investment project of the enterprise, amounted to 2270,00 thousand UAH, and the resulting optimization distribution of investment resources - 2523,00 thousand UAH, thus the amount of the economic effect was 253,00 thousand UAH.

In order to test the methodology for determining effective investment volumes, the classical methodology for evaluating the effectiveness of investment projects was used [16-21]. The following set of indicators was used:

1. The present value (PV) is calculated for the constant discount interest by the formula:

$$\text{PV} = \sum_t \frac{P_t}{(1+r)^t}$$

where:

Pt – cash receipts for a selected time period,

r – discount interest.

PV = 2523.0 / (1 + 20%) = 2102.5 thousand UAH

2. Net present value (NPV) is defined as the amount of streaming effects (i.e., exceeding revenue over expenses) for the entire estimated project period over those in the beginning of the project:

$$\text{NPV} = \sum_t \frac{P_t - IC_t}{(1+r)^t}$$

where:

ICt is the investment (expenses) made during a selected time period.

If NPV value is positive at a given discount interest (NPV> 0), the project can be considered effective and consider its acceptance or further analysis. The higher the NPV value is, the more effective the project is. If NPV <0, then the project is considered ineffective.

NPV = (2523 – 656,9) / (1 + 20%) = 8886,19

3. The index of return on investment (RI) is the ratio of the sum of these effects to the investment volume, i.e.:

$$\text{PI} = \sum_t \frac{P_t}{(1+r)^t} \; / \; IC$$

The return on investment index (index of profitability) is closely related to the NPV: if NPV value is positive, then RI> 1, and vice versa. Thus, if RI> 1, then the project is considered effective, and if RI <1 - it is ineffective.

$$PI = (2523 / (1 + 20\%)) / 656,9 = 18,28$$

4. The internal rate of return (IRR) is the norm of the r discount when NPV = 0 (this means that the size of the consolidated effects is equal to the consolidated investment), which is determined by the formula:

$$IRR = \sum_t \frac{IC_t}{(1+r)^t}$$

The NPV value of the investment project reflects its efficiency at a given predetermined rate of the r discount, and the IRR is determined by the method of successive approximations and compared with the required rate of return on investment. If the IRR value is not less than the required return on investment, then the investments are worthwhile. Otherwise, the project is rejected.

With the IRR indicator, the maximum relative cost level acceptable for the analyzed project can be determined. For example, if the project is fully funded by a commercial bank loan, the IRR value indicates the upper limit of the acceptable level of the bank interest rate, the excess of which turns the project into an unprofitable one.

$$IRR = \frac{656.9}{1+20\%} = 3128 \text{ thousand UAH}$$

5. The account rate of return (ARR) is the ratio of the average annual net profit of the project Pcp (balance profit minus deductions to the budget) to the average annual amount of investment ICcp (without residual or liquidation value):

$$ARR = \frac{P_{cp}}{IC_{cp}} \cdot 100\%$$

The ARR indicator is calculated without discounting costs and profits, so it does not allow to consider the difference between projects with similar annual average profits, but those that vary in time.

$$ARR = (2523 / 656,9) \cdot 100\% = 3,84$$

6. The payback period (*PP*) is the minimum time interval (from the beginning of the project), beyond which the integral return on the project becomes positive and remains the same. In other words, it is a period of time from which initial investments and other costs associated with the project are covered by the results. The sequence of calculating the payback period depends on the uniformity of distribution of the estimated return on investment. If the profit is distributed over the years evenly, then it is proposed to use the following formula:

$$PP = \sum_t \frac{IC_t}{P_t'}$$

where:

P_t' is the annual profit from capital.

$$PP = 656,9 / 2523 = 0,26$$

Thus, based on the calculation of the efficiency of an investment project using the classical methodology for assessing the investments efficiency, we can conclude that, in accordance with all of the above indicators, the project proved to be effective.

CONCLUSIONS

The authors received a number of important results that make up the scientific novelty of the work.

For the first time: theoretical aspects of management of investment activity at the coal mining enterprise, which are reflected in the complex of economic and mathematical models, which include determination of profit of the mine from the realization of the investment project, determination of necessary investment volumes and optimization of their distribution on the criterion of profit maximization, are developed;

Improved:

- a model for determining the effectiveness of investments, which allows to determine the profit of the coal mining enterprise from the implementation of the investment project. Unlike existing ones, the model takes into account a group of factors inherent in the coal mining industry itself, such as geological factors and technical characteristics of coal;

– - the model of the neural network, which performs the definition of necessary investments in a coal mine at the expense of its own funds in conditions of uncertainty, which, unlike existing ones, takes into account geological factors and technical characteristics of coal;

- a model for optimizing the distribution of investments in a coal mine, which, unlike the existing ones, determines the optimal volumes of investment that help maximize profits not only by types of investments (tangible, financial, intangible), but also by 12 kinds of investments (9 kinds of investments in equipment, investments in capital investments, securities portfolio, intangible investments), which are most characteristic for a coal mining enterprise;

Got further development: the classification of factors that influence the efficiency of investment projects in coal mining enterprises, to which, in addition to the existing ones, technical characteristics of coal have been added.

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ОПТИМІЗАЦІЯ УПРАВЛЯННЯ ІНВЕСТИЦІЯМИ НА ВУГІЛЬНІЙ ШАХТІ ІЗ ЗАСТОСУВАННЯМ МОДЕЛІ НЕЙРОННИХ МЕРЕЖ

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Основна мета статті полягає у розробці концептуальних положень та системи економіко-математичних моделей управління інвестиційною діяльністю вуглевидобувного підприємства, включаючи вдосконалення принципів і методів аналізу прибутковості інвестиційних проектів та оптимального розподілу інвестицій. Виходячи з цього, у статті обґрунтована необхідність вирішення таких питань:

– визначити цілі інвестиційної діяльності на вуглевидобувних підприємствах;

– систематизувати й визначити статистично значимі фактори, які впливають на інвестиційну діяльність на вуглевидобувних підприємствах;

– сформувати економіко-математичну модель визначення обсягів інвестування з метою отримання суми, яку вуглевидобувне підприємство спроможне виділити на інвестування;

– сформувати економіко-математичну модель визначення прибутку підприємства у результаті реалізації інвестиційного проекту.

– показати доцільність і перспективність впровадження розробленого комплексу моделей, перевірити їх практичну ефективність.

За допомогою нейронних сіток було побудовано модель за 12-ма видами інвестування (9 видів інвестицій в обладнання, інвестиції у капітальні вкладення, у портфель цінних паперів, нематеріальні інвестиції), що є найбільш характерними для вуглевидобувного підприємства. Розроблено методику оптимізації розподілу інвестицій на вугільній шахті, яка на відміну від існуючих визначає оптимальні обсяги інвестування, що сприяють максимізації прибутку за 12-ма моделями інвестування. Створені в ході дослідження економічні та математичні моделі вирішують наступні питання:1) аналіз впливу геологічних факторів та технічних характеристик вугілля на ефективність роботи вугледобувного підприємства та на ефективність інвестицій; 2) аналіз впливу обсягів 12 видів інвестицій на рівень прибутку вугільної шахти; 3) визначення суми, яку вугільна шахта може виділити на інвестування за власні кошти; 4) визначення прибутку від певного інвестиційного проекту з урахуванням усіх вищезазначених параметрів; 5) можливість коригування інвестиційного проекту з метою отримання максимального прибутку.

Ключові слова: вугільна промисловість, інвестиції, статистично значущі фактори, економіко-математичні моделі, нейронні мережі, оптимізація.

ОПТИМИЗАЦИЯ УПРАВЛЕНИЯ ИНВЕСТИЦИЯМИ НА УГОЛЬНОЙ ШАХТЕ С ПРИМЕНЕНИЕМ МОДЕЛИ НЕЙРОННОЙ СЕТИ

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Основная цель статьи заключается в разработке концептуальных положений и системы экономико-математических моделей управления инвестиционной деятельностью угледобывающего предприятия, включая совершенствование принципов и методов анализа прибыльности инвестиционных проектов и оптимального распределения инвестиций. Исходя из этого, в статье обоснована необходимость решения следующих вопросов:

- определить цели инвестиционной деятельности на угледобывающих предприятиях;
- систематизировать и определить статистически значимые факторы, влияющие на инвестиционную деятельность на угледобывающих предприятиях;
- сформировать экономико-математическая модель определения объемов инвестирования с целью получения суммы, которую угледобывающее предприятие способно выделить на инвестирование;
- сформировать экономико-математическая модель определения прибыли предприятия в результате реализации инвестиционного проекта.
- показать целесообразность и перспективность внедрения разработанного комплекса моделей, проверить их практическую эффективность.

С помощью нейронных сетей была построена модель по 12-ти видам инвестирования (9 видов инвестиций в оборудование, инвестиции в капитальные вложения, в портфель ценных бумаг, нематериальные инвестиции), являются наиболее характерными для угледобывающего предприятия. Разработана методика оптимизации распределения инвестиций на угольной шахте, в отличие от существующих определяет оптимальные объемы инвестирования, способствующих максимизации прибыли за 12-ю моделями

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инвестирования. Созданные в ходе исследования экономические и математические модели решают следующие вопросы: 1) анализ влияния геологических факторов и технических характеристик угля на эффективность работы угледобывающего предприятия и на эффективность инвестиций; 2) анализ влияния объемов 12 видов инвестиций на уровень прибыли угольной шахты; 3) определение суммы, которую угольная шахта может выделить на инвестирование за собственные средства; 4) определение прибыли от определенного инвестиционного проекта с учетом всех вышеупомянутых параметров; 5) возможность корректировки инвестиционного проекта с целью получения максимальной прибыли.

Ключевые слова: угольная промышленность, инвестиции, статистически значимые факторы, экономико-математические модели, нейронные сети, оптимизация.

MANAGEMENT

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INCREASING SOCIAL RESPONSIBILITY IN THE MANAGEMENT OF INDUSTRIAL ENTERPRISES (USING THE EXAMPLE OF "ARTERIUM" CORPORATION)

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Abstract

The **purpose** of the study is to identify the ways to increase social responsibility in the modern management of industrial enterprises on the example of corporation "Arterium". The basic **principles** that have been used in the research are historical, systematic and comparative methods, institutional and structural-functional approaches. In the paper the theoretical foundations of corporate social responsibility were considered, foreign and domestic practices were analyzed, in particular, based on "Arterium" corporation. The urgency of the work is to study the current state of corporate social responsibility in Ukraine, and, in particular, at the "Arterium" enterprise. More and more companies are introducing CSR into their business, business standards are changing, and socially responsible behavior becomes an essential element of successful entrepreneurship. It was found that the corporation, implementing the principles of social responsibility of business towards society, focuses on the following areas: business ethics and ethical marketing, innovation and product development, patient health and safety, protection against fraud, investment in employee training, environmental policy and Green office, support for health, sports and education programs, community care.

According to the **results** of the conducted research:

- the situation and effectiveness of corporate social responsibility at the specified enterprise have been substantiated;
- the algorithm for developing a social report for "Arterium" corporation has been proposed as a method of increasing social responsibility.

To achieve the goal, the following tasks have been solved:

- the essence of the concept of corporate social responsibility and the state of CSR in the world have been investigated;
- the activity of "Arterium" corporation has been analyzed;
- the state of corporate social responsibility in Ukraine has been assessed;
- the experience of foreign companies in the field has been studied.

Keywords: corporate social responsibility, social reporting, social control, social investment.
JEL Classification: M11, M14, M31.

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INTRODUCTION

The current state of development of society is characterized by complexity, inconsistency and ambiguity, due to a number of factors of subjective and objective nature. The effectiveness of the reform processes largely depends on the existence of an effective mechanism of public regulation. It is confirmed that any project has greater chances to succeed provided that it has quality scientifically grounded support. The current situation determines the need for scientific understanding of the complex problems in the field of social responsibility.

Social responsibility is an integral element in the macro-system "state-society-person". Effective social control is one of the first signs of an independent democratic social state of civil society. Through the implementation of a set of actions aimed at increasing the level of social responsibility of industrial enterprises, it is possible to improve the situation in the social, economic, political and other spheres. However, at this stage of development, the implementation of this set of actions is not possible for a number of reasons.

The problem of implementation of corporate social responsibility in industrial enterprises is its multifaceted character. Attention to corporate social responsibility in Ukraine has recently emerged. Due to this fact, analysts and scientists do not have a unified approach to understanding the problem.

LITERATURE REVIEW

The term “corporate social responsibility” (hereafter CSR) is considered by such foreign researchers: Thomas Bredgaard (2004), Howard Bowen (2013), Jeremy Moon (2014), Milton Friedman (1970), Philip Kotler (2005), Peter Drucker (1993) and many others.

Own vision of corporate social responsibility in Ukraine has recently begun to form. The following scholars worked on the study of CSR: G. Popovich, F. Evdokimov, G. Nazarov, O. Filipchenko, Yu. Saenko, O. Osinkina and others.

METHODOLOGY

The acceptance of social responsibility is entirely voluntary. It can depend only on the desire of the company to contribute to the development of society. Social responsibility is aimed at streamlining, harmonizing social relations and ensuring their progressive and stable development. Social responsibility ensures social and personal security, maintains and strengthens social harmony, the integrity of society and the state. Social security, therefore, objectively requires a reliable mechanism of social responsibility (V. Hryshchuk, 2012).

Social responsibility is the responsibility of the management of the organization to make decisions and carry out actions that increase the level of well-being.

In recent years, the institute of corporate social responsibility (CSR) has gone from the organizational and managerial exoticism of global corporations to standard technologies for the introduction of this phenomenon into the practice of organizations of various forms of ownership and management, of various sizes and types of economic activities operating around the world (A. Kolot, 2018). Moreover the methodology for assessing the effectiveness of socially responsible activities of the enterprise has been recently created. This method is aimed at determining the effectiveness of social investments of the enterprise by calculating quantitative and qualitative indicators (Table 1).

Table 1

Methods of quantitative and qualitative assessment of CSR of the enterprise

Quantitative indicators	Quality indicator
The index of specific social investments (IL) – represents the value of social investments of the surveyed companies per employee (in monetary units): $IL = \frac{\sum_{i=1}^{n} Ci}{\sum_{i=1}^{n} Li} \times 100\%$ where Ci is the volume of social investment of the I - th company (including voluntary and mandatory costs of social programs); Li is the average number of employees of the i-th company; n is the number of companies participating in the survey.	The qualitative index of social investments for the i-th enterprise (IKi) shows the level of complexity of social activity of the enterprise, %: $IKi = (\frac{1}{m}\sum_{j=1}^{m} Xij) \times 100\%$ where Xij is a Boolean variable that takes the value 1 if j - a sign takes place in the i - th company, and is equal to 0 if the sign is absent; m is the number of signs by which the social activity of the company is evaluated, participates in the study.
The share of social investments of the surveyed companies in their total sales (IS) is measured as a percentage $:IS = \frac{\sum_{i=1}^{n} Ci}{\sum_{i=1}^{n} Si} \times 100\%$ where Si is the sales of the company.	The qualitative index of social investments for the j - th trait (IKj) shows the degree of presence of this qualitative trait in the statistical voters of the enterprise, %: $IKj = (\frac{1}{n}\sum_{j=1}^{n} Xij) \times 100\%$ where n is the number of companies participating in the study.
The share of social investments of surveyed companies in the total amount of their profits before taxation (IP), which is measured as a percentage: $IP = \frac{\sum_{i=1}^{n} Ci}{\sum_{i=1}^{n} Pi} \times 100\%$ where Pi – the amount of profits before taxation of the i-th company.	The general qualitative index of social investments (IK) shows the level of complexity of the social activity of the enterprise,%: $IK = (\frac{1}{n \times m})\sum_{i=1}^{n}\sum_{j=1}^{m} Xij) \times 100\%$

Source: *compiled based on "Arterium" Corporate Social Responsibility Report (2013).*

RESULTS AND DISCUSSION

The term "corporate social responsibility" is widely used by general public due to the fact that it more accurately reflects the modern approach to socially responsible behavior of business organizations. The interpretation of social responsibility as a corporate one is justified by a number of factors:

1. Leading corporations have shown commitment to socially responsible behavior and social activity in its broadest sense.

2. The corporation is the leading and most complex organizational form of doing business.

3. The focus on the corporation does not deny the focus on any other structures that embody business and managers formulating organizational (corporate) policies and their constituents; it gives grounds for talking about the adoption of organizational (corporate) citizenship.

Corporate social responsibility is divided into internal and external (Table 2).

Table 2

Social Responsibility Groups

Internal social responsibility	External social responsibility
1. Medical and social insurance	1. Sponsorship and corporate charity
2. Stability of compensation system	2. Environmental protection
3. Safety of work	3. Interaction with local authorities
4. Development of human resources (training programs)	4. Participation in crisis situations
	5. Responsibility to consumers

Source: *compiled based on T. Antoshko et al (2013).*

Principles of Corporate Social Responsibility are a new system for improving the competitiveness of enterprises, which requires the establishment of close links between inter-branch corporate associations and representatives of the state and society. Implementation of the principles of corporate social responsibility will reduce costs, operational risks, increase revenues, stimulate innovation, facilitate access to commodity markets and capital markets, improve reputation, etc. (Y. Behma et al, 2006).

The choice of following corporate social responsibility policies is strategically important. Thus, corporate social responsibility as a policy and the concept of strategic development of an enterprise implies: formation and strengthening of image and business reputation; corporate development (restructuring and organizational changes involving representatives of senior management of enterprises, their staff and public organizations); ecological policy and use of natural resources; management of personnel development; health, safety and health, and respect for human rights; interaction with local authorities, state structures and public organizations for solving common social problems, etc. (A. Kolot, 2018).

When analyzing foreign enterprises, it can be concluded that corporate social responsibility plays an important role in the formation of efficient economy, because it is based on the use of CSR standards. Table 3 shows companies that use CSR principles in their activities.

Table 3

Corporations of foreign countries that use the principles of CSR

Country	Company	CSR Standards
1	2	3
France	Citroën	France Citroën Dow Jones Sustainability Index, FTSE4Good Indices, EMAS System, AA1000 Standard, European Union Eco-Label
Brazil	Petroleo	Brasileiro S.A. FTSE4Good Indices, ISO9000 / ISO14000 Standards, AA1000 Standard
Australia	Orica	Code of Business Conduct of APEC Countries, FTSE4Good Indices, ISO9000 / ISO14000 Standards, AA1000 Standard, European Union EcoLebel
UK	British Petroleum	Dow Jones Sustainability Index, FTSE4Good Indices, EMAS System, AA1000 Standard, European Union Eco-Label
Denmark	FL Smidth	Dow Jones Sustainability Index, FTSE4Good Indices, ISO9000 / ISO14000 Standards, AA1000 Standard, Ethical Trade Initiative, Eco-Label of the European Union

Table 3 continuation on the next page

Table 3 continuation

1	2	3
India	Reliance Industries	FTSE4Good Indices, ISO9000 / ISO14000 Standards, AA1000 Standard
Spain	Maquinaria GEKA S. A.	FTSE4Good Indices, EMAS System, AA1000 Standard, European Union Eco-Label
Italy	Impregilo S.p.A.	FTSE4Good Indices, EMAS System, AA1000 Standard, European Union Eco-Label
Germany	Henschel	Dow Jones Sustainability Index, FTSE4Good Indices, EMAS System, AA1000 Standard, European Union Eco-Label
Japan	Yamaha Motor Company Limited	APEC Business Conduct Code, Dow Jones Sustainability Index, FTSE4Good Indices, EMAS System, AA1000 Standard

Source: *compiled based on N. Tkachenko (2008).*

The main benefits and incentives of Ukrainian companies following CSR are:

- increase in profits, increase of company growth rates;
- the opportunity to access socially responsible investments, distributing which investors take into account the indicators characterizing the company's social and ethical spheres in the field of environmental protection (FTSE4Good, Dow Jones Sustainable Index);
- possible reduction of operating costs, for example, by reducing waste from production or processing, increasing the efficiency of the use of electricity or selling recycled materials;
- improvement of the reputation causing further opportunities for developing, entering new markets and opening new business directions;
- sales growth, increase of customers' loyalty;
- increase of labor productivity;
- increase of competitiveness of the company as a whole.

One of the corporations that use CSR is "Arterium" corporation. The Ukrainian pharmaceutical company "Arterium" works in a sphere that values human health and life most of all, and this business is united by more than two thousand employees. Social responsibility is an important and complex concept for the company. Using this term implies the responsibility of all the groups and target audiences affected by the activities of this corporation. The corporation seeks to establish a harmonious, trusting and long-term relationship with all of them.

The corporation is aware of the importance of social, regulatory and environmental issues and the harmonious existence of all organizations and individuals with whom the company interacts. The corporation is a powerful Ukrainian pharmaceutical manufacturer and seeks to bring as much benefit as possible to the country, its people and society as a whole.

There are still areas in need of support and assistance on the country's path to European values, and therefore the corporation devotes great attention to the revival of the charity traditions that were laid down by the founders of the "Arterium" corporation. Within the framework of charitable activities a program of assistance to local communities is being implemented at the locations of corporation enterprises – Kyiv and Lviv.

Major efforts in the area of social responsibility focus on such important areas as ethics, products, employees, the environment and society. "Arterium" company defines these areas as key in its activities.

Consider the key areas of the "Arterium" corporation in more detail:

1. Ethics: clinical research and business ethics (ethical marketing).

Clinical trials are critical to determining the safety and effectiveness of new drugs. Patient safety for a company is a key issue at the stage of pharmaceutical development.

“Arterium” carries out clinical trials in accordance with: GCP standards (proper clinical practice is an international standard of ethics and quality of scientific research that describes the rules for designing, conducting, maintaining documentation and reporting on research involving human being as a subject) and GLP (due laboratory practice - a system of norms, rules and guidelines aimed at ensuring the consistency and reliability of laboratory research results), the order of the Ministry of Health of Ukraine "Procedure for conducting clinical trials of medicine tools and examination of materials of clinical trials", instructions "Medicines. Good clinical practice", approved by the order of the Ministry of Health of Ukraine, legislation of the countries in which “Arterium” carries out clinical research.

In conducting preclinical studies “Arterium” adheres to the norms and requirements of such documents: the order of the Ministry of Health of Ukraine “On approval of the procedure for pre-clinical study of medicinal products and examination of materials for pre-clinical study of medicinal products”, the European Convention for the Protection of Vertebrate Animals used in experiments or in other scientific goals. The company conducts research in Ukraine, Russia and Belarus. All employees of the company involved in the process of organizing clinical trials are regularly trained in compliance with international standards and regulations. “Arterium” is a member of the Association of Clinical Research Organizations (Russia). The corporation seeks to comply with high ethical standards and compliance with all local, national laws and international norms of the countries where it conducts its business. “Arterium” operates ethically and responsibly in all spheres of activity: from research and development to production and marketing. Compliance with the rules of ethics with regard to employees, patients, clients, suppliers and other stakeholders is one of the main approaches to corporate responsibility in “Arterium” corporation.

Business ethics: the principles of ethics of business relationships of employees. This document establishes the standards of relationship between the company, its employees and partners. The ethical principles serve as the basis for the adoption of daily decisions and help maintain the reputation of an honest and reliable partner. From the employees, the company expects the observance of ethical standards in all aspects of its work, the performance of its work honestly and conscientiously, in compliance with the principles of corporate responsibility, as well as the provisions of the current legislation and regulations.

Ethical Marketing: The responsible marketing activity of “Arterium” employees enables healthcare providers to receive reliable information about medicines and, thus, promote the rational use of drugs with maximum benefit to the health of patients. By cooperating with health professionals, all “Arterium” employees adhere to current laws, rules of good practice of promotion, industry codes and internal standards of the Corporation.

Transparency in business: openness and transparency are integral elements of dialogue with stakeholders and the basis of trust between the parties. “Arterium” is a big conscientious taxpayer. By replenishing in time and in full the budget, the corporation takes direct part in improving the welfare of the country, contributing to raising the standard of living of citizens.

2. Innovations and product development

To meet the needs of each patient, the corporation is constantly looking for fresh solutions to develop new drugs and improve existing ones. The development of new drugs is carried out in accordance with the concept of “Quality through Development”, according to which the composition, technology and system of specification of new drugs are developed, their pre-clinical and clinical studies are carried out in accordance with the rules of GLP and GCP. In addition, for a number of medicines that have been in the company's portfolio for a long time, the development and additional clinical research in accordance with modern regulatory requirements is being planned.

The Corporation promotes the health of patients through the development and production of innovative and high-quality drugs. Due to active innovation, cooperation with leading scientists, application of advanced technologies and quality standards in production, the portfolio of products of the company is regularly replenished with new drugs.

The health and safety of the patient is the main goal of the corporation. "Arterium" strives to provide quality at every stage of the product life cycle, from pharmaceutical product development to distribution to the end user. "Arterium" controls the safety and efficacy of the product, from the development and research of the future drug, the selection of raw materials, components, packaging, technology, registration and entry into the market and ending the termination of the release of the drug in all markets. The Corporation maintains and develops feedback from consumers on all aspects of the quality of its products to ensure effective and safe treatment or prevention of diseases. Feedback with consumers is provided through Pharmacovision, work with complaints and customer interaction.

Falsification protection: counterfeit medicines represent a danger to the consumer and can cause serious illness. The high quality of drugs, including the adequate level of protection against possible falsifications is a strategically important tasks for the corporation. "Arterium" constantly improves the methods of protection against falsification and for this creates an original, difficult to reproduce the packaging layout, as well as provides protective unique elements. These methods of protection provide more assurance that the consumer will receive a quality drug.

3. Employees

"Arterium" invests in training and development of employees and provides them with wide opportunities for professional growth. The "Arterium" corporation personnel development system covers all categories – from workers and specialists to plant management and management companies.

"Arterium" confirmed the compliance of the labor protection system at the enterprises Kyivmedpreparat and Halychpharm with the international standard OHSAS 18001: 2007. Internal communications. Corporate portal – with the help of an intranet portal employees learn and discuss corporate news, changes in procedures, use the electronic database of corporate documents, participate in contests and plan joint leisure activities. Access to the portal company also provides employees whose activities are not related to work on the computer – through so-called "infokiosks". The corporate newspaper (Pulse newspaper) is published once a quarter and provides employees with information on the major events in the company.

Corporation "Arterium" believes that employees are the basis of the successful work of each enterprise. That is why the company's management invests a lot of money in the development of employees. Specific data is shown in Table 4.

Table 4

Calculation of expenses for personnel development

Indicator	2015	2016
Number of employees trained and	2 429	2 700
retraining, persons	3 000 000	3 200 000
Total expenses for training and retraining of staff, UAH	1235, 1	1185,20

Source: *compiled by the author.*

As a result of the analysis, the following conclusion can be drawn: despite the increase in the cost of training and retraining of staff, the average cost per employee has decreased. It is evident that workers have become more evidenced by the rapid development of the corporation. The company managed to minimize costs per employee, leaving staff development programs as effective.

4. Ecology

The "Arterium" corporation has introduced the Environmental Policy, which sets out the commitment of the company's top management, annually updates the goals and targets for reducing

the environmental impact and evaluates the achievement of the level of environmental characteristics.

Green Office: The corporation is committed to complying with the concept of the Green Office in the company. For this purpose the company has introduced the practice of videoconferencing to reduce the number of business trips; has reduced the volume of paper consumption (due to double-sided printing); has activated "sleep mode" on all working computers; recommends that staff shut down all equipment from the network for the night; participates in eco-events.

5. Society

When selecting projects for investment in the social sphere, the priority for the corporation is to support programs in the health, sports and education sectors.

Program “What to Know”. In order to raise awareness of the population about the common diseases in 2012 the program “What to Know” was initiated. In cooperation with the leading healthcare professionals, an information campaign was conducted, in which the population was informed about the methods of prevention of the most common diseases.

The program of work with interns: in implementing the program of work with trainees, the corporation offers students and graduates to undergo internships in the company, the best participants being offered further cooperation. More than 10 higher educational establishments of Ukraine receive support in the form of a professional base for educational, pre-graduate and industrial practice. The corporation also helps to equip the audience in compliance with the requirements of the specialized training directions (Arterium Corporation, 2013, “Corporate Social Responsibility Report”).

The activities of “Arterium” corporation correspond to the principles of social responsibility. In the corporation there are various programs that indicate its active participation in public life and dialogue with various social groups; careful attitude to the environment, employee care and environmental environment, etc. In our opinion, corporations need to pay attention to the deepening of social responsibility of business towards partners and the wider external environment in general. Despite all of these benefits and strengths of the “Arterium” company in corporate social responsibility, there are aspects that need to be addressed.

Since “Arterium” corporation is constantly engaged in socially responsible activities, it is important to highlight the results of its activities to users. We believe it is important to focus on this, because socially responsible activities are designed specifically for the needs of users. Thus, a significant need for management is the formation of complete, reliable and operational information for the adoption of effective socio-economic decisions. In order to meet these needs, it is necessary to compile internal social reporting.

We will develop a general algorithm for compiling social reporting for “Arterium” corporation, which can be used both for compiling the internal social report and external. Figure 1 graphically depicts the algorithm.

We propose to compile a social report of voluntary form. This will allow you to display only the information that is required by the company. We recommend analyzing qualitative and quantitative metrics in the report you created. Quantitative indicators need to be calculated economically, according to generally accepted formulas, and thus it will be possible to obtain the total amount of social costs. We recommend evaluating the qualitative indicators in a binary system, analyzing all the data obtained in a comprehensive manner.

We believe that the creation of the structure of the social report involves the development of sections and sub-clauses, which will allow the user to navigate the document and find the necessary information. Quantitative and qualitative indicators call for grouping according to the sections (Figure 1).

The responsible for drafting a social report should be a senior manager who coordinates social projects. We believe that the social report should be made once a year. It is imperative to compare

the results of the report with the previous years and plan the activity for the next year based on the data.

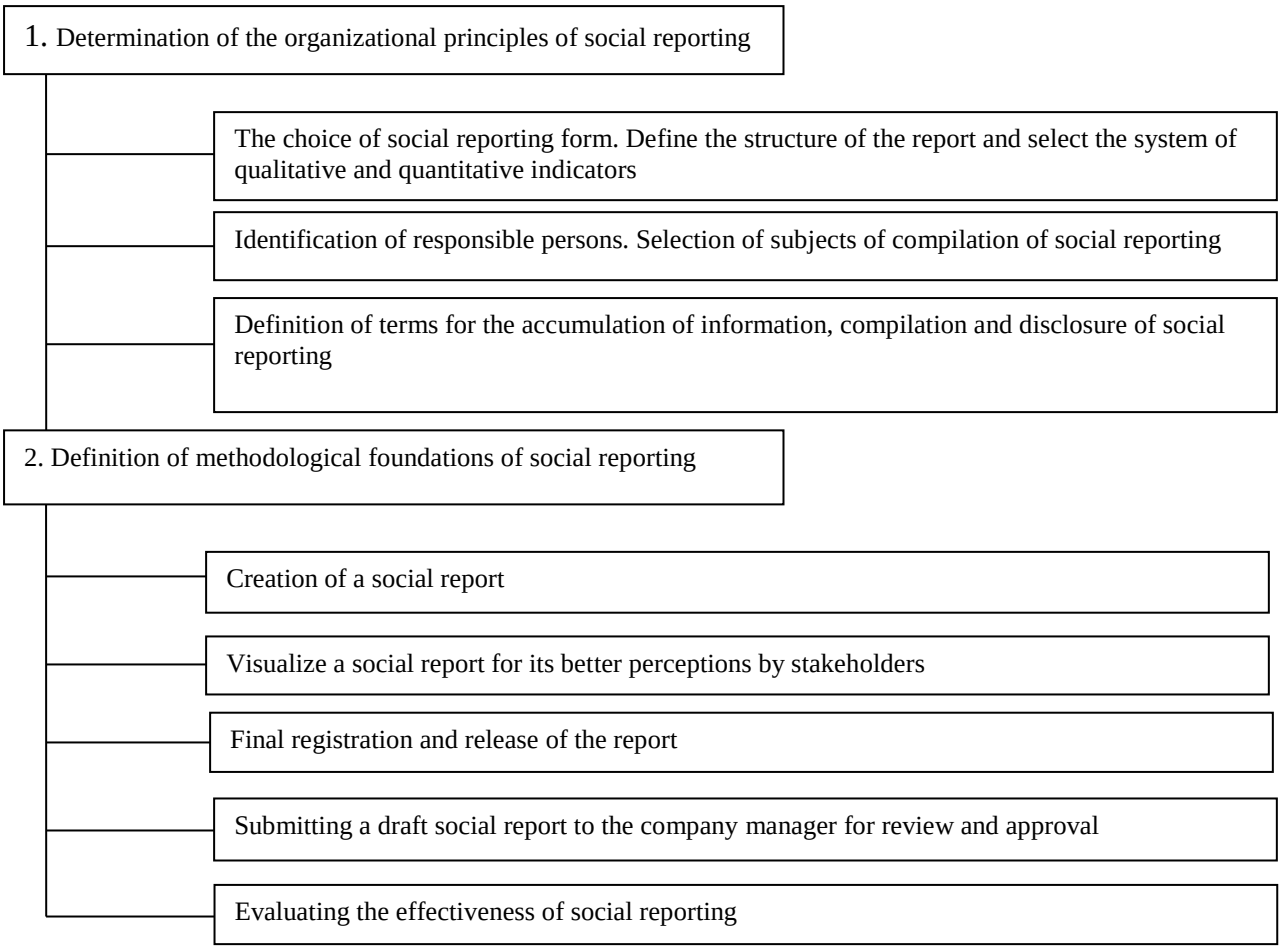

Figure 1. Algorithm for Social Reporting by "Arterium" corporation

To form a qualitative social report, you must adhere to a number of principles. They will help to structure the implementation of accounting procedures and reporting. Among the main principles: systematic, scientific, autonomous, quantitative evaluation, materiality, hasty, efficiency, transparency, clarity, analyticity, independence, consistency and timeliness. All data must be documented.

The "Arterium" Social Report, in the first place, should satisfy the needs of the major groups of stakeholders. Social reporting should reflect the priorities of the enterprise. It is important to understand that the information displayed in the report should affect the decision-making of users by reporting, be essential. Thus, drawing up a social report requires consistent and clear action, which will be based on specific principles.

CONCLUSIONS

Social responsibility of business and corporate social responsibility are oriented towards responsible attitude towards business, product or service, consumers, employees, partners, environment, etc. Social responsibility pursues the goal of streamlining, harmonizing social relations and ensuring their progressive and stable development. The concept of CSR was considered on an example of the pharmaceutical company "Arterium". It was found that the

corporation, implementing the principles of social responsibility of business towards society, focuses on the following areas: business ethics and ethical marketing, innovation and product development, patient health and safety, protection against fraud, investment in employee training, environmental policy and Green office, support for health, sports and education programs, community care. To improve corporate social responsibility, an algorithm for creating a social report was proposed. According to our plan, the structure of the report involves the grouping of qualitative and quantitative indicators in terms of several sections in a randomized form. The disclosure of indicators in accordance with the structure will serve as the basis for the adoption of socio-economic decisions and future external social reporting.

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ПІДВИЩЕННЯ СОЦІАЛЬНОЇ ВІДПОВІДАЛЬНОСТІ В МЕНЕДЖМЕНТІ ВИРОБНИЧИХ ПІДПРИЄМСТВ (НА ПРИКЛАДІ КОРПОРАЦІЇ “АРТЕРІУМ”)

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У роботі розглянуто теоретичні основи корпоративної соціальної відповідальності, проаналізовано зарубіжні і вітчизняні практики, зокрема на основі корпорації «Артеріум». Актуальність роботи полягає у дослідженні сучасного стану корпоративної соціальної відповідальності в Україні, й, зокрема, на підприємстві «Артеріум». Все більше компаній запроваджують КСВ у свою діяльність, стандарти для бізнесу змінюються і соціально відповідальна поведінка стає обов’язковим елементом успішного підприємництва. Метою дослідження є виявлення методів підвищення соціальної відповідальності в сучасному менеджменті виробничих підприємств на прикладі корпорації «Артеріум». В ході дослідження було встановлено, що корпорація, реалізуючи принципи соціальної відповідальності бізнесу перед суспільством, зосереджується на таких напрямках: ділова етика та етичний маркетинг, інновації та розвиток продукції, здоров’я та безпека пацієнтів, захист від шахрайства, інвестиції в навчання працівників, політика захисту навколишнього середовища та дотримання принципу «екологічний офіс», підтримка програм охорони здоров'я, спорту та освіти, громадський догляд.

Для досягнення поставленої мети були вирішені наступні завдання:

- досліджено сутність поняття корпоративної соціальної відповідальності та стан КСВ у світі;
- проаналізована діяльність корпорації «Артеріум»;
- оцінено стан корпоративної соціальної відповідальності в Україні;
- вивчено досвід іноземних компаній у зазначеній сфері.

За результатами проведеного дослідження:

- обґрунтовано ситуацію та ефективність корпоративної соціальної відповідальності на зазначеному підприємстві;
- запропоновано алгоритм розробки соціального звіту для корпорації «Артеріум» як метод підвищення соціальної відповідальності.

Ключові слова: корпоративна соціальна відповідальність, соціальна звітність, соціальний контроль, соціальні інвестиції.

ПОВЫШЕНИЕ СОЦИАЛЬНОЙ ОТВЕТСТВЕННОСТИ В МЕНЕДЖМЕНТЕ ПРОИЗВОДСТВЕННЫХ ПРЕДПРИЯТИЙ (НА ПРИМЕРЕ КОРПОРАЦИИ “АРТЕРИУМ”)

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В работе рассмотрены теоретические основы корпоративной социальной ответственности, проанализированы зарубежные и отечественные практики, в частности на основе корпорации «Артериум». Актуальность работы заключается в исследовании современного состояния корпоративной социальной ответственности в Украине и, в частности, на предприятии «Артериум». Все больше компаний вводят КСО в свою деятельность, стандарты для бизнеса меняются и социально ответственное поведение становится обязательным элементом успешного предпринимательства. Целью исследования является выявление методов повышения социальной ответственности в современном

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менеджменте производственных предприятий на примере корпорации «Артериум». В ходе исследования было установлено, что корпорация, реализуя принципы социальной ответственности бизнеса перед обществом, сосредотачивается на следующих направлениях: деловая этика и этический маркетинг, инновации и развитие продукции, здоровье и безопасность пациентов, защита от мошенничества, инвестиции в обучение работников, политика защиты окружающей среды и соблюдение принципа «экологический офис», поддержка программ здравоохранения, спорта и образования, общинный уход.

Для достижения поставленной цели были решены следующие задачи:

- исследована суть понятия корпоративной социальной ответственности и состояние КСО в мире;
- проанализирована деятельность корпорации «Артериум»;
- оценено состояние корпоративной социальной ответственности в Украине;
- изучен опыт иностранных компаний в указанной сфере.

По результатам проведенного исследования:

- обоснованно ситуацию и эффективность корпоративной социальной ответственности на указанном предприятии;
- предложен алгоритм разработки социального отчета для корпорации «Артериум» как метод повышения социальной ответственности.

Ключевые слова: корпоративная социальная ответственность, социальная отчетность, социальный контроль, социальные инвестиции.

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THE IMPACT OF GLOBALIZATION ON THE FORMATION OF MIGRATION POLICY IN UKRAINE

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Abstract

The study of the regularities of international migration processes, economic, social and cultural transformations caused by the reorientation of regional migration flows in the second half of the twentieth century is relevant and timely for countries that are actively modernizing their migration policies. The article is devoted to the analysis of trends in the impact of globalization processes on the migration policy of the state. Paper **purpose** is to study the impact of globalization processes on the formation of the nature of migration policy measures taken by the state in modern conditions. The transition of the Ukrainian economy to market relations, reform in the political sphere, deepening of integration processes have created extremely favorable conditions for our country's full participation in the international labor market. Ukraine's entry into the world market is shaping new migration flows. In the structure of external migration, labor migration is becoming more and more prominent. Thus, the tendencies of migration processes in Ukraine are defined; the features of the Ukrainian international labor migration are investigated. In the course of the research it is proved that the present level of migration legislation and migration policy of Ukraine as a whole is still far from the level of European countries. As a **result** some propositions for the state authorities to improve the migration policy of Ukraine were made, according to which Ukrainian authorities at national and sub-national (regional and local) levels should take greater control of their coordination role in migration management and related migration and development issues, as well as assume responsibility for building technical capacity, to be able to support such management and related activities.

Key words: globalization, migration, labor migration, international migration, migration processes, immigration, migration policy of the state.

JEL Classification: J61, J62, J68.

INTRODUCTION

In the third millennium, globalization and integration have a direct impact on exchanges between states and affect the socio-political situation in most countries (O. Grishnova, 2008). International migration is becoming more widespread and poses many problems for the states. These problems require conceptual and theoretical analysis and practical solutions.

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In today's world, it is no longer possible to consider human mobility as a secondary factor in the development process or, even worse, as a by – product of an inadequate development process. The 2030 development agenda is laying a new foundation by recognizing the positive contribution of migrants to inclusive growth and viewing migration as a “multifaceted phenomenon”. The sustainable development goals define migration as a key issue that is important for many areas and has a significant impact on social development. Mobile populations, whether internal, cross-border or displaced, constitute the main target audience for achieving sustainable development goals.

The increase in migrant flows, which occurs both globally and in Ukraine (O. Kyslytsina, 2010), requires increased attention to theoretical and methodological developments in the field of strategic planning and the formation of effective mechanisms for the implementation of migration policy of the state.

LITERATURE REVIEW

The problem of improving migration policy has been studied in the works of domestic and foreign scientists, in particular: A. Babenko, Yu. Borjas, I. Gnibeda That Kislitsina, V. Kolpakov, E. Libanova, K. Macconnel, Malinovskaya, V. Olefir, A. Parkhomchuk, M. Romaniuk, A. Roy. But in the works of these authors the aspects of the impact of globalization processes on the state migration policy are not covered.

PAPER OBJECTIVE

The paper objective is a study of the impact of globalization processes on the formation of the nature of migration policy measures taken by the state in modern conditions.

RESULT AND DISCUSSION

In the context of globalization, migration processes are becoming widespread. The beginning of the XXI century was characterized by an increase in the scale and intensity of migration flows, so, according to the World Migration Report 2018, in 2015 the number of migrants amounted to 244 million people compared to 153 million in 1990. World migration, as a social phenomenon, appears today as complex and multi-faceted. In general, today it appears as legal, despite its negative aspects caused by non-observance of human rights, military conflicts, narrow opportunities for a citizen within a state, etc. The 2018 world migration report differs from the previous ones focusing on a new set of issues that were not present in the World Migration Report Series before. Among them:

the development of global mechanisms for the management of international migration;

the relationship between migration and rapidly changing levels and types of transnational linkages;

the situation of migrants in the migration process;

migration and power extremism.

Special emphasis is placed on the modern role of media in the world. Mass media broadcast opinions and positions on migration of citizens, politicians, even entire societies, and therefore are important (according to the World Migration Report 2018).

The transition of the Ukrainian economy to market relations, reforms in the political sphere, deepening of integration processes have created extremely favorable conditions for the full participation of our state in the international labor market. Ukraine's entry into the world market creates new migration flows. Labor migration is increasingly distinguished in the structure of external migration. The involvement of the national labor market in international cooperation, the penetration of the world labor market, the various socio-economic consequences for the

participating countries have led to the need for an in-depth analysis of the motivations of labor migration and the reasons that hinder this process.

After obtaining independence, the volume of internal migration in Ukraine has decreased significantly due to the disappearance of Soviet era organized resettlement and recruitment of labor force, commercialization of education, rising housing prices, difficulties with employment, etc. If at the turn of the 1980-1990-ies the internal migration turnover reached 3 million, now it is less than a million. According to the state statistics service, in 2017 only 12 out of 1000 of Ukrainians changed their place of residence (State Employment Service, 2018). However, so far, the statistically recorded internal movements are about 10 times larger than international migration. Urban-rural movements dominate in the internal migration. The rural population is declining due to the outflow of young people to the cities, its aging accelerating. Since 2014, numerous internal displacements in Ukraine, caused by the annexation of the Crimea and military actions in the Donbas, have been forced. According to the interdepartmental coordination center for social security of internally displaced persons (IDP), as of July 20, 2016 1029571 people were moved from uncontrolled areas to other regions of Ukraine: including 1007112 people from the Donetsk and Lugansk regions and 22459 people from the Autonomous Republic of Crimea and Sevastopol city, among which 170581 children and 49593 people with disabilities and the elderly (according to the Interagency Coordination Headquarters reports).

The main recipient in interregional migrations is the city of Kiev and Kiev region. In 2000s, the population growth of the capital at the expense of other regions reached 20 thousand people per year. In the current crisis, migration growth decreased (14400 in 2014, about 12000 in 2015), but remained the largest in Ukraine. These data, however, relate only to officially recorded relocations and do not include temporary movements, including forced ones. In addition, the participation of the population in internal labor migration, which is not associated with daily or weekly return to the place of permanent residence, is significant. Such migration is carried out to perform seasonal, shift, and even longer work in the capital and large industrial centers. According to the latest data obtained in the course of the study conducted by IOM in 2016 - 2017, the number of internal labor migrants in Ukraine is 1643000 and reaches 9% of the economically active population. Moreover, in the near future, internal labor migration may grow by about 50% (International Organization for Migration, Mission in Ukraine, 2016). In 2017 there were 688000 international labor migrants, 144.400 people returned home. According to other sociological studies, 55% of respondents from the number of internal labor migrants have permanent jobs, for the vast majority – the only one. At the same time, only 20% of the surveyed internal labor migrants work officially, under an employment agreement, others – on the basis of verbal agreement, or consider themselves self-employed (Amzhadi, 2012). Top 5 destination countries of Ukrainian labor migration are: Russian Federation (204000 people), Poland (141000 people), Czech Republic (102000 people), Italy (76000 people), Belarus (22000 people). According to the survey conducted among migrants, 60% intend to return, 21% have no such intention, 19% do not know. The total volume of transfers to Ukraine in 2017 amounted to $ 2.8 billion, of which 53% ($1.42 billion) was transferred through informal channels, and only 47% ($1.369 billion) through official channels. About 400,000 Ukrainian long-term labor migrants save $4 billion a year abroad. The savings goals of Ukrainian long-term labor migrants coincide with the savings goals of labor migrants from other countries. Buying a home/durable goods and educating children are among the most important savings goals; 21% of migrant workers intend to invest in various sectors of the Ukrainian economy.

Globalization is fundamentally changing international migration, both quantitatively and qualitatively, with more people going to high-income developed countries (which need an influx of migrants because of the need to maintain a working-age population). Migration policy and intensification of migration processes have caused a split in society in many countries. Disputes continue not only about jobs and competition for access to social security, but also about the culture, the opportunity, and the right to require immigrants to perceive the language and values of

their new country (N. Bortnik, 2012). In the 1990s, the dynamics of migration processes increased dramatically, including illegal migration, which spread in the 1990s and reached almost 30 million worldwide (M. Vidyakina, 2015).

After the establishment of democratic freedoms, in particular freedom of movement, cross-border mobility of the population of Ukraine grew rapidly primarily due to crossing the Western border. In 2013, that is, even before the annexation of Crimea and the beginning of the conflict in Eastern Ukraine, for the first time the number of trips of Ukrainians in Poland exceeded the number of trips to Russia, which has traditionally been most visited by Ukrainian citizens and which maintained a visa-free regime.

With the beginning of the conflict, there has been an overall decrease in the number of trips abroad, primarily through trips to Russia: in 2014 there were nearly a third less than in 2013. At the same time, the number of visits of Ukrainians to the EU continued to grow to 10.5 million in 2014 and 12.5 million in 2015.

In the process of visa liberalization with the EU, visa procedures for Ukrainians were gradually simplified, the number of Schengen visas issued to citizens of Ukraine increased. If in 2010 Ukrainians received 1.28 million Schengen visas, in 2013-already 1.56 million and 38.6% of these visas were multiple (according to European Commission. DGs Migration and Home Affairs, 2016). In 2014, 52.4% of multiple-entry visas were issued. In 2015 – 56,8% (according to Schengen Visa statistics by third country, 2015). This partly explains the first decade decline in the number of issued Schengen visas-Ukrainians issued 1.35 million Schengen visas during 2014, 1.19 million in 2015.

Another reason for the reduction in the number of visas is the increase in the number of refusals. In 2010, the failure rate was 3.83%, but decreased to 1.85% in 2013. During the war, it began to grow again: 1.97% in 2014, 3.4% - in 2015.

The intensification of cross-border mobility of Ukrainians towards the EU contribute to agreements on local border traffic concluded with Hungary in 2007, Poland and Slovakia in 2008, Romania in 2014, Thanks to them, the citizens living in frontier zone without visas can travel to neighboring States, venturing into their territory to a distance of 30 km (Poland) to 50 km (other neighboring countries). For example, according to surveys of international passengers, residents of the 30-kilometer border zone carry out up to 65% of border crossings with Poland (according to the Statistic Office in Rzeszow, 2014).

The number of Ukrainians living in the EU is constantly growing. In 2017 there were 905,2 thousand They amounted to more than 6% of foreigners from third countries on the territory of the European Union. Most Ukrainians lived in Italy (238 thousand), Poland (336 thousand), Germany (112 thousand), the Czech Republic (113 thousand) and Spain (84 thousand).

Migration of the population in recent decades contributed to the spread in Ukraine of European values and norms of market consciousness, the formation of an open world society capable of innovation.

Labor migrations reduce labor market tensions. In the absence of employment abroad, the number of unemployed more than doubled their actual number (O. Pozniak, 2012). According to various surveys, the earnings of migrant workers abroad are three to four times higher than the average wage in Ukraine. The funds earned during labor migration are mainly used for consumption, which helps to improve the quality of life of migrant families, reduce poverty, and stimulate the development of the economy by increasing the effective demand. According to the results of the study of financial revenues associated with migration and their impact on the development of Ukraine, conducted by IOM in 2014-2015, migrants ' transfers to Ukraine make up almost half of the budget of households with long-term labor migrants, and 60% of the budget of those whose members practice short-term labor migration (International Organization for Migration, Mission in Ukraine, 2016).

According to the same study, almost one in five long-term migrants expressed investment intentions, preferring investments in their local communities in Ukraine and in sectors such as construction, tourism and retail.

Attempts to stop migration run counter to globalization. Measures that would be difficult to introduce in a democracy must be applied to reduce migration movements markedly. Obstacles to the entry of people, as opposed to the entry of goods and capital, have not been eliminated even in today's globalized world, and are explained primarily by the need to preserve the national interests of indigenous peoples and their cultural identity (according to Commission of the European Communities in "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, A Common Immigration Policy for Europe: Principles, Actions and Tools", COM, 2008). The challenge is to shape the migration policy of each individual state in the context of globalization, combining the goals of unity and respect for differences and diversity. Modern globalization processes have caused the emergence of a new model of historical dynamics, provoked the emergence of trend-structures and Megatrends that have defined the latest phase of social development, as well as caused new challenges models of social modernization, which include the global society of risk. This indicates that globalization as a new type of social development has led to qualitative and quantitative changes in the functioning of forms of social organization associated primarily with the rise and decline of traditional forms of social development dynamics. That is why the global society of risk has become the embodiment of a form of new dynamics, has revealed an integrative scheme that characterizes the new hierarchy of social organization and is a synthesis of responses to the challenges of modern development. This approach gives grounds to consider the global society of risk as a form of social organization that meets the modern challenges of globalization, sets the formats for the implementation of the latest strategies and trends of globalization dynamics.

Differentiation does not promote loyalty to the country among immigrants or provide adequate social protection. At the same time, programmes for migrant workers can be a source of exploitation and conflict. Assimilation, in turn, recognizes neither differences nor respect for diversity; nor does it directly address imbalances. Immigrants today are more than ever inclined and able to maintain close ties with family and their community at home, this contributes to the development of information and telecommunication technologies, and increasing the availability (both technical and financial) use of transport (O. Grishnova, 2008). Such connections are not new, but their impact on social, economic, and political behavior has changed.

Due to the availability of modern means of communication and movement, immigrants want to have connections both where they were born and in the country that adopted them, which is a trend of migration processes in a globalizing world. In the context of globalization, there is a tendency to increase the number and diversity of human communities. Given such factors as the growth of economic and political freedom, the strengthening of migration processes, the information revolution, people should be more mobile to determine the assessment of their own identity.

A significant proportion of migrants form their new identity, forgetting their nationality. This is especially true for labor and political migrants. But some try to preserve traditional identity, which leads to adaptation inconveniences. Most migrants still try to combine multiple identities, linking traditional and newly created. For rice.1 the model of building communication processes that take place in the period of adaptation of immigrants.

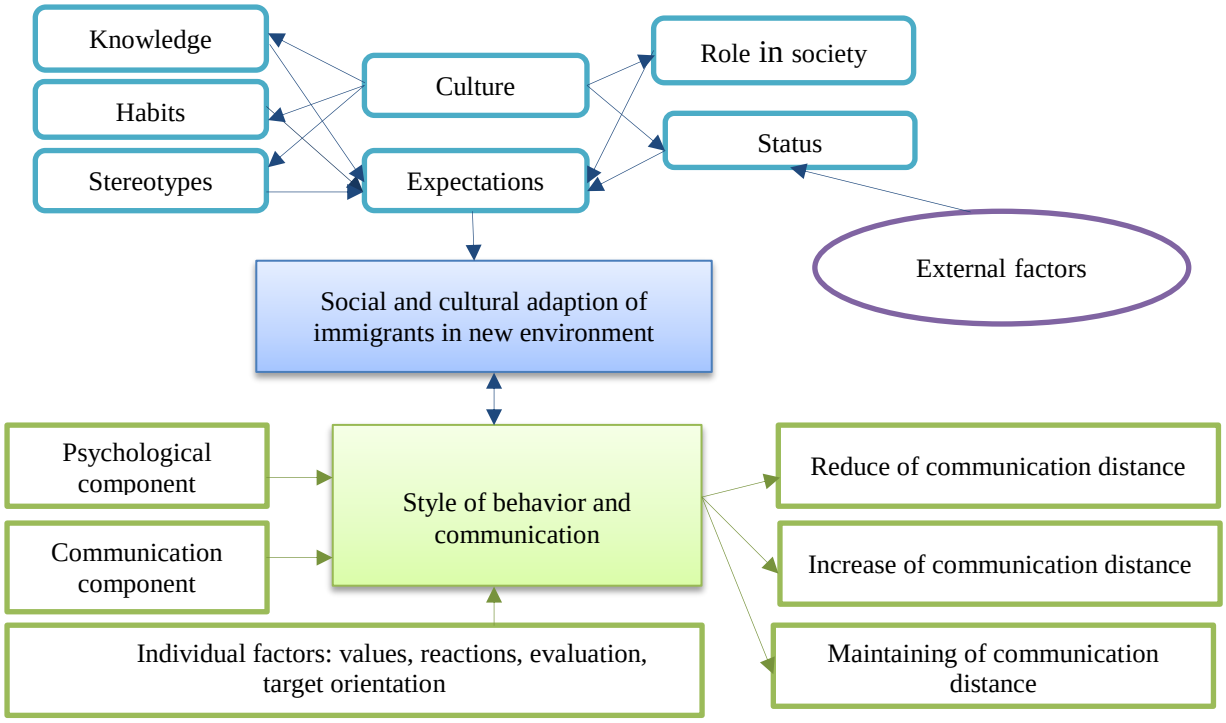

Figure 1. Model of building communication processes that take place in the period of adaptation of immigrants

The state migration policy is one of the most important system-forming factors of the country's safe development. State migration policy in the context of globalization should be developed both within the framework of national migration strategies and through the development of joint interstate concepts in order to deepen international cooperation on migration issues (V. Kulyk, 2009). The interaction of migration trends and relevant policies of the state are shown in Figure 2.

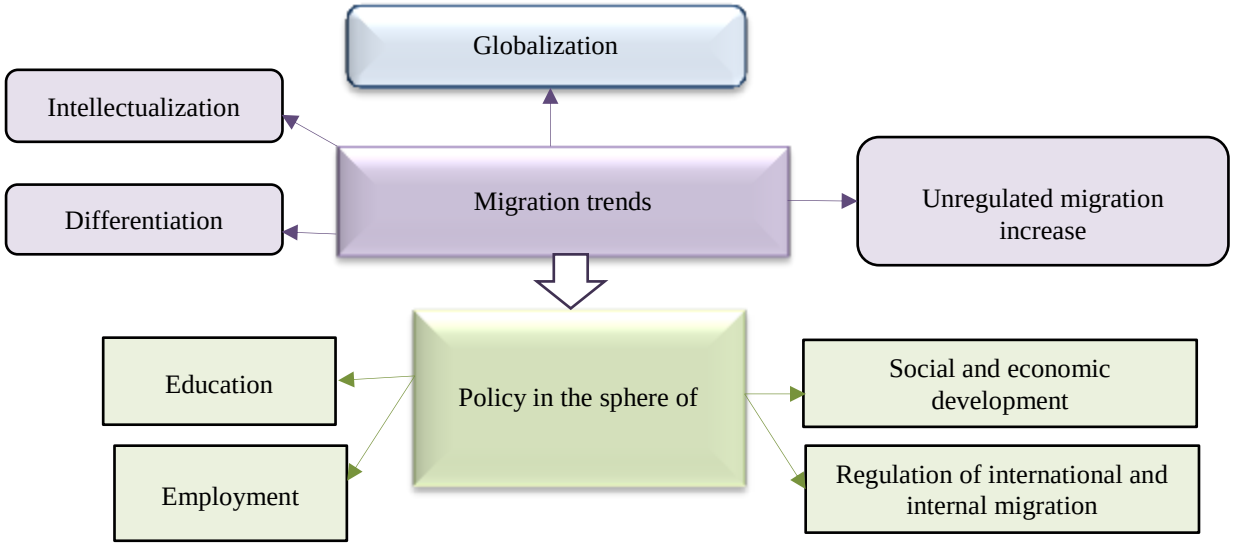

Figure 2. Interaction of migration trends and relevant state policies

The current level of migration legislation and migration policy in Ukraine is still far from the level of European countries (V. Kulyk, 2009). Our country's participation in international migration

flows has recently acquired a multifaceted character: the country is entering the global international labor market, participates in the development of international legal migration documents, and so on. In the context of strengthening integration processes, it would be advisable to partially adopt the experience of successful implementation of the migration policy of developed countries, namely: to develop a strategy to support ethnic Ukrainians who emigrated; to use complex programs on adaptation of migrants, experience of the European migration practice. We believe that the "National Action Plan on Migration and Development in Ukraine" taking into account the specifics of Ukraine is be adopted. This plan has been widely discussed. It is to outline a medium-term roadmap for introducing migration into development planning in Ukraine. In particular, the plan is to describe the issues to be addressed, codify strategic objectives and priorities, include national and local government authorities, other priorities and stakeholder contributions, and outline programme / activity areas, mandatory indicators and a results matrix. The plan and related policy documents should be developed in accordance with the overall development strategy of Ukraine and with its full consideration. Their development should take place in cooperation with regional and local authorities, as well as with key partners in the private sector and among specialized agencies. A flexible monitoring and evaluation plan is to be an integral part of all such plans.

The experience of other countries shows that the Ukrainian authorities at the national and subnational level (regional and local) should assume greater control over their coordinating role in the field of migration management and related migration and development issues, as well as take responsibility for the development of technical capacity to be able to support such management and related activities. Domestic institutions, with the support of relevant specialized agencies, should have sufficient capacity to enhance the positive impact of labour migrants on development: to identify and address significant information gaps, to ensure complementarity and sufficient coordination of future initiatives in the public and private sector at the interdepartmental, national and local levels, to initiate priority activities and relevant pilot projects that take into account the interests of relevant public and private stakeholders and, not least, the interests of labour migrants themselves.

CONCLUSIONS

Summarizing the above, we can state that globalization processes are becoming a new and very significant factor of modern migration, which actually performs the function of an accelerator in its development. An important indicator of the growth rate of international migration is the increase in the share of international migrants in the population of countries. Thus, in today's world, migration flows are becoming global in nature, affecting all aspects of the life of the world community. In turn, migration increasingly plays the role of a factor of globalization in the development of individual countries and regions. The trends of the modern world migration cycle have led to the fact that it becomes difficult to divide states into clear categories: countries of emigration, immigration, transit. More and more countries have begun to change their status and combine the characteristics of two or three categories.

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ВПЛИВ ГЛОБАЛІЗАЦІЇ НА ФОРМУВАННЯ МІГРАЦІЙНОЇ ПОЛІТИКИ В УКРАЇНІ

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Вивчення закономірностей міжнародних міграційних процесів, економічних, соціальних та культурних перетворень, спричинених переорієнтацією регіональних міграційних потоків у другій половині XX століття, є актуальним та своєчасним для країн, які активно модернізують свою міграційну політику. Стаття присвячена аналізу тенденцій впливу глобалізаційних процесів на міграційну політику держави. Мета статті – вивчення впливу глобалізаційних процесів на формування характеру міграційної політики, яку вживає держава в сучасних умовах. Перехід економіки України до ринкових відносин, реформи в політичній сфері, поглиблення інтеграційних процесів створили надзвичайно сприятливі умови для повної участі нашої країни у міжнародному ринку праці. Вихід України на світовий ринок формує нові міграційні потоки. У структурі зовнішньої міграції робітнича міграція стає все більш помітною. В статті визначено тенденції міграційних процесів в Україні; досліджено особливості міжнародної трудової міграції України. У ході досліджень доведено, що сучасний рівень міграційного законодавства та міграційної політики України загалом ще далекий від рівня європейських країн. Як результат, були запропоновані певні заходи для державних органів влади щодо вдосконалення міграційної політики України, відповідно до яких вони повинні взяти на себе більший контроль над своєю координаційною роллю в галузі управління міграцією та суміжними питаннями міграції та розвитку, а також взяти на себе відповідальність за розбудову технічного потенціалу, щоб бути в змозі підтримувати таке управління й пов’язані з ним заходи. Вітчизняні установи, за підтримки відповідних спеціалізованих установ, повинні мати достатній потенціал для посилення позитивного впливу трудових мігрантів на розвиток: виявлення та усунення значних інформаційних прогалин, забезпечення доповнюваності й достатньої скоординованості майбутніх ініціатив у державному й приватному секторі на міжвідомчому, національному та місцевому рівнях, ініціювання пріоритетних заходів та відповідних пілотних проектів, що враховують інтереси відповідних державних і приватних зацікавлених сторін, а також, не в останню чергу, інтереси самих трудових мігрантів.

Ключові слова: глобалізація, міграція, трудова міграція, міжнародна міграція, міграційні процеси, імміграція, міграційна політика держави.

ВЛИЯНИЕ ГЛОБАЛИЗАЦИИ НА ФОРМИРОВАНИЕ МИГРАЦИОННОЙ ПОЛИТИКИ В УКРАИНЕ

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Изучение закономерностей международных миграционных процессов, экономических, социальных и культурных преобразований, вызванных переориентацией региональных миграционных потоков во второй половине XX века, является актуальным и своевременным для стран, которые активно модернизируют свою миграционную политику. Статья

посвящена анализу тенденций влияния глобализационных процессов на миграционную политику государства. Цель статьи – изучение влияния глобализационных процессов на формирование характера миграционной политики, принимаемые государством в современных условиях. Переход экономики Украины к рыночным отношениям, реформы в политической сфере, углубления интеграционных процессов создали чрезвычайно благоприятные условия для полного участия нашей страны в международном рынке труда. Выход Украины на мировой рынок формирует новые миграционные потоки. В структуре внешней миграции рабочая миграция становится все более заметной. В статье определены тенденции миграционных процессов в Украине; исследованы особенности международной трудовой миграции Украины. В ходе исследований доказано, что современный уровень миграционного законодательства и миграционной политики Украины в целом еще далек от уровня европейских стран. Как результат, были предложены определенные меры для государственных органов власти по совершенствованию миграционной политики Украины, согласно которым они должны взять на себя больший контроль над своей координационной ролью в области управления миграцией и смежными вопросами миграции и развития, а также взять на себя ответственность за развитие технического потенциала, чтобы быть в состоянии поддерживать такое управление и связанные с ним мероприятия. Отечественные учреждения, при поддержке соответствующих специализированных учреждений, должны иметь достаточный потенциал для усиления положительного влияния трудовых мигрантов на развитие: выявление и устранение значительных информационных пробелов, обеспечения достаточной скоординированности будущих инициатив в государственном и частном секторе на межведомственном, национальном и местном уровнях, инициирование приоритетных мероприятий и соответствующих пилотных проектов, учитывающих интересы соответствующих государственных и частных заинтересованных сторон, а также, не в последнюю очередь, интересы самих трудовых мигрантов.

Ключевые слова: глобализация, миграция, трудовая миграция, международная миграция, миграционные процессы, иммиграция, миграционная политика.

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MERGERS AND ACQUISITIONS AS AN OPPORTUNITY GETTING NEW COMPETITIVE ADVANTAGES IN AGRO BUSINESS

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Abstract

The article is devoted to the issues of mergers and acquisitions of agricultural enterprises of Ukraine, in order to gain new opportunities in competition. The main competitive advantages, which are additionally obtained by weak agribusiness enterprises in forming an integration association with more promising enterprises in this industry, are highlighted. Today, despite the fact that our country is very interested in increasing sales to foreign markets, especially EU markets, under free trade conditions, the question remains about increasing the competitiveness of Ukrainian enterprises and enlarging their volumes. That is why the topic of this research is relevant and has some practical significance for the further development not only of individual enterprises, but also of the agrarian sphere of the economy of Ukraine as a whole. **The purpose** of this article is to outline the importance of processes such as mergers and acquisitions to improve the competitive advantage of agribusiness. According to the objective, the task was to investigate the current trends in the development of agribusinesses in the context of mergers and acquisitions that have already taken place. **The main methods** of this study are the methods of empirical research, such as observation, comparison, measurement, as well as abstraction, analysis and synthesis, induction and deduction. **The results** of the study have drawn conclusions on the positive impact of such processes as mergers and acquisitions on the competitiveness of agribusinesses. **The value of the research**. Scientific and practical significance of the work. The research is of practical value, as evidenced by the recommendations, to improve the competitive position of businesses operating in the agricultural sector by consolidating their businesses and increasing their capital through mergers with other enterprises.

Keywords: mergers, acquisitions, competitive advantage, integration, competition, agribusiness.
JEL Classification: G34, Q12.

INTRODUCTION

Transformational restructuring of the Ukrainian economy has led our country's entrepreneurs to take a fresh look at doing business and to pay attention to the experience of the world's leading companies. For a long time, the phenomenon of mergers and acquisitions (M&A), or even the

formation of multinationals, was not at all peculiar to our country's enterprises. In particular, this phenomenon has long been sidelined in the agro-industry. However, things are changing and new business opportunities dictate new requirements and new rules.

It should be noted that such a rather complex transformation process, which is taking place in the economic sphere of Ukraine, requires a more thorough study of the issues of managing integrated organizations, in order to increase the effectiveness of interaction between their members. It is imperative to take into account those integration processes that are currently underway in the development of our country's relations with the countries of the European Union.

LITERATURE REVIEW

Merger and acquisition issues are at the core of the studies of many domestic authors, such as: O. Tarasova (2010), I. Maksimenko (2018), G. Yegorova (2016), T. Kubakh (2012), etc. The works of O. Shulga (2018) and D. Schur (2019) are devoted to M&A issues in the agricultural sector. In addition, the issues of competitive advantages of agribusinesses were investigated in the works of O. Kuchkova (2018), O. Lazareva (2010), A. Sitkovskaya (2016). However, many issues, especially the issue in increasing competitive advantage through mergers, have not been sufficiently addressed. Research on these issues is fragmentary and needs further in-depth study. Thus, the topic of this research is the most in-depth study of M&A processes and their impact on the competitiveness of Ukrainian agricultural enterprises.

PAPER OBJECTIVE

The purpose of the paper is to justify the improvement of competitive advantages of agribusinesses under the influence of mergers and acquisitions. The main objectives of the study are to study the dynamics of M&A processes in the agricultural sector of Ukraine and to clarify links between these processes with improving the competitive status of agribusinesses.

METHODOLOGY

The main methods of this study are the methods of empirical research, such as observation, which was used to study in detail the state of M&A processes in Ukraine's agricultural sector. Methods such as comparison, measurement, abstraction, analysis, synthesis, induction and deduction were also used to determine the interdependence between increasing competitive advantage and intensifying mergers of agribusinesses.

RESULT AND DISCUSSION

The redistribution of assets between different owners by changing the management of the company is very often interpreted as a merger or acquisition process. Abroad, mergers and acquisitions are often considered to be an agreement for the transfer of control and ownership of the enterprise, which was planned and prepared in advance, in order to eliminate the risks and increase the efficiency of the company.

Merger is the process of uniting the two or more business entities, and the formation of a new one. Such a process can be presented in three different forms. Most often, these are mergers of ownership, meaning that both companies cease to form a new merger, with a single asset and a single governing body. The second form of merger is due to the pooling of assets. That is, the transfer of assets and property rights of one company to another enterprise. the third form is a merger when a company acts after a merger with another company (Yegorova, 2016).

Enterprises, in particular in the agro-industrial sector, are constantly on the lookout for additional sources of development, expansion of spheres, and scaling-up of their activities. Often,

the only way out for businesses that are in a difficult situation and do not find the sources of internal financing is to create integrated structures based on them. Creating integrated structures can take many different paths: merging (predominantly large) firms on a cross-shareholding basis; grouping of firms (small and medium), mainly subcontractors, around a large firm with which they are in contract and property relationships; merger or acquisition of one firm by another; merger with banks or other financial institutions of companies whose controlling interest is in these institutions; on a contractual basis, etc.

By choosing any of the following mergers or acquisitions, companies can benefit from such agreements. Most often, the main advantages of enterprise integration are:

- getting economies of scale;
- the possibility of obtaining low cost of capital;
- accelerate technical development and improve product quality and reduce production costs;
- conquering and maintaining markets due to diversification and growth in production;
- increasing the number of levers of influence on the market;
- risk reduction (Tarasova, 2010).

However, perhaps the most important positive feature of this process is the receipt of additional competitive advantages. Speaking of competitive advantages, it should be noted, first of all, that there are two main approaches in determining the main factors influencing the competitive advantages of an enterprise. Scholars consider the main factors external or internal, depending on which theory they are more inclined to – the classical theory of M. Porter, or the resource theory of competitive advantage. It is the external factors of the competitive environment of the enterprise that have the greatest influence and improvement of the competitive position of the firm in the conditions of integration with a more promising enterprise.

Speaking about the historical aspect of mergers and acquisitions of Ukrainian enterprises in the agrarian sector of the economy, there are several outstanding agreements that took place in 2009-2012. 93% of the Ukrainian operator of the Allseeds Group oil market (the cost of the transaction is estimated at US $ 150-300 million). Horizon Capital has acquired minority stakes in Agro-Soyuz Corporation (agricultural machinery, transaction value of $ 40 million) and Vitmark Holding (TM juices Jaffa, Nash Juice, Juicy). Suntory Holding Sells Non-Alcoholic Beverage Producer Rosinka to Kiev Investment Group for Approximately $ 45-50 Million A steady trend in the agricultural sector has also been consolidation of land through the acquisition of large agroholdings by small enterprises. poultry meat production and grain production) in 2010 expanded the land bank by 80 thousand hectares – to 300 thousand hectares. Balance “and the cooperative“ Ukraine. ”The Ternopil agri-holding“ Mriya ”has increased the land bank almost three times by 2013 – from 220 to 650 thousand hectares. , but also improved the image and competitive position of these businesses.

From the latest AIC news regarding mergers and acquisitions, the most important deals in 2019 can be identified: Namely, according to the official data of the tripoli.land website, Nestle has fully purchased the Torchin sauce manufacturer. According to Tripoliland news, today the share of the Swiss company Nestle in PJSC “Volynholding”, which produces products under the trade mark "Torchin", was 100%. Nestle acquired 9.5% of Volynholding PJSC as the sole owner of a powerful producer of sauces, ketchup, mayonnaise and seasonings. Volynholding decided to sell the last stake it owned to its shareholder, who already had control of the company. Volynholding joined Nestle in 2003. Nestle has three production sites in Ukraine (in Kharkiv, Lviv, and in the village of Torchin in Volyn, which gave its name to the sauce and seasoning trademark). Ukraine is also home to one of the five Nestle Business Service (NBS Lviv) service centers in the world.

Another example of M&A in the agricultural sector of Ukraine this year is the agreement of sale and sale of InVenture and the Land Union of Ukraine of LLC “Letychiv Agro” in the Khmelnytsky region Letychiv district with a land bank of 4 thousand hectares. In this agreement, the buyer was the Closed-End Non-Diversified Venture Corporate Investment Fund Konditerinvest, which acquired a company for growing and selling grain, leguminous and oilseeds from an

American company, represented in Ukraine by the Agroprosperis Group of Companies. According to the management of LLC "Letychiv Agro", this will have a positive impact on the competitiveness of the enterprise, namely it will allow the company to significantly expand its presence in the agricultural sector of Ukraine and increase the volume of grain cultivation.

Such integration agreements between Ukrainian agribusinesses and investors from abroad are increasingly bringing about positive changes in the sales of agricultural products of Ukraine to the world markets and increasing the competitive advantages of these companies. A striking example of a successful merger in the agro-industrial complex of Ukraine is Kernel, the world's largest producer and exporter of sunflower oil, a leading producer and supplier of agricultural products from the Black Sea region to the world markets. Thus, according to the report of the holding, grain exports from Ukraine in January-March increased by 63% – up to 1.5 million tons, half of them – own production, the rest was produced by farmers. In the first nine months of 2019, grain exports from Ukraine amounted to 4.7 million tonnes (+ 65%).

Separately, we would like to remind you about agreements with foreign investors, namely: the agreement regarding the Dream Agro Holding Company, which was sold to Saudi Agriculture and Livestock Investment Company (SALIC) for $ 242 million. USA. A major deal was the purchase of a stake in Kernel Holdings by Julius Baer for $ 73 million. USA.

Confirmation of positive competitive positions due to the consolidation of business, may be the list of the 15 largest agricultural holdings of Ukraine (table 1), compiled by the business magazine on agribusiness Landlord. The magazine deals with ratings, analytics, market forecasting. The rating was made on the basis of the list of owners / beneficiaries of large assets in the agricultural business, on the basis of expert evaluations, taking into account the persons involved in the ratings of the past years. The basis of the rating methodology was the valuation of net assets in the agricultural sector.

Table 1

The list of the 15 largest agricultural holdings of Ukraine

Agroholding Name	Capital
MYROVSKIY BREAD PRODUCT	$ 781.7 million
ROSHEN, "UKRPROMINVEST-AGRO"	$ 776.6 million
UKRLANDFARMING, Vanguard	$ 649.8 million
KERNEL	$ 451.3 million
NIBULON	$ 348.9 million
ASTARTA-KIEV	$ 226.7 million
AGROMARS COMPLEX	$ 158.4 million
VIOIL	$ 114.1 million
"KONTI", "APK-INVEST"	$ 113.8 million
PROMETEY GROUP OF COMPANIES	$ 111.5 million
AGROFIRM "SVITANOK"	$ 92.7 million
IMC	$ 87.7 million
AGROTREYD	$ 87.4 million
OVOSTAR UNION	$ 73.1 million
GOODVALLEY	$ 72.9 million

Source: *modified by the authors according the data of official site of the magazine "Landlord"*

As you can see, the largest agro holdings have a large share of capital, so it is very important for small agribusinesses to compete with them. In order to strengthen its competitive position not

only in the domestic market, but also to be able to access its products to external small enterprises of the agricultural sector, it is necessary to merge or merge with larger ones.

Another opportunity to increase agribusiness is to attract foreign investors. Moreover, international investors' confidence in Ukrainian businesses has recently grown under the influence of the country's gradual economic recovery and structural reforms, which have been and remain key requirements of the IMF and the EU.

Regarding the dynamics of mergers and acquisitions of Ukrainian agrarian enterprises, we note that according to experts, the number of M&A transactions is constantly increasing, as is the total value of these agreements. So in Figure 1 you can see this positive trend from 2015 to 2018.

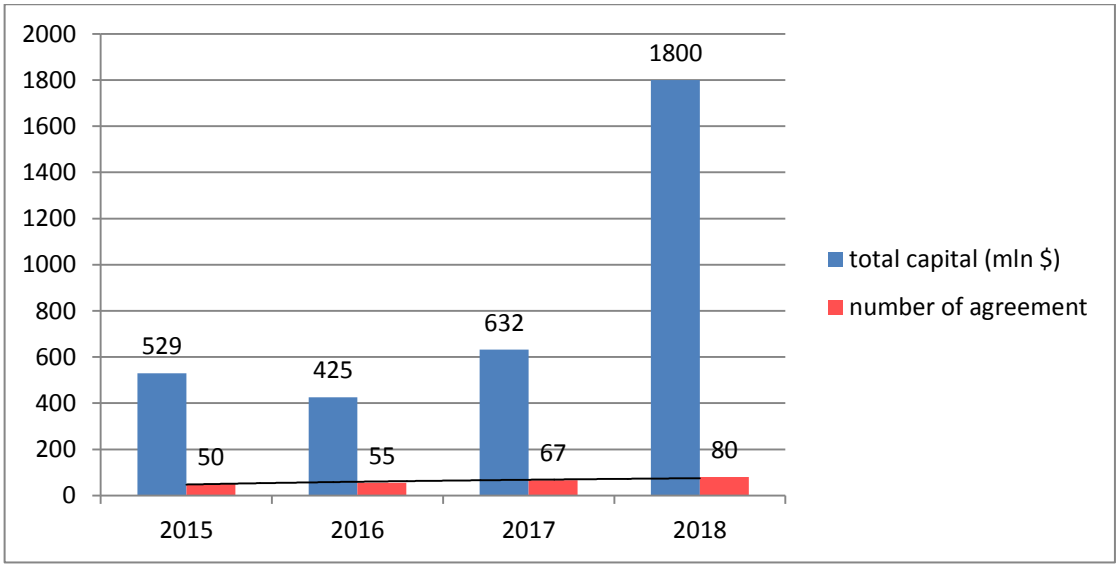

Figure 1. The positive trend of M&A transactions from 2015 to 2018

Source: *compiled by the authors*

When considering M&A issues of agribusinesses, it is imperative to mention the main motives that encourage agribusiness owners to buy assets from other businesses. Among the various motives behind mergers and acquisitions in general, economists highlight the motives for reducing capital outflows, the motives for increasing and stabilizing resources, and the neutral, non-motive resources.

Based on a similar classification of the motives of enterprises for M&A transactions, all the goals and motives of Ukraine's agricultural holding companies, which have concluded such agreements, can be presented as the following scheme (Figure 2).

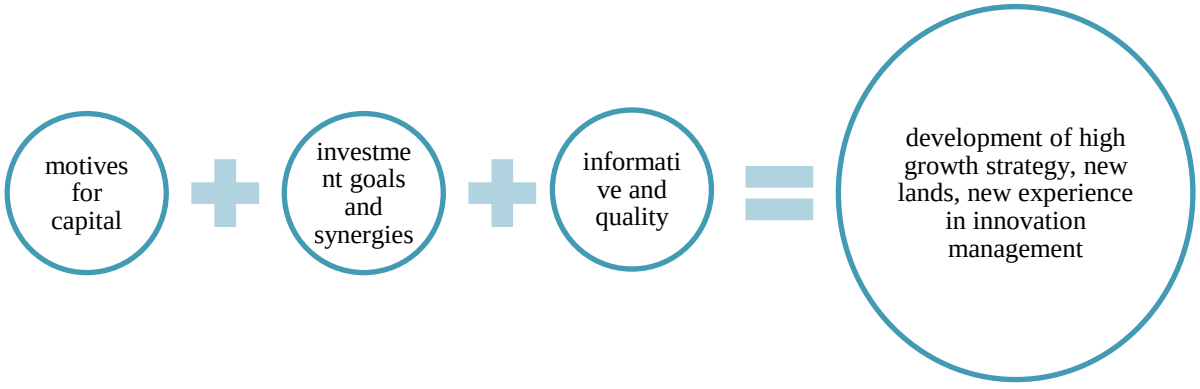

Figure 2. The scheme of motives that encourage agribusinesses to unite (compiled by the author)

Summarizing the reasons considered, which encourage the agribusinesses to unite, we note that the main reason is still called by the experts as a motive for increasing agricultural land and capital for expansion of production.

The desire to expand is often the reason for a significant increase in demand for the company's products, as well as the desire to conquer new, often foreign, markets, modernization of production, expansion of the range and expansion of the scope of activities of the agricultural firm.

Recently, there has been a situation where large agribusinesses are not just buying up more land but restructuring their land funds by selling unprofitable, far-flung lands, and buying new ones, which are closer to the main territories of the enterprise. All of this leads to an improvement in the major competitive advantages of large agro-industry enterprises compared to smaller ones that do not actively participate in mergers and acquisitions. With regard to the most competitive advantages, we can distinguish the most significant, which are greatly enhanced by M&A processes. Among them are the following:

- cost reduction and cost optimization at the level necessary to fully meet production needs;
- the possibility of increasing the price of sales by improving the quality of products and an established sales system;
- increase in land use and production volumes;
- strengthening the impact on the markets of resources and products through the use of advanced technologies;
- the benefits of reducing the cost of production, etc.

Also, by continuing to analyze the main competitive advantages of agro holdings with the acquisition of other agricultural companies, there are many other positive points.. We note the most important, in our opinion, namely:

- improving the ability to control the quality of products;
- obtaining the opportunity to influence the average market price;
- ensuring the volume of production, in order to take a more favorable position in the market;
- gradual and systematic reduction of production costs,

that guarantees the price competitiveness of products;

- focusing of economic activity on achievement of strategic goals of agricultural enterprise (

On the other hand, there is absolutely no need to forget about the new risks that arise in the process of mergers and acquisitions of companies. It is precisely in the face of such obstacles and possible problems that owners of agro-holdings who purchase other companies in the agricultural sector should be alert to certain surprises and temporary difficulties. Among the ready-made risks that may arise in the M&A process, scientists include:

- lack or imperfection of the development strategy;
- underestimation of potential costs;
- lack or complexity of proper controls;
- financial risks such as an increase in the total amount of taxation, risks of redemption by the shareholders of the securities, an increase in borrowing, and an increase in costs.

It should be emphasized that all major mergers and acquisitions affect plant companies to a greater extent. The main purpose of such agreements is to increase the land bank.

More clearly the risks of the merger of agribusinesses and their correlation with the motives and increasing competitive advantage can be seen in the following figure (Figure 3).

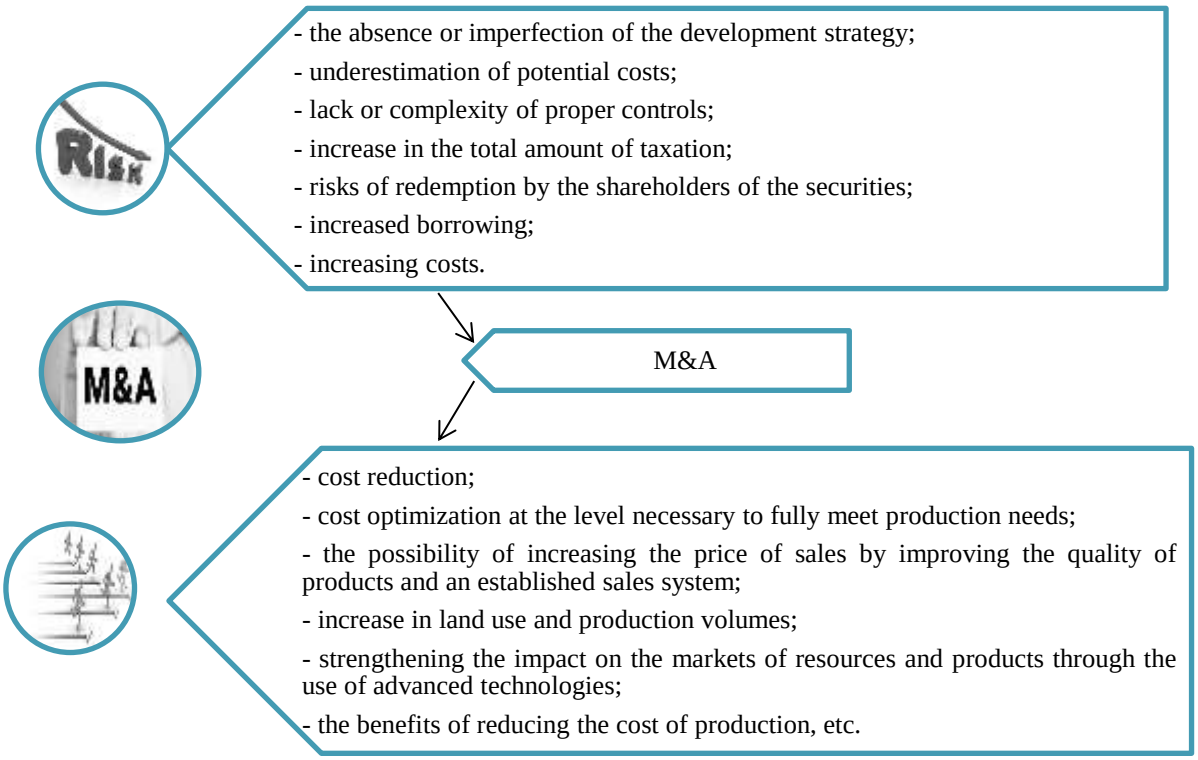

Figure 3. Risks of merging agribusinesses and their correlation with motives and increasing competitive advantage

Source: *compiled by the authors*

Given the existence of the listed risks, it is necessary for the enterprise to conduct risk analysis, evaluation and monitoring at all stages of the M&A agreement.

CONCLUSIONS

As a conclusion, it can be summarized that mergers and acquisitions increase the competitiveness of agricultural enterprises, as evidenced by the analysis. On the other hand, the risks involved in the M&A process should be particularly considered and analyzed. However, despite the risks and costs of merging agroholdings, positive results outweigh the benefits. It can be noted that mergers and acquisitions are one of the effective ways of increasing the competitive advantages of agribusinesses.

The study substantiated and proved the main conclusion that under the influence of mergers and acquisitions the competitive advantages of Ukrainian agribusinesses are improving. Having thoroughly studied the dynamics of mergers in the agrarian sector of Ukraine, it was found that the most active part in this process is taken by enterprises involved in crop production. It was also found that the main motive for the combination of capital of agro holdings is the increase of the land fund, in order to further increase production volumes.

It was also argued that there is a close link between participation in the M&A process and the increased competitive advantage of agricultural enterprises. First of all, this is due to the increase not only of capital and sown area, but also to optimization of production processes, reduction of the total amount of costs, improvement of the strategy of effective management and further development.

Experts say that today the enterprises of the agricultural sector of Ukraine do not always have time to fully meet the growing demand for their products, in particular in foreign markets. New

conditions of trade with the EU, which set new requirements for producers of agricultural products, dictate new conditions of competition. In order to be successful today, Ukrainian agricultural sector companies have to combine their efforts and increase production volumes.

However, the ways of acquiring the corporate rights of agribusinesses remain under-researched, which further needs further attention. Thus, the study did not consider the use of EBITDA techniques and the use of ancillary DCF and EV valuation techniques. All of these issues require more thorough research and will be the topic of a separate new article.

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ЗЛИТТЯ ТА ПОГЛИНАННЯ ЯК МОЖЛИВІСТЬ ОТРИМАННЯ НОВИХ КОНКУРЕНТНИХ ПЕРЕВАГ В АГРОБІЗНЕСІ

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Стаття присвячена питанням злиття та поглинання сільськогосподарських підприємств України з метою отримання нових можливостей у конкуренції. Висвітлено основні конкурентні переваги, які додатково отримують слабкі підприємства агробізнесу при злитті з більш перспективними підприємствами цієї галузі. Сьогодні, незважаючи на те, що наша країна дуже зацікавлена в збільшенні продажів на зовнішніх ринках, особливо ринках ЄС, в умовах вільної торгівлі, залишається питання про підвищення конкурентоспроможності українських підприємств та збільшення їх обсягів. Саме тому тема цього дослідження є актуальною та має певне практичне значення для подальшого розвитку не лише окремих підприємств, а й аграрної сфери економіки України загалом. Метою цієї статті є окреслити важливість таких процесів, як злиття та поглинання для підвищення конкурентної переваги агробізнесу. Відповідно до мети, завдання полягало у дослідженні сучасних тенденцій розвитку агрофірм в умовах злиття та поглинання, які вже відбулися. Основними методами цього дослідження є методи емпіричного дослідження, такі як спостереження, порівняння, вимірювання, а також абстрагування, аналіз та синтез, індукція та дедукція. За результатами дослідження було зроблено висновки про позитивний вплив таких процесів, як злиття та поглинання на конкурентоспроможність агропідприємств. З іншого боку, слід особливо враховувати та аналізувати ризики, пов'язані з процесом злиття та поглинання. Однак, незважаючи на ризики та витрати на об'єднання агрохолдингів, позитивні результати переважують. Наукове та практичне значення роботи. Дослідження має практичну цінність, про що свідчать певні рекомендації, щодо поліпшення конкурентної позиції підприємств, що працюють в аграрному секторі шляхом консолідації свого бізнесу та збільшення їх капіталу за рахунок злиття з іншими підприємствами.

Ключові слова: злиття, поглинання, конкурентна перевага, інтеграція, конкуренція, агробізнес.

СЛИЯНИЕ И ПОГЛОЩЕНИЕ КАК ВОЗМОЖНОСТЬ ПОЛУЧЕНИЯ НОВЫХ КОНКУРЕНТНЫХ ПРЕИМУЩЕСТВ В АГРОБИЗНЕСЕ

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Статья посвящена вопросам слияния и поглощения сельскохозяйственных предприятий Украины, с целью получения новых возможностей в конкуренции. Приводятся основные конкурентные преимущества, которые дополнительно получают слабые предприятия агробизнеса при слиянии с более перспективными предприятиями этой отрасли. Сегодня, несмотря на то, что наша страна очень заинтересована в увеличении продаж на внешних рынках, особенно рынках ЕС, в условиях свободной торговли, остается вопрос о повышении конкурентоспособности украинских предприятий и увеличения их объемов. Именно поэтому тема данного исследования является актуальной и имеет определенное практическое значение для дальнейшего развития не только отдельных предприятий, но и аграрной сферы экономики Украины в целом. Целью этой статьи является определить важность таких процессов, как слияния и поглощения для повышения конкурентного преимущества агробизнеса. Согласно цели, задача состояла в исследовании современных тенденций

развития агрофирм в условиях слияния и поглощения, которые уже произошли. Основными методами этого исследования является методы эмпирического исследования, такие как наблюдение, сравнение, измерение, а также абстрагирование, анализ и синтез, индукция и дедукция. По результатам исследования были сделаны выводы о положительном влиянии таких процессов, как слияния и поглощения на конкурентоспособность агропредприятий. Научное и практическое значение работы. Исследование имеет практическую ценность, о чем свидетельствуют определенные рекомендации по улучшению конкурентной позиции предприятий, работающих в аграрном секторе путем консолидации своего бизнеса и увеличения их капитала за счет слияния с другими предприятиями.

Ключевые слова: слияния, поглощения, конкурентное преимущество, интеграция, конкуренция, агробизнес.

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INTERACTION OF PARTICIPANTS OF URBAN FREIGHT CONSOLIDATION OF DIFFERENT LEVELS

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Abstract

The **purpose** of this publication is generalization of research on the types of urban consolidation, classification of systems for urban freight consolidation by levels, consideration of participants at each level and schemes of their interaction, as well as analysis of direct and reverse flows that accompany this interaction. The works of domestic and foreign scientists on the problems of urban freight transportation and use of consolidation for their solving are the **theoretical and methodological basis** of the research. Data of official statistical and analytical materials of ministries and departments of Ukraine and world agencies made up the Information basis. When solving the tasks set, methods of economic analysis, systematization, generalization, comparison were applied. The **results** of the work are classifications of consolidation schemes for urban distribution, urban consolidation centers and their participants. Different levels of urban consolidation allow flexible application of the idea of consolidation to cities of various sizes and topologies, while reducing congestion and improving environmental situation in the city. The forward and reverse flows between various participants in the urban distribution system are evaluated. The prospect of the study is to consider the schemes of consolidation of different levels and an assessment of their economic and socio-ecological efficiency. The **limitations** of the results obtained are their applicability exclusively for urban areas and for consolidated transportation between cities. The presence of all levels of freight consolidation can be economically feasible only for cities with population of over 1 million inhabitants with corresponding long delivery distances. The **practical significance** of the study lies in the possibility of using the proposed classification and schemes of direct and reverse flows in the design of urban distribution schemes with the involvement of consolidation centers at various levels.

Keywords: urban distribution, freight consolidation, urban consolidation center, two-tiers consolidation, participants of urban freight distribution, direct and reverse flows.

JEL Classification: R40, R22, O18.

INTRODUCTION

Urban freight transport plays an important role in meeting the needs of citizens and urban businesses, but at the same time it damages the environment of the city, increases congestion, which causes discontent among residents (Nuzzolo et al, 2019).

According to a study of Traffic Index – 2018, in 2018 Kyiv is in the 13th place in the world in terms of traffic congestion. Kyiv's congestion bypassed Tokyo, Rome, London, New York, which are respectively at 25, 31, 40, 42 rating. Considering the lack of a municipality or government improvement program, the situation requires immediate and intent attention from researchers.

Among the alternatives aimed at mitigating the negative external effects of freight traffic related to the concept of urban logistics, an urban consolidation center or city distribution center (UCC and UDC) can be proposed, which is an important factor for increasing efficiency of the logistics process in the city (Correia et al, 2012).

With the increase in the size of the city, the duration of delivery also increases. The concept of consolidation in a large city with high traffic density plays a vital role (Browne et al, 2005).

According to case studies in sustainable urban transport #10, published by GIZ GmbH, the main purpose of urban consolidation centers is to reduce the need for freight vehicles to deliver goods to urban areas (city center, an entire city or a specific large object such as a shopping center).

For example, Browne et al (2011) describe an implementation of a micro-UDC in London where electric vans and tricycles arc used as delivery vehicles for the last mile delivery. With the new system in place, significant reductions on total distance (by 20%) and CO2 – equivalent emissions (by 54%) are reported although the distance per parcel rose by 349%.

LITERATURE REVIEW

The topic of consolidation of small shipments has long been studied by world and domestic scientists (R. Larina, 2005; A. Kotenko et al, 2014; L. Savchenko, M., Lysenko et al, 2018). However, unfortunately, the search for domestic materials on the topic of urban consolidation and its role in improving urban logistics has not been crowned with success. At the same time, global experience is quite broad. Urban distribution and consolidated deliveries were have been researched by J. Allen, N. Ananda, M. Browne, A. Campagna, K. Chwesiuk, V. Correiaa, T.G. Crainic, L. Dablanc, R. Duina, A. Galelo, P. Gianessi, S. Gragnani, A. Guerra, K. Hassall, J. Leonardi, R. Macário, C. Macharis, L. Oliveiraa, K. Ogden, H. Quaka, L. Persia, N. Ricciardi, P. Storchi, M. Sweet, E. Taniguchi, L. Tavasszya, RG Thompson, G. Valenti, M.P. Valentini, S. Verlinde, F. Witlox, A. Woodburn and others.

In Traffic Index – 2018. various levels of consolidation of freight road transport in cities and interactions of participants in urban delivery schemes with its goods flows and revenues are considered. Dablanc (2007) mentioned that many projects involving the installation of only one UCC were unsatisfactory in large cities with high population density and a high concentration of commercial, administrative and cultural activities. Thus, for large cities that require a long-distance transportation in the city, a network of CC, possibly of different levels of consolidation, should be used.

In the study on the classification of urban consolidation and UCC (Allen et al, 2015), classification was made into three groups, each of which has a different classification attribute (without general principle of classification). Browne et al (2005) classify UCC into two groups according to the number of clients that are served through consolidation — UCC for one company, UCC for several companies. Thus, consolidation for B2B format is assumed.

Also Browne et al. (2005) stated that consolidation schemes may vary depending on the size of the geographical area they serve (a small area, such as the narrow historical center of an urban area, a specific shopping area, or a larger, more diverse geographical area to the whole city/town). Verlinde et al (2012) are talking about classification by the number of "tiers" or "echelons". It can be named "levels" as well. Two types of configurations – single and multi-tier were mentioned there.

Hassall (2009) notes that most urban logistics projects involve so-called *single-level* systems based on UCC, that is, systems in which delivery schemes are performed from one UCC to city

consumers. Such systems are well suited for small cities. But for large cities, it can be considered as a poor decision. There is a possibility of reverse flow, when the UCC also receives the cargo collected in the city and prepares it for a long part of the journey to another city or region [13].

Optimization for location of facilities (Taniguchi, 1999) and real-time routing of vehicles (Taniguchi, 2001) methodologies have been proposed for single-tiered systems. Gianessi at al. (2015) consider location decisions on a single tier only.

For large cities, *three-level* systems were proposed, for example, for Amsterdam and a *two-level* system for Rome (Crainic et al, 2009; Gragnani et al, 2004).

With a *two-tier* scheme, the first level of the UCC is located on the outskirts of the urban zone, the second level of the system consists of so-called *satellites*, where cargo arriving from the first level UCC and other external points can be transferred and integrated into vehicles adapted for use in dense urban areas (Crainic et al, 2015). Existing objects such as parking lots, bus stations or railway stations / stops can be used as satellites (Crainic et al, 2009; Crainic et al, 2004). It is assumed that middle vehicles (urban-trucks) move between UCC of the 1st and 2nd levels, and cargo vehicles of light vehicles (city-freighters,up to 3.5 t) carry out deliveries from UCC of the 2nd level (Hassall, 2009; Baldi et al, 2019).

According to Chwesiuk (2008) UCC can be divided into three categories:

- local – performing services to specific trade areas (e.g. Broadmead-Bristol, England), city centres (e.g. La Petite Reine-Paris, France) or the whole city (e.g. Monaco);
- on the serviced area where there is only one owner it is usually built as a unit performing services on a specified location; the owner may influence other tenants to make use of the UCC; examples of such consolidation centres functioning at airports can be Heathrow Real Urban Consolidation Centre or Hadowhall Shopping Centre;
- special projects of a UCC for other purposes not connected with retail customer service (e.g. centres for building materials at Heathrow and in Stockholm); such centres attend to a single location or perform their services only at specified time.

As we can see from a review of literary sources, the topic of classification of urban consolidation of freight traffic has been raised repeatedly, however, at the moment, there is no unity in this regard.

The issue of participants in the urban distribution process is also interesting for many scientists. So, for example, Ananda et al (2012) divide stakeholders in the urban freight domain in two categories:

1. Public sector stakeholders that include traffic authorities, infrastructure authorities, municipalities, railway terminal/port authorities etc. These all stakeholders can be termed as "administrator".

2. Private sector stakeholders that include producers, suppliers, shippers, freight forwarders, trucking firms, truck drivers, shopkeeper, receivers etc. This long list of private stakeholders can be stratified to shipper, carrier and receiver according to leg of transportation activities.

In contrast to private stakeholders, administrator is interested in achieving the overall objective, i.e. reducing the total social cost (Ogden, 1992; Taniguchi and Tamagawa, 2005; Macário et al, 2008).

We believe that such an enlarged view of the stakeholders of urban distribution is insufficient and requires clarification.

PAPER OBJECTIVE

The purpose of the article are analyses and summarizing of interaction of participants of urban freight consolidation of different levels.

Research tasks:

- to summarize research on the types of urban consolidation;
- to classify urban cargo consolidation systems by levels;

- to considerate participants at each level and the patterns of their interaction;
- to analyze direct and reverse flows that accompany this interaction.

The subject of the study is distribution of small shipments in a dense urban traffic.

METHODOLOGY

The works of domestic and foreign scientists on the problems of urban freight transportation and use of consolidation for their solving are the theoretical and methodological basis of the research.

Information basis is made up of data of official statistical and analytical materials of ministries and departments of Ukraine and world agencies.

When solving the tasks set, methods of economic analysis, systematization, generalization, comparison were applied.

RESULT AND DISCUSSION

We propose to consider the authors' approach to classification of consolidation in the urban distribution (UD), based on the number of consolidation points (levels) in the supply chain:

0-level: no consolidation, goods are delivered from a supplier to a receiver directly.

1-level: goods arrive from a supplier to a macro UCC (or mini-UCC, or micro-UCC), thereafter deliver to a receiver.

2-level: goods arrive from a supplier to a macro UCC, then to a mini UCC, thereafter deliver to a receiver. There may be other interaction schemes, for example, mini-UCC and micro-UCC, or macro-UCC and micro-UCC (sequential connection of two different levels of UCC in a chain).

3-level: goods arrive from a supplier to a macro-UCC, then to a mini-UCC, then a micro-UCC, thereafter deliver to a receiver (consecutive inclusion in the chain of three UCC of different levels - macro, mini and micro).

Based on the proposed aforementioned tiered (level) consolidation model for UD, we propose tier (level) classification of UCC:

- macro-UCC, which consolidates goods for the whole city or its significant part. The macro-UCC allows to exclude transportation of non-consolidated goods on intercity routes;
- mini-UCC consolidates goods to service a district of a city or several districts, is located within the city (location based on the principle of minimizing the distance to customers of the service region);
- micro-UCC consolidates cargo for delivery to the area of the city district with pedestrian delivery by couriers.

Let's consider the main possible participants in the process of UD. Based on the research studied, it is proposed to classify all possible direct participants (stakeholders) in urban delivery to:

1) senders (suppliers);
2) recipients (customers, clients);
3) micro-UCC;
4) mini-UCC;
5) macro-UCC;
6) other participants (3PL logistics operators, carriers, freight forwarders, the municipality and government, other road users, residents of the city).

Further in this article the last group of participants of the UD is considered indirectly.

At any level of consolidation, it is convenient to divide urban traffic by zones with size and territorial boundaries those may differ for different cities depending on their conditions, restrictions and characteristics. Thus, micro-consolidation can be considered to serve the pedestrian goods delivery zone, mini-consolidation - to serve the city district, macro-consolidation - to serve the

whole city or a large part of it (for example, in the case of Kyiv, it would be expedient to use the macro-center for servicing the left and right banks of the Dnipro river to avoid congestion on bridges and large distances between points of the route of delivery).

Further, for the convenience of understanding the relationships between all participants in the urban delivery process, it is proposed to divide those into 2 groups:

- internal (located within the zone);
- external (located outside the zone).

Since it is the first fivestakeholders that are directly involved in the city delivery process, we will consider possible options for urban distribution at different levels. At the same time, for each level, interactions are considered either within the zone, or between the zone and the external environment, or in the external environment.

For further analysis, each major participant in the urban transportation process is assigned a two-digit number, where the first number is the number of the participant according to the classification, the second number is a sign of being inside or outside the viewing zone (1 - in the zone, 2 – out of the zone) (Fig. 1).

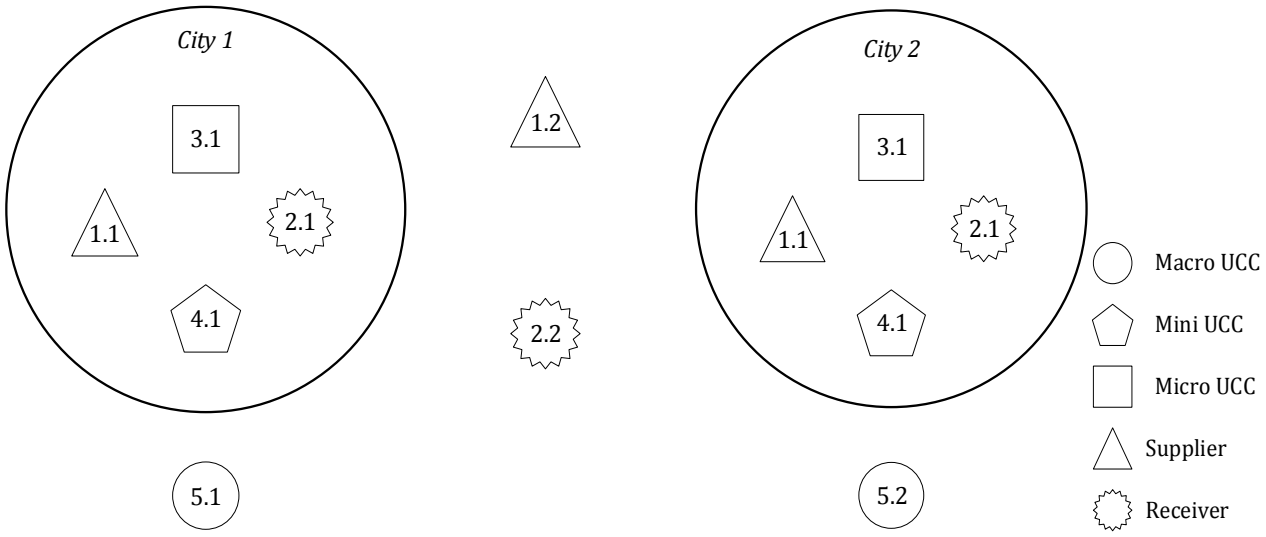
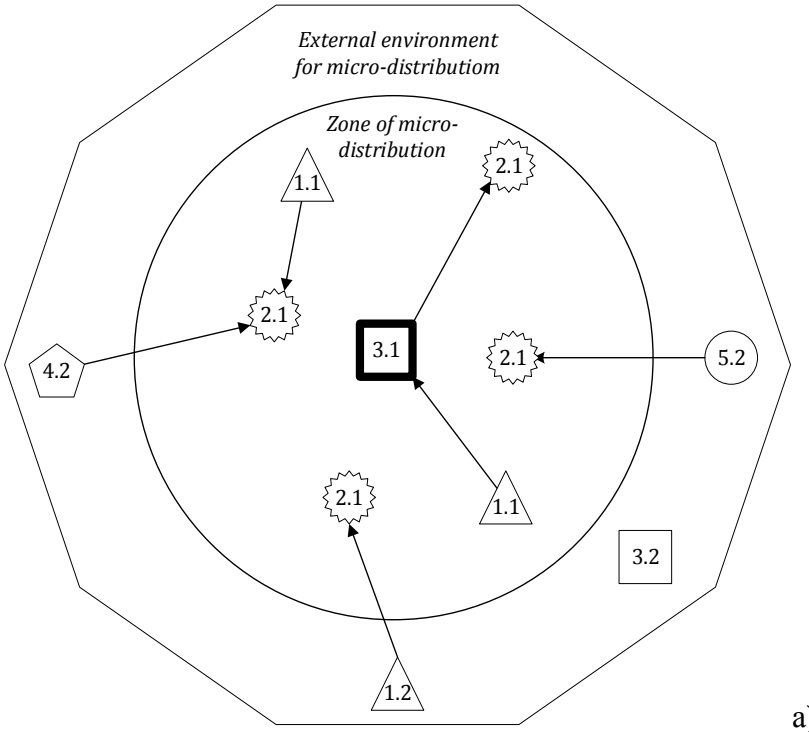


Figure 1. Possible participants in the urban distribution process

Source: own study

Fig. 1 shows a diagram of possible participants in the distribution process of the two cities. As can be seen, it takes into account both intercity participants and non-urban, however, having outgoing or incoming flows associated with cities.

Consider the interaction of stakeholders in the process of UD at different levels of consolidation (Fig. 2).


External environment
for micro-distributiom
Zone of micro-
distribution
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2.1
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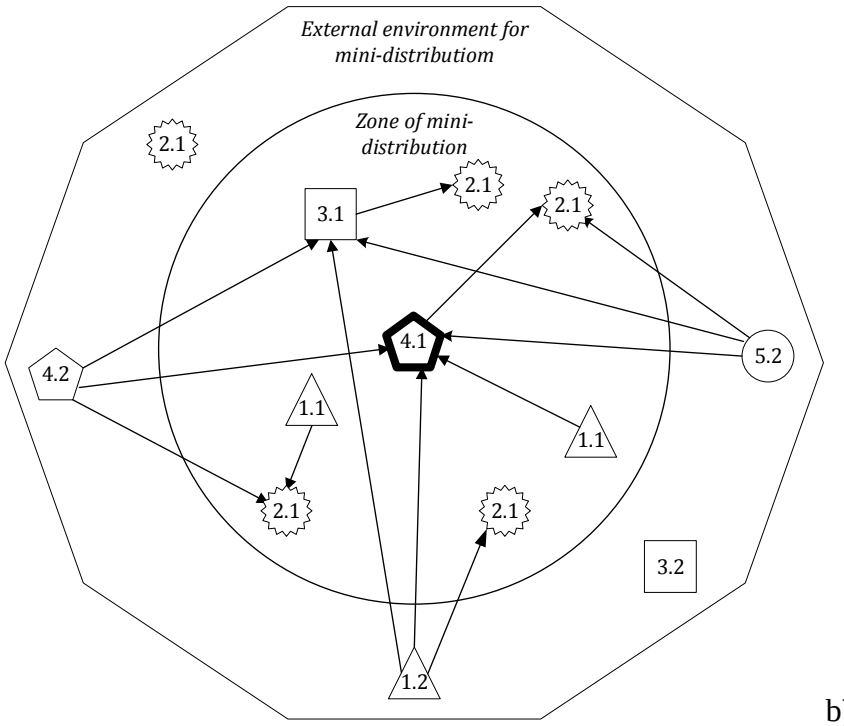
a)


External environment for
mini-distributiom
Zone of mini-
distribution
2.1
3.1
2.1
2.1
4.1
5.2
4.2
1.1
1.1
2.1
2.1
3.2
1.2

b)

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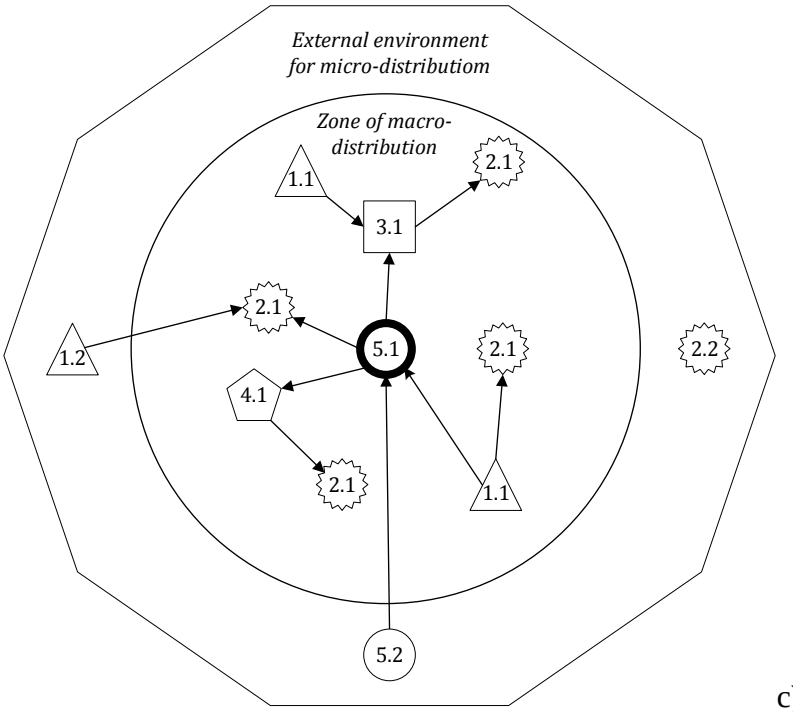

c)

Fig. 2. The interaction of stakeholders of the UD at different levels of consolidation:

a) micro-consolidation; b) mini-consolidation; c) macro-consolidation

Source: own study

The choice of delivery scheme and rational level of consolidation depends on:

- volume-dimensional characteristics of the cargo, the possibility of its transportation in the consolidated batch;
- distance from the sender to all levels of consolidation centers;
- distances from all levels of consolidation centers to the recipient;
- the distance between the sender and the recipient;
- existing restrictions on intercity transportation;
- the cost of cargo handling at all levels of consolidation centers.

Let’s consider the example of a sender-receiver supply chain with micro-UCC. Such options are possible:

- the sender is in the zone of micro-consolidation (1.1);
- the sender is outside the zone (1.2).

The external participants for the micro level are:

- external senders (1.2);
- external macro-UCC (5.2);
- external mini-UCC (4.2).

All recipients of the micro level are in the zone of micro-consolidation, i.e. theyare in category 2.1.

Since a micro-UCC participates in delivery to end customers only who are in a radius limited around it, the external micro-UCC does not participate in the interaction.

Let’s consider the flow of goods between all the above participants in the UD process. To do this, we will compose a square matrix and evaluate each cell in the context of the existence of flows, the direction of these flows and their possible features.

For convenience, define the different types of flows:

- direct (or forward), the direction of which corresponds to the direction of movement of the material flow from the sender to the recipient;

- reverse, showing return flows, the direction of which is opposite to the direction of direct flows.

We will also analyze the absent flows, in the absence of interaction between the participants of the urban distribution system. Each corresponding table contains comments in those compounds that are not typical.

During the flow analysis process, it was revealed that the matrix of possible connections is not symmetrical, since interactions between participants in the supply chain of urban freight almost always go in one direction (according to the direction of the cargo movement from the sender to the recipient).

It is necessary to give the features of the classification. An internal UCC serves recipients or a lower-level UCC in a certain territory (within a certain zone). An external UCC is one that is outside the range of a certain level of consolidation system.

Direct and reverse flows, as well as their features are given in Table 1.

Table 1 shows two interaction options:

- “yes” if interaction is possible;
- “no” if interaction is not possible (not exists).

Also listed comments to non-standard cases of interaction.

According to the base table 1, a sample of direct (Table 2), reverse flows (returns) (Table 3), bidirectional direct flows (Table 4) and absent flows (Table 5) was carried out.

As you can see from the Table. 2-5, among the flows there are two symmetric matrices - for couples with no interaction and for couples with bidirectional flows of goods (not returns). While the direct and reverse flow matrices are asymmetric.

Depending on the boundaries of the zone being analyzed, it is necessary to consider those pairs of interactions stakeholders that correspond to tabular ones.

CONCLUSIONS

Summarizing the above material, it can be noted that the topic of urban distribution is increasingly relevant due to the increasing urbanization of the population and the development of electronic commerce. Difficulties associated with the movement of vehicles in the conditions of dense urban traffic, are a problem both for the participants of urban distribution, and for residents of the city. A way out of the current situation may be the consolidation of urban cargo flows. Different levels of urban consolidation allow to apply flexible the idea of consolidation to cities of various sizes and topologies, while reducing congestion and improving the environmental situation in the city. The prospect of the study is to consider the schemes of consolidation of different levels and an assessment of their economic and socio-ecological efficiency.

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Table 1

The existence of direct and reverse flows between possible participants in the process of urban cargo delivery

O \ D	Participant marking	Internal sender	External sender	Internal recipient	External recipient	Internal micro-UCC	External micro-UCC	Internal mini-UCC	External mini-UCC	Internal macro-UCC	External macro-UCC
		1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Internal sender	1.1		**no**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**
External sender	1.2	**not**		**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**
Internal recipient	2.1	**no (or just returns)**	**no (or just returns)**		**not**	**no (or just returns)**	**not**	**no (or just returns)**	**no (or just returns)**	**no (or just returns)**	**no (or just returns)**
External recipient	2.2	**no (or just returns)**	**no (or just returns)**	**not**		**no**	**no (or just returns)**	**no (or just returns)**	**no (or just returns)**	**no (or just returns)**	**no (or just returns)**
Internal micro-UCC	3.1	**no (or just returns)**	**no (or just returns)**	**yes**	**no (too small coverage radius)**		**no**	**no (or just returns)**	**no (or just returns)**	**no (or just returns)**	**no (or just returns)**
External micro-UCC	3.2	**no (or just returns)**	**no (or just returns)**	**no (too small coverage radius)**	**yes**	**not**		**no (or just returns)**	**no (or just returns)**	**no (only return flow is possible if there is no external macro and mini UCC)**	**no (or just returns)**
Internal mini-UCC	4.1	**no (or just returns)**	**no (or just returns)**	**yes**	**yes**	**yes**	**yes**		**yes**	**yes (returns, flow to other city)**	**yes (returns, flow to other city)**
External mini-UCC	4.2	**no (or just returns)**	**no (or just returns)**	**yes**	**yes**	**yes**	**yes**	**yes**		**yes (returns, flow to other city)**	**yes (returns, flow to other city)**
Internal macro-UCC	5.1	**no (or just returns)**	**no (or just returns)**	**yes**	**yes**	**yes**	**yes (if there is no external macro- and mini-UCC)**	**yes**	**yes (if there is no external macro-UCC)**		**yes**
External macro-UCC	5.2	**no (or just returns)**	**no (or just returns)**	**yes (possible, if there is no internal UCC, large consolidated cargoes)**	**yes**	**yes (possible, if there is no internal UCC, large consolidated cargoes)**	**yes**	**yes (perhaps, if there is no internal macro-UCC, large consolidated cargoes)**	**yes**	**yes**	**yes**

Source: own study

Table2

The existence of direct flows between possible participants in the process of urban cargo delivery

O \ D	Participant marking	Internal sender	External sender	Internal recipient	External recipient	Internal micro-UCC	External micro-UCC	Internal mini-UCC	External mini-UCC	Internal macro-UCC	External macro-UCC
		1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Internal sender	1.1										
External sender	1.2										
Internal recipient	2.1										
External recipient	2.2										
Internal micro-UCC	3.1										
External micro-UCC	3.2										
Internal mini-UCC	4.1									**flow to other city**	**flow to other city**
External mini-UCC	4.2									**flow to other city**	**flow to other city**
Internal macro-UCC	5.1						**if there is no external macro- and mini-UCC**		**if there is no external macro flow to other city UCC**		
External macro-UCC	5.2	**if there is no external macro- and mini-UCC**		**if there is no internal UCC, large consolidated cargoes**		**if there is no internal UCC, large consolidated cargoes**		**if there is no internal macro-UCC, large consolidated cargoes**			

Source: own study

Savchenko, L., Polishchuk, V. and Grygorak, M. (2019). "Interaction of participants of urban freight consolidation of different levels", *Management and entrepreneurship: trends of development*, 3(09), pp. 89-106. doi: https://doi.org/10.26661/2522-1566/2019-3/09-07

Table3

The existence of reverse flows between possible participants in the process of urban cargo delivery

O \ D	Participant marking	Internal sender	External sender	Internal recipient	External recipient	Internal micro-UCC	External micro-UCC	Internal mini-UCC	External mini-UCC	Internal macro-UCC	External macro-UCC
		1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Internal sender	1.1										
External sender	1.2										
Internal recipient	2.1										
External recipient	2.2										
Internal micro-UCC	3.1										
External micro-UCC	3.2									**if there is no external macro and mini UCC**	
Internal mini-UCC	4.1										
External mini-UCC	4.2										
Internal macro-UCC	5.1										
External macro-UCC	5.2										

Source: own study

Table4

The existence of bidirectional direct flows between possible participants in the process of urban cargo delivery

O \ D	Participant marking	Internal sender	External sender	Internal recipient	External recipient	Internal micro-UCC	External micro-UCC	Internal mini-UCC	External mini-UCC	Internal macro-UCC	External macro-UCC
		1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Internal sender	1.1										
External sender	1.2										
Internal recipient	2.1										
External recipient	2.2										
Internal micro-UCC	3.1										
External micro-UCC	3.2										
Internal mini-UCC	4.1										
External mini-UCC	4.2										
Internal macro-UCC	5.1										
External macro-UCC	5.2										

Source: own study

Savchenko, L., Polishchuk, V. and Grygorak, M. (2019). "Interaction of participants of urban freight consolidation of different levels", *Management and entrepreneurship: trends of development*, 3(09), pp. 89-106. doi: https://doi.org/10.26661/2522-1566/2019-3/09-07

Table 5

The absent flows between possible participants in the process of urban cargo delivery

O \ D	Participant marking	Internal sender	External sender	Internal recipient	External recipient	Internal micro-UCC	External micro-UCC	Internal mini-UCC	External mini-UCC	Internal macro-UCC	External macro-UCC
		1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Internal sender	1.1										
External sender	1.2										
Internal recipient	2.1										
External recipient	2.2										
Internal micro-UCC	3.1				**coverage radius is too small**						
External micro-UCC	3.2			**coverage radius is too small**							
Internal mini-UCC	4.1										
External mini-UCC	4.2										
Internal macro-UCC	5.1										
External macro-UCC	5.2										

Source: own study

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ВЗАЄМОДІЯ УЧАСНИКІВ МІСЬКОЇ КОНСОЛІДАЦІЇ ВАНТАЖІВ РІЗНИХ РІВНІВ

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Міський вантажний транспорт відіграє важливу роль у задоволенні потреб городян і міського бізнесу, але в той же час він завдає шкоди навколишньому природному середовищу міста, збільшує затори, обумовлює невдоволення мешканців. Метою статті є узагальнення досліджень про види міської консолідації, класифікація систем міської консолідації вантажів по рівнях, розгляд учасників кожного рівня і схем їх взаємодії, а також аналіз прямих і зворотних потоків, які супроводжують цю взаємодію. Теоретичною і методологічною основою дослідження є роботи вітчизняних і зарубіжних вчених з проблем міських вантажоперевезень і застосування консолідації для їх вирішення. Інформаційну базу становлять дані офіційних статистичних та аналітичних матеріалів міністерств і відомств України та світових агентств. При вирішенні поставлених завдань застосовувалися методи економічного аналізу, систематизації, узагальнення, порівняння. Результатами роботи є класифікація схем консолідації міської дистрибуції, міських консолідаційних центрів і їх учасників. Різні рівні міської консолідації дозволяють гнучко застосовувати ідею

консолідації до різних за розміром і топологією міст, знижуючи при цьому рівень заторів і покращуючи екологічну ситуацію в місті. Перспективою дослідження є розгляд схем консолідації різних рівнів і оцінка їх економічної і соціально-екологічної ефективності.

Наукової значимістю роботи є отримання нових теоретичних положень щодо класифікації схем міської консолідації вантажів, а також їх учасників. Узагальнено та проаналізовано можливі схеми взаємодії між учасниками процесу міської дистрибуції. Практичне значимість дослідження полягає у можливості використання запропонованої класифікації та схем прямих та зворотних потоків при проектуванні схем міської дистрибуції з залученням консолідаційних центрів різних рівнів.

Ключові слова: міська дистрибуція, консолідація вантажів, міський центр консолідації, дворівнева консолідація, учасники міської дистрибуції, прямі і зворотні потоки.

ВЗАИМОДЕЙСТВИЕ УЧАСТНИКОВ ГОРОДСКОЙ КОНСОЛИДАЦИИ ГРУЗОВ РАЗНЫХ УРОВНЕЙ

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Городской грузовой транспорт играет важную роль в удовлетворении потребностей горожан и городского бизнеса, но в то же время он наносит ущерб окружающей природной среде города, увеличивает заторы, чем обусловливает недовольство жителей. Целью статьи является обобщение исследований о видах городской консолидации, классификация систем городской консолидации грузов по уровням, рассмотрение участников каждого уровня и схемы их взаимодействия, а также анализ прямых и обратных потоков, сопровождающих это взаимодействие. Теоретической и методологической основой исследования являются работы отечественных и зарубежных ученых по проблемам городских грузоперевозок и решениям с их консолидацией. Информационную базу составляют данные официальных статистических и аналитических материалов министерств и ведомств Украины и мировых агентств. При решении поставленных задач применялись методы экономического анализа, систематизации, обобщения, сравнения. Результатами работы является классификация схем консолидации городской дистрибуции, городских консолидационных центров и их участников. Разные уровни городской консолидации позволяют гибко применять идею консолидации к различным по размеру и топологии городам, снижая при этом уровень заторов и экологическую ситуацию в городе. Оценены прямые и обратные потоки, протекающие между различными участниками системы городской дистрибуции. Перспективой исследования является рассмотрение схем консолидации разных уровней и оценка их экономической и социально-экологической эффективности.

Научная значимость работы состоит в получении новых теоретических положений по классификации схем городской консолидации грузов, а также их участников. Обобщены и проанализированы возможные схемы взаимодействия между участниками процесса городской дистрибуции. Практическая значимость исследования заключается в возможности использования предложенной классификации и схем прямых и обратных потоков при проектировании схем городской дистрибуции с привлечением консолидационных центров различных уровней.

Ключевые слова: городская дистрибуция, консолидация грузов, городской центр консолидации, двухуровневая консолидация, участники городской дистрибуции, прямые и обратные потоки.

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DESIGN OF LOGISTICS SYSTEMS AS A COMPOSITION OF EFFECTIVE FUNCTIONING OF ENTERPRISE

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Abstract

Given the fact that logistics activity takes place in a very dynamic environment the state of the logistics system should be constantly monitored, analyzed and evaluated. The research is devoted to an important and at the same time complicated issue – the process of designing logistics systems as an important component of the operation of the enterprise. This problem is not fully understood both at the theoretical level and in the field of practical application of design principles. The **purpose** of scientific research is to determine the essence, tasks and features of the processes of designing logistics systems. The authors use such research **methods** as descriptive, comparative and systemic. The essence of the concepts of "project" and "design" is considered in the article. The main tasks of designing logistic systems are determined and possible conditions of their implementation are given. The study found the most important factors determining the success of the project on design of logistics systems. A system of branch logistic functions has been proposed. The factors that determine the success of logistics systems implementation are systematized. On the basis of the research, general recommendations for the design of logistics systems at any type of enterprise have been generated. The list of solutions that are accepted in the process of designing logistics systems has been proposed. Stages and steps in the design of logistics systems have been identified according to the tasks of designing logistic systems. Research results have shown that designing logistics systems should take into account the possible risks of implementing a solution and calculate with the help of mathematical models, possible benefits and losses for the enterprise. In addition recommendations to boost the efficiency of designing logistics systems have been distinguished.

Key words: project, designing, logistics systems.
JEL Classification: D24, L23, L90.

INTRODUCTION

A demanding market and growing competition mean that enterprises need to look for new solutions in the manufacturing process, adapting to customer requirements through systematic product improvement and after-sales service. Measures to improve should be characterized by efficiency, that is, achievement of results, not worse than competitors, but with less costs. Exactly because of this reason entrepreneurs seek to achieve new management and information technology

solutions, as well as in other interdisciplinary areas such as telecommunications, automation, robotics, flexible manufacturing systems, materials science and microelectronics. The constituent increase in the efficiency of the enterprise is the development of a logistics system that requires careful preparation. Above all, the key to the efficient operation of logistics systems is the high level of their design.

LITERATURE REVIEW

Theoretical substantiation of project management and designing is at the core of the studies of domestic and foreign researchers, among them: Razu (2006), Bjeg'juli (2002), Burimenko et al (2017), Denysenko et al. (2016), Larson and Gray (2011), Mykytiuk (2014), Rumjanceva et al (1996), Balakrishnan et al (2017), Morris (2013), Schwalbe (2004), Söderlund (2004), Turner (1996) etc.

Implementation of logistics systems and their impact on the functioning of enterprises is considered in the works of: Hemamala et al (2017), Ballou (1995), Bostel et al (2005), Kuhn and Schmidt (1988), Multaharju and Hallikas (2015), Göpfert and Wellbrock (2016), Han (2019) and others.

PAPER OBJECTIVE

The paper purpose is to study the essence of the design of logistics systems, the definition of its objectives, the characteristics of its stages and the development of practical recommendations for its implementation at enterprises of all types.

RESULT AND DISCUSSION

In modern conditions of functioning of enterprises, aspects related to optimization of their activities play an important role. The introduction of logistics systems in a market economy is an important factor in the development of entrepreneurship. When designing and refining logistics systems, it is necessary to have a sufficient level of data, the accounting of which, as well as collection and processing, must be continuous. However, for further familiarization with the essence, features and methods of designing logistics systems, the definition of the term “project” must be done (Table 1):

Table 1

Approaches to the definition of “project”

Concept	Definition
Project	System complex of planned (financial, technological, organizational, etc.) documents containing a complex system model of actions aimed at achieving a certain goal (Razu, 2006)
	A sequence of interrelated events occurring during a limited time period, which are aimed at achieving a unique, but at the same time, certain result (Bjeg'juli, 2002)
	A comprehensive, one-time event, limited in time, budget, resources, as well as clear performance guidelines tailored to the needs of the customer (Larson and Gray, 2011)
	The project is one that includes the idea (problem), the means of its implementation (all solutions of the problem) and the results obtained in the process of implementation (Mykytiuk, 2014)
	The project always focuses on the result, on the achievement of certain goals, on a specific subject area (Burimenko et al, 2017)

Consequently, the project is a plan, a scheme, a goal that should be implemented. In turn, designing is the process of creating a project – a prototype of the predicted or possible object (state).

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Designing a logistics system is a multi-faceted, multi-criteria and multi-stage process. This task requires taking into account a number of conditions and technological assumptions, and should:

- characterized by a systematic approach;
- use the knowledge of many disciplines in scientific fields such as: management, sociology, science of safety and defense, mathematics, computer science, transport, telecommunications, engineering, information technology, automation and robotics;
- be interdisciplinary;
- use mathematical models and simulations.

Designing logistics systems at the enterprise is possible under different conditions and may have different end goals:

- designing logistics systems in an existing company that has not yet had such a solution (internal transport subsystem, storage, procurement, distribution);
- development of a functioning logistics system (for example, automatic identification, packaging, palletizing, flow control of the material on the production line);
- development of the logistics system as part of the newly created company;
- design of logistic objects (for example, modern warehouses based on WMS);
- design of the flow of material goods and information in the logistics system, which includes participants in the upper and lower parts of the supply chain (for example, using the concept of "JIT" and automatic identification);
- development of logistics processes, including ERP class systems (transport, storage, packaging, customer service and ordering).

In the design process, there are various options for solutions in those or other areas, each of which can reach the logistical goal. Most importantly, in combination with each other in one system, they will give a synergistic effect (Razu, 2006). A list of possible solutions related to this or other aspect of the design process of logistics systems is presented in Table2.

Table 2

List of solutions that are accepted in the process of designing logistics systems

The component of the process	Questions that need to be addressed
Transport	- Choice of vehicle type - Definition of travel routes
Stocks	- Storage strategy - Registration of documents - The size of the buffer stock - Short-term forecasting of sales
Services	- Collect information about customers' needs and expectations - Response to needs and expectations
Making orders	- Ordering - Data processing - Data analysis
Storage	- Use of warehouse space - Distribution of assortment - Configuration of the warehouse
Inland transport	- Selection of equipment - Storage / reception
Packaging	- Movement - Storage - Protection
Production planning	- Aggregation of volume of production - Planning time to perform certain operations
Distribution	- Location, number and size of objects - Demand for objects

Project management involves achieving the goal in accordance with the defined requirements, taking into account the constraints on terms, cost and quality indicators (Rumjanceva et al, 1996). The main precondition for the development and implementation of logistics solutions is the expected benefits of improving the company's performance. An undisclosed issue is the development of an integrated logistics system for the enterprise. The essence of the project is to integrate the branched activity, which is classified as a logistical enterprise. Consequently, the development and implementation of the logistics system is related to the restructuring of the company and applies to all areas of its operation. Therefore, we can assert that the design of logistics systems is intended to perform a number of tasks at the micro and macro levels (table 3).

Table 3

Tasks of designing logistic systems

At the micro level	At the macro level
Tasks of optimal progress of the material flow in the production system	Tasks for placing elements of logistic infrastructure (warehouses, terminals)
Tasks of placement of capacities, equipment, workplaces, goods in the warehouse	Tasks for the design of cargo delivery systems
Task designing warehouses	Complex tasks of distribution systems design

The process of designing the logistics system must be preceded by:

- definition of the goals, place and role of the developed system in the company's strategy and its tasks;
- definition of logistics solutions used at similar enterprises;
- determination of criteria for evaluating the developed system;
- definition of the budget of the developed system.

The following stages and activities can be distinguished in the process of designing logistics systems (table 4).

Table 4

Stages and steps in the design of logistics systems

Stage	Name of the stage	Actions
1	2	3
I	Determining external conditions, defining the problem and determining the quality pattern of the designed system	- definition of the design purpose and its utility functions; - business case for system design; - determining the number and structure of streams of entrances and exits of the system; - defining the system quality standard; - defining financial, technical, legal and ecological restrictions.
II	Development of the system concept	- identification of material goods and information flows in the system; - description of the transformation processes of material goods and information; - determining storage needs and methods of storing material goods and storage parameters; - determining the needs of means of transport, transport technology and parameters of transport routes; - establishing parameters of logistics processes; - determining the costs of logistics processes; - establishing system management methods.

Table 4 continuation on the next page

Table 4 continuation

1	2	3
III	Analysis and evaluation of system opportunities	- system functioning analysis; - system assessment in terms of costs, technical capabilities, time, parameters of management and executive processes; - selection of the most advantageous system opportunities.
IV	Implementation of the selected opportunities and development of the system functioning technology	- detailed analysis of the selected system opportunities; - developing technology for implementing executive processes; - defining information flow technology; - developing management process technology

After the completion of the project, which is preceded by an analysis and evaluation of possible options, the technology of the system is being implemented and developed. Since the implementation of the logistics system will affect all the company's functions, it must be carefully prepared and implemented in a very short time.

The most important factors determining the success of the project can be included (Larson and Gray, 2011):

- mutual understanding and trust in the organization that manages the project;
- the correct definition of project constraints: the scale of the project, time, cost, quality;
- responsibility, trust and honesty of senior management, real support of the project by the senior management;
- focusing on people in project management (taking care of their knowledge development, raising competencies, creating an appropriate incentive system and ensuring an adequate flow of information);
- the ability to make the right decisions from the top management;
- rapid response of the main management to emerging problems;
- appointment of competent people to the position of project managers;
- experience in implementing projects (both employees and managers), proper control over timely progress of work;
- identification of risks in the project, risk management skills, monitoring and control of project costs;
- clearly defined project implementation strategy, depending on the nature of the project, the project's organizational structure, specificity and scale of tasks (correct definition of the principles of cooperation, hierarchy and subordination);
- proper management of relations with the project stakeholders;
- use of IT tools that support project management in an organization.

Logistics system design is primarily aimed at minimizing logistical risks at all levels of the hierarchy of management of the logistics system (table 5). Incorrect configuration of the logistics system leads to increased costs for logistics and lower customer service, in which case it is necessary to decide on the improvement of the logistics system of the company. This is a complex issue with an interdisciplinary nature and therefore the improvement of the logistics system requires multidisciplinary analysis.

Table 5

Risks at different levels of logistics chain management

Levels of logistics chain management	Risks of logistics chain management
Strategic management	Inadequate choice of enterprise strategy, inadequate goals and objectives, incorrect or inefficient planning
Planning and coordination	Deviation from implementation schedules, inefficient allocation and provision of necessary resources
Operational management	Inconsistency of actual indicators with planned values, late adoption of corrective actions, etc.

Realization of separate logistic purposes can be provided by system of branch logistic functions, namely:

- planning of the production program;
- planning of the production process;
- planning of the use of power;
- planning of material flow;
- internal production transportation;
- production control;
- operational management of production;
- ecology of production processes;
- packaging.

Logistics activity takes place in a very dynamic environment, so the state of the logistics system should be constantly monitored, analyzed and evaluated. The goal of improving the logistics system of the company is to increase the efficiency of logistics processes and improve the company's image on the market. The effect of optimizing a logistics system can be as follows: limiting the number of objects, for example, by consolidating them, changing their location or expanding the system by increasing the number of exploited distribution objects. The main criterion for change is to increase the efficiency of the logistics system and minimize overall logistics costs while maintaining the desired level of customer service.

The modern organization and operational management of production (material flows) must meet certain requirements, namely (Denysenko et al, 2016):

- providing rhythmic, coordinated work of all production units on a single schedule and even output;
- ensuring maximum continuity of production processes;
- ensuring the maximum reliability of planned calculations and the minimal complexity of planned work.

A prerequisite for optimizing the logistics system is the availability of a diagnostic system that would provide the enterprise management apparatus with the necessary data on the state of the subject, which would be the basis for decision making and forecasting for the future. The diagnosis of the operating system will have the effect of detecting its defects. Designing logistics systems should take into account the possible risks of implementing a solution and calculate with the help of mathematical models, possible benefits and losses for the enterprise.

In order to increase the efficiency from the practical results of designing logistics systems, the following recommendations should be distinguished:

1. Intelligent demarcation and correct decomposition of project objectives.
2. When designing a logistics system of an enterprise it is recommended to use information technologies that would allow visualization of the future logistic model for all its participants.
3. Development of an integrated diagnostic system for defects in the functioning of the logistics system.

CONCLUSIONS

The subject of research combines engineering issues with the expected level of efficiency of the movement of material flow and related information. The issue of minimizing mistaken decisions during the design of logistics systems remains relevant. The problem needs further study, in particular the study of the application of innovative technologies in the field of process simulation and the development of an integrated model for assessing the state of the logistics system.

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ПРОЕКТУВАННЯ ЛОГІСТИЧНИХ СИСТЕМ ЯК СКЛАДОВА ЕФЕКТИВНОГО ФУНКЦІОНУВАННЯ ПІДПРИЄМСТВА

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Зважаючи на той факт, що логістична діяльність відбувається в дуже динамічному середовищі, стан логістичної системи слід постійно контролювати, аналізувати та оцінювати. Дослідження присвячено важливому і водночас складному питанню – процесу проектування логістичних систем як важливої складової функціонування підприємства. Ця проблема не повністю вивчена як у теоретичному рівні, так і в області практичного застосування принципів проектування. Метою наукового дослідження є визначення сутності, завдань та особливостей процесів проектування логістичних систем. Предмет дослідження поєднує інженерні питання з очікуваним рівнем ефективності руху матеріального потоку та супутньої інформації. У роботі використані наступні методи дослідження: описовий, порівняльний, системний. В статті розглянуто сутність понять «проект» та «проектування». В ході дослідження визначено основні завдання проектування логістичних систем та наведено можливі умови їх впровадження. Систематизовано чинники, що зумовлюють успіх впровадження логістичних систем. На основі проведеного дослідження сформовано загальні рекомендації щодо проектування логістичних систем на підприємствах будь-якого типу, запропонована система галузевих логістичних функцій. Запропоновано список рішень, які приймаються в процесі проектування логістичних систем. В ході дослідження були визначені етапи проектування логістичних, відповідно до можливих завдань проектування логістичних систем. Результати досліджень показали, що при проектуванні логістичних систем слід враховувати можливі ризики впровадження рішення і розраховувати за допомогою математичних моделей можливі вигоди і збитки для підприємства. Практичною цінністю проведеного дослідження є запропоновані рекомендації щодо підвищення ефективності проектування логістичних систем.

Ключові слова: проект, проектування, логістичні системи.

ПРОЕКТИРОВАНИЕ ЛОГИСТИЧЕСКИХ СИСТЕМ КАК СОСТАВЛЯЮЩАЯ ЭФФЕКТИВНОГО ФУНКЦИОНИРОВАНИЯ ПРЕДПРИЯТИЯ

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Учитывая тот факт, что логистическая деятельность происходит в очень динамичной среде, состояние логистической системы следует постоянно контролировать, анализировать и оценивать. Исследование посвящено важному и одновременно сложному вопросу – процесса проектирования логистических систем как важной составляющей функционирования предприятия. Эта проблема не полностью изучена как в теоретическом уровне, так и в области практического применения принципов проектирования. Целью научного исследования является определение сущности, задач и особенностей процессов проектирования логистических систем. В работе использованы следующие методы исследования: описательный, сравнительный, системный. В статье рассмотрена сущность понятий «проект» и «проектирование». Определены основные задачи проектирования логистических систем и приведены возможные условия их применения. Систематизированы факторы, обусловливающие успех внедрения логистических систем. На основе проведенного исследования сформированы общие рекомендации по проектированию логистических систем на предприятиях любого типа, предложена система отраслевых логистических функций. Предложен список решений, которые принимаются в процессе проектирования логистических систем. Этапы проектирования логистических систем были определены в соответствии с задачами проектирования логистических систем. Результаты исследований показали, что при проектировании логистических систем следует учитывать возможные риски внедрения решения и рассчитывать с помощью математических моделей возможные выгоды и убытки для предприятия. Кроме того, были выделены рекомендации по повышению эффективности проектирования логистических систем.

Ключевые слова: проект, проектирование, логистические системы.

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