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STUDY OF GENETIC POLYMORPHISM AND ADAPTATION POTENTIAL TO DROUGHT STRESS OF BREAD WHEAT (*T. AESTIVUM* L.) OF AZERBAIJAN

[1,2]Hajiyev E.S., [1]Mammadova A.D., [1]Abbasov M.A., [1]Aliyev R.T.

[1]*Genetic Resources Institute, ANAS, Baku; e-mail: elcin_haciyev_1985@mail.ru;*

[2]*Research Institute of Vegetable growing, Baku*

The article presents the results of a drought tolerance study and genetic diversity assessment of 30 bread wheat genotypes grown in various conditions of Azerbaijan – on Absheron (irrigation) and Gobustan (bogar). To determine the degree of resistance of the samples to drought, several resistance indicators were used, such as the Stress Tolerance (STI), Mean Productivity (MP) and Geometric Mean Productivity (GMP), as well as Tolerance (TOL) and Stress Susceptibility Index (SSI). A study of the genetic diversity of bread wheat genotypes revealed high rates Mean Productivitys (MP=48.1) in var. *murinium* (YBFS12), Tolerance (TOL = -1.3) – in var. *erythroleucon* (YBFS35), geometrical Mean Productivity (GMP = 46.1) and Stress Tolerance Index (STI = 1.0) – in var. *cianotrics* (YBFS45), Stress Susceptibility Index (SSI = 1) – var. *erythroleucon* (YBFS35). Basically, there was a positive statistically highly significant relationship between the studied features. When assessing genetic diversity, 15 randomly selected ISSR markers were used based on polymorphism of 2 microsatellite DNA fragments. A total of 121 fragments were identified, of which 97 were polymorphic. The number of amplified polymorphic fragments varied in the range of 57-100 %. The variation in PIC values for the used 15 primers ranged from 0.270 to 0.48. Of the obtained 97 polymorphic loci, 37 were the most informative. The cluster analysis revealed the closest genotypes of var.*albidum* (YBFS48) and var.*barbarossa* (YBFS43), in which the genetic affinity index was 0.434.

Keywords: bread wheat, drought, tolerance, genetic diversity, genetic similarity

Drought, one of the main negative environmental factors that has a negative impact on the growth, development and productivity of wheat. Currently, the direction of breeding varieties for resistance is widely developing. Breeding resistant varieties presupposes a good knowledge of the source material and targeted attraction of it, the use in this work of the rich arsenal of the world's plant resources. It is necessary to increase the productivity of plants by introducing stress-resistant varieties into production, which are characterized by high yields. The creation of such varieties involves the study of the genetic diversity of populations, accumulation of information on the characteristics of plant traits. For this, it is necessary to study the gene pool of plants, assessment of plant diversity, their certification [1, 2].

Assessment of genetic diversity is carried out using various methods: traditional (morphological), biochemical (protein markers) and molecular markers. The use of genetic markers allows identification and comparison of alleles of different genotypes. Molecular markers include 3 groups: hybridization-based markers – RFLP, molecular markers based on PZR and markers for quantitative trait loci (QTL). PZR-based markers include random (RAPD, ISSR, AFLP, SRAP, etc.) and special markers (SSR, SNP, CAPS, etc.). These markers are adapted to detect differences in different DNA fragments. The use of RAPD, which includes a 10 nucleotide sequence, allows detecting random fragment polymorphism, amplified DNA fragment length polymorphism (RFLP), and single nucleotide polymorphism (SNP) [3].

Purpose of the study

The purpose of this study was to assess the adaptive potential to drought of collection samples of common wheat grown in contrasting ecological conditions (irrigated and rainfed) in Azerbaijan, in terms of yield elements, as well as to study genetic diversity using various ISSR markers.

Material and research methods

The object of the study was 30 genotypes (figure) of common wheat grown in various conditions of Azerbaijan – in Absheron (irrigation) and Gobustan (bogara). The main elements of productivity were studied: plant height, length of upper internodes, number of productive stems, number of grains of the main spike, weight of grains of the main spike, weight of 1000 grains, number of grains of 30 ears, yield). All studied genotypes of common wheat are of Azerbaijani origin.

To determine the degree of resistance of the samples to stress, the resistance coefficients were used:

Mean Productivity [MP = (Yp + Ys) / 2];

Tolerance [TOL = Yp – Ys];

Geometric Mean Productivity [GMP = $\sqrt{y_s y_p}$];

Stress Susceptibility Index SSI = [$(1 - y_s/y_p) / (1 - \bar{y}_s / \bar{y}_p)$];

Stress Tolerance Index [STI = $(y_p)(y_s) / (\bar{y}_p)^2$],

Yp and Ys: Grain yield of each genotype under non-stress and stress conditions, respectively.

$y_{\bar{p}}$ and $y_{\bar{s}}$: Mean grain yield of all genotypes under non-stress and stress conditions, respectively.

It should be noted that high values of the Stress Tolerance Index (STI), average fluidity (MP) and geometric mean yield (GMP), as well as low values of the Tolerance (TOL) and Stress Susceptibility Index (SSI) are equivalent to high resistance in the studied samples, which makes it possible to estimate them as stress-resistant [4].

Molecular analysis. The study of common wheat genotypes was carried out using 15 ISSR markers (table 3). When extracting genomic DNA, 0.1 g samples were taken from freshly harvested leaves according to the CTAB (cetyltrimethylammoniumbromide) protocol proposed by Doyle and Doyle with some modifications. The concentration and purity of the DNA molecule was determined using a NanoDrop device (Thermo, NANO DROP, 2000). The final volume of the reaction mixture for PCR sample was 20 µL and contained 2 µL of 10×PCR buffer, 2 µL of a 5 mM dNTP mix, 1.5 µL of MgCl2 (50 mM), 2 µL of each primer (15 pmol/µL), 0.1 µL of the Taq polymerase enzyme (1 U/µL), and 2 µL of isolated DNA (50 ng/µL). For multilocus intermicrosatellite analysis, 14 polymorphic ISSR primers with a length of 11–18 nucleotides were used. As a result of the optimization, the following amplification conditions were chosen: preliminary denaturation at 94 °C for 5 min; subsequent 35 cycles—denaturation at 94 °C (1 min), annealing temperature depending on the primer used (45 s), synthesis for 5 min at 72 °C; final elongation cycle at 72 °C for 10 min. Amplification was performed in a programmable T100 thermal cycler (Applied Biosystems, United States). Electrophoresis of PCR products was carried out in a 2 % agarose gel with the addition of ethidium bromide and visualization under ultraviolet light using the BioRad gel documentation system.

Statistical analysis. Analysis of the amplified fragments was carried out using the SPSS computer program. The assessment of resistance to stress was determined by the yield potential (Yp), by yield under stress (Ys), by Mean Productivity (MP), Geometric Mean Productivity (GMP), TOL – according to the obligatory decrease in yield (Yp-Ys), Stress Susceptibility Index (SSI), on the Stress Tolerance Index (STI) [5–7].

To assess the genetic diversity of wheat genotypes, a number of statistical parameters were calculated, including the genetic diversity index (GDI) and polymorphic information potential (PIC) [8].

The assessment of the genetic similarity between the samples and the construction of the dendrogram were carried out on the basis of Jacquard's genetic similarity index, clustering was carried out using the UPGM method.

Research results and discussion

Statistical analysis. Table 1 shows the mean values for the studied traits, standard deviation (SD), standard error (SE) and coefficient of variation (CV %). Each of the studied traits was characterized by high variability. The highest coefficient of variation of features was noted for the Tolerance (CV = 10.5 %), the lowest for the Stress Tolerance Index (CV = 0.02 %). Among the common wheat genotypes studied by us, the highest Mean Productivity (MP = 48.1) was exhibited by the YBFS12 var. *murinium*. The highest Tolerance was recorded in the YBFS35 var. *erythroleucone*, which was -9.8, the highest Mean Productivity (MP = 48.1) was shown by YBFS12 var. *murinium.*

The geometric mean yield index is an important indicator, the presence of a high indicator indicates a significant resistance of plants to stress. This indicator was the highest in the YBFS017K-45 var. *cyanotrics* (GMP = 46.1).

Low index of tolerance (-1.3), indicating a high plant resistance to the action of an unfavorable environmental factor, was noted for the YBFS35 var. *erythroleucon*. According to the data obtained, the YBFS45 var. *cianotrics*, whose stress Stress Tolerance Index (STI) had the highest value at 1.0, is stress-resistant.

Table 1

Statistical indicators of traits

	TOL	SSI	STI	MP	GMP	Yp	Ys
Average	10.8	0.87	0.75	39.7	39.1	46.9	40.3
Standard error	1.84	0.14	0.02	0.71	0.63	0.66	1.3
Standard deviation	10.2	0.82	0.14	4.0	3.55	3.7	7.4
Dispersion	10.5	0.68	0.02	16.0	12.6	13.8	56
Range	41.6	3.40	0.50	15.0	13	14.1	35
Minimum	-9.8	-1.30	0.50	33.1	33.1	40.9	18
Maximum	31.8	2.1	1.00	48.1	46.1	55	53

Analyzing the literature data of this direction, attention is drawn to the research of İmren Kutlu [9]. In his studies, the stress susceptibility index (SSI), when assessing the drought tolerance of wheat genotypes, varied in the range of 0.02-11.25. Genotypes with a Stress Tolerance of less than 1 are considered resistant [10], the range of fluctuations in the stress Stress Tolerance Index (STI) was 0.31-0.87.

Correlation analysis. Correlation analysis can provide valuable information when assessing plant genotypes [11, 12]. In this part of the research, the correlation between potential yield (Yp), yield under stress (Ys) and resistance indices was studied (Table 2).

As can be seen from the data presented in the table, with the exception of the relationship between yield under stress conditions (Ys) and the stress susceptibility index (SSI), a highly significant relationship was noted between the rest of the studied indices. There is a positive correlation was noted between potential yield (Yp) and other indexes. There was a significant relationship between yield under stress conditions (Ys) and Mean Productivity (MP) (r = 0.846), between potential yield (Yp) and Stress Tolerance Index (STI) (r = 0.825). There was a positive correlation between yield under stressful conditions and potential yield (r = 0.594 **).

In the studies of Amiri et al. [13], when studying the relationship between yield under stress and potential yield in common wheat genotypes, there was a significant positive correlation (r = 0.534 **). Assessing the drought tolerance of common wheat genotypes, Farshadfar and colleagues [10] noted a highly significant relationship between potential yield and stress Stress Tolerance (r = 0.835).

A significant correlation was noted by us between the yield under stress conditions and the geometric Mean Productivity, equal to r = 0.837, between the Mean Productivity and the Geometric Mean Productivity (r = 0.921), between the Mean Productivity MP and the stress Stress Tolerance STI (r = 0.898). The relationship between TOL and STI was 0.845, between GMP and STI – 0.894, between SSI and STI – 0.465.

The literature contains information on the need to use the indicators of stress Stress Tolerance (STI), average geometric yield (GMP) and Mean Productivity (MP) for the study of drought tolerance [6]. Basically, there is a highly significant relationship between the traits of common wheat [10].

Thus, the results of our studies are consistent with the data of other authors.

Molecular analysis. Of the 20 studied primers, 15 effective primers were selected for analysis. A total of 121 fragments were identified, of which 97 were polymorphic (80 %) and 24 were monomorphic (20 %).

The number of amplified fragments varied within 6-10, the length of the obtained fragments was 80-1100 nm. On average, one primer synthesized 7.6 fragments. Most of the amplicons were found using primers UBC 840 and IS15. The number of polymorphic DNA fragments varied from 3 to 9. The smallest amplification was observed with the UBC 857 primer, the largest – with IS15. The average number of polymorphic fragments was 6. Depending on the primer, the amplified polymorphic fragments varied within 57-100 %. The average level of ISSR primer polymorphism was 79 %. The polymorphism level for UBC811 was 100 %.

Table 2

Correlation coefficients between Yp, Ys and indices of sustainability

	Ys	MP	TOL	GMP	SSI	STI
Yp	0,594**	0,846**	0,823**	0,811**	0,493**	0,825**
	0,000	0,000	0,000	0,000	0,000	0,000
Ys		0,841**	0,324**	0,834**	0,302	0,841**
		0,000	0,004	0,000	0,289	0,000
MP			0,811**	0,921**	0,412**	0,898**
			0,000	0,000	0,000	0,000
TOL				0,711**	0,697**	0,845**
				0,000	0,000	0,000
GMP					0,423*	0,894**
					0,060	0,000
SSI						0,465**
						0,000

Table 3

ISSR primers and their statistical parameters

Primers	Repeating sequence type	NAF	NPF	PIC	Polymorphism, %	IDG
UBC808	$(AG)_8C$	6	5	0,4	83.3	0.8
UBC810	$(GA)_8T$	7	4	0,28	57.1	0.67
UBC811	$(GA)_8C$	8	8	0,44	100	0.9
UBC812	(GA)8 A	6	5	0,36	83.3	0.83
UBC827	(AC) 8G	6	5	0,28	83.3	0.6
UBC834	$(AG)_8YT$	8	6	0,38	75.0	0.8
UBC840	$(GA)_8TT$	10	8	0.36	80.0	0.81
UBC857	$(AC)_8TT$	6	3	0,34	50.0	0.4
UBC868	(GAA)6	8	7	0.41	87.5	0.85
UBC873	(GACA)4	6	5	0.37	83.3	0.7
HB14	$(CTC)_3GC$	8	7	0.43	87.5	0.8
ISSR3	TGT $(AC)_7A$	7	6	0.4	85.7	0.7
ISSR16	$CGT(CA)_7C$	9	6	0.48	66.7	0.9
IS 11	(AGC)6G	9	7	0.27	77.8	0.84
IS 15	$(GA)_8CG$	10	9	0.43	90.0	0.92
Average value	-	7.6	6.0	0.4	79.3	0.77
Total	-	121.6	97	-	-	-

PIC significance was calculated based on 15 selected primers. It is known that dominant ISSR markers have PIC values in the range of 0–0.5 [8]. For the 15 primers we used, the PIC value varied from 0.270 to 0.48, averaging 0.4 units. The lowest PIC is noted for primer IS11, the highest is for ISR16. Of the 97 polymorphic loci obtained, 37 were more informative. The most common polymorphic loci were observed when using the (AG) 8 and (GA) 8 primer dinucleotide repeats, in which the polymorphism was 100 %.

Analysis of the data obtained showed that ISSR primers, which include repeats (AG) n, are more polymorphic, which is consistent with the results of Hajiyeva's studies [8]. The effectiveness of using ISSR markers for studying DNA polymorphism was noted by us in other studies [1]. The high polymorphism of ISSR markers is explained by their multi-allelic and hypervariable nature.

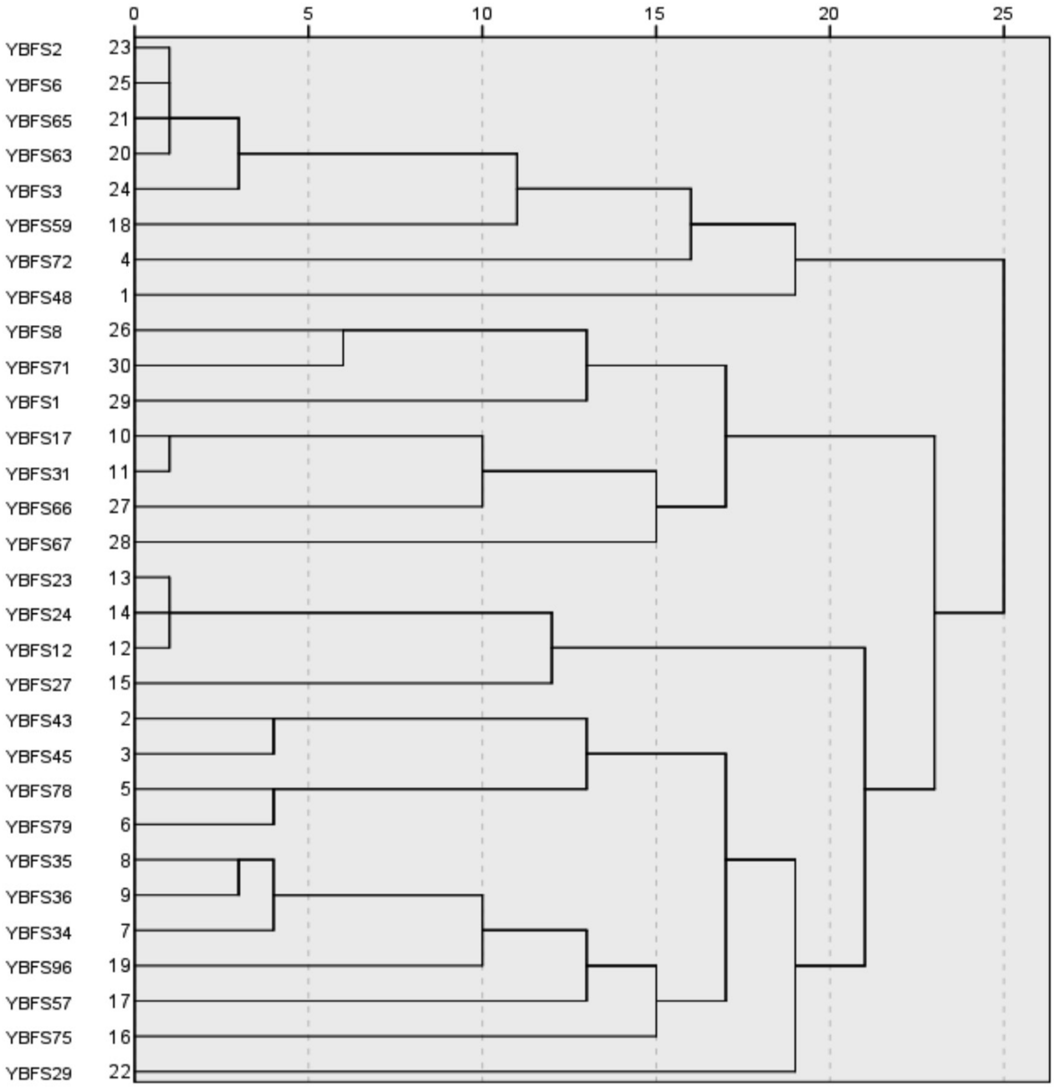
During the research, the genetic diversity index (GDI) was calculated for each ISSR locus. The average value of the genetic diversity index for each ISSR locus was 0.77 units. The primer IS15 had the highest index of genetic diversity, equal to 0.92 units.

In our studies, although most of the genotypes belonging to the same species were grouped into one cluster, nevertheless, polymorphism was noted within this species.

Thus, based on the analysis of the data obtained and the calculated values of the main parameters determined by the informativeness of the markers, it was found that the primers we used can be recommended for characterizing the genotypes of common wheat: for assessing the polymorphism of wheat genotypes, for determining the genetic similarity and genetic distance of various species and forms. Compared to other primers, IS15 and UBC811 are distinguished as the most highly polymorphic (90 % -100 %).

Cluster analysis. It is known, that cluster analysis allows identifying genotypes and revealing similarities and differences in plants [14]. Taking this into account, to assess the genetic relationship of the studied common wheat genotypes, the genetic similarity index was calculated by the Jacquard's method and a dendrogram was drawn up (Figure).

When analyzing the dendrogram, attention is drawn to the fact that the samples of the same species are located quite close, and the coefficients of their genetic similarity were close to unity. The closest genotypes in the dendrogram were YBFS48 var. *albidum* and YBFS43 var. *barbarossa*, in which the genetic similarity index was 0.434. Several genotypes were the closest in the dendrogram. For a number of samples, this indicator was equal to one.



Dendrogram based on the results of ISSR analysis based on the Jacquard's genetic similarity index

Conclusions

Thus, as a result of the statistical assessment of the indicators of the yield elements, wheat genotypes were identified that are distinguished by drought tolerance. Based on the correlation analysis, a positive significant relationship was established for most of the studied traits. Studies have confirmed the effectiveness of ISSR markers in assessing the genetic diversity and genetic relationship of common wheat genotypes. Research results can be used in breeding programs.

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PHYSIOLOGICAL EVALUATION OF PEA GENETIC RESOURCES UNDER DROUGHT STRESS

Huseynova T.N., Hajiyeva Sh.I., Mikayilova R.T., Abishova Kh.Sh., Kalbiyeva Y.E., Karimova F.R.

Genetic Resources Institute of ANAS, Baku, e-mail: abishova.xayala@mail.ru

The tolerance of plants to unfavorable environmental factors is one of the most important characteristics that characterize their adaptation to environmental conditions. This feature allows plants to survive in extreme conditions, including drought, and reveals their adaptive properties. The plants are exposed to a number of natural factors that limit their growth and productivity, which is manifested in a number of changes that occur at the cellular, physiological and biochemical levels. Evaluation of the photosynthetic properties of plants is of great importance in the study of their tolerance to environmental stresses. Since photosynthetic pigments are directly related to photosynthetic potential and initial productivity, the physiological state of plants can be assessed by determining the amount of pigments. So it is of great practical importance to determine them based on physiological indicators. The aim of the investigation is to study the adaptation of new genetic resources of peas (*Cicer arietinum* L.), introduced to enrich the national gene pool, to the negative consequences of drought from abiotic stresses and to assess the degree of resistance to drought. 20 pea (*Cicer arietinum* L.) samples of ICARDA origin were evaluated based on physiological parameters associated with drought tolerance. The genetic resources of the pea tolerant to abiotic stresses were selected for use in various breeding programs.

Keywords: pea, physiological parameters, abiotic stresses, drought, chlorophyll, carotenoids

Environmental degradation have led to increased stress, reducing of plant genetic resources, destruction of many valuable plants and the emergence of harmful combinations of genes and mutant forms. Currently, one of the most pressing issues in agriculture is the conservation and effective use of plant genetic resources, including legume biodiversity. One of the ways to solve the problems of food security of the population is to increase and develop grain and leguminous crops, which are considered the main food of humanity and an important source of vegetable protein. From this point of view, it is very important to expand the collection of leguminous crops, including peas, and create new varieties and forms that meet the requirements of intensive farming and are tolerant to changing environmental factors. The selected best genetic sources should be used in this process as valuable donors for environmental traits and indicators.

During their life cycle, plants are exposed to almost all natural factors, which negatively affects their growth and development, productivity and distribution of species. Complex responses to abiotic stresses are manifested by changes at the cellular, physiological and biochemical levels. The answer depends on the intensity and duration of stress, plant genotype, developmental stage, and environmental factors. In order to better understand the mechanism of plant adaptation to various stresses, it is necessary to develop new strategies for the breeding of tolerant genotypes, in order to ensure the growth and development of plants, their productivity under environmental stress.

It is necessary to develop new strategies for the selection of tolerant genotypes in order to ensure the growth and development of plants, their productivity under environmental stress conditions, and to better understand the mechanism of plant adaptation to various stresses.

Environmental problems associated with pollution are at the center of attention of the modern world. The consequences of any pollution seriously affect vegetation; therefore, crop production is multifaceted and subject to various studies. The majority of research focuses on the development and physiology of plants, their adaptation, reproductive ability, genetic variation, and so on. Taking into account the constantly increasing negative impact of abiotic stresses on the environment, conducting eco physiological studies is of great interest for agriculture.

The tolerance of plants to unfavorable environmental factors is one of the most important characteristics that characterize their adaptation to external environmental conditions. This feature allows plants to survive in extreme conditions, including drought, and reveals their adaptive properties. Throughout their life, plants are exposed to a number of natural factors that limit their growth and productivity, which is manifested in a number of changes that occur at the cellular, physiological and biochemical levels. The response of plants to abiotic stresses depends on the intensity and duration of stress, plant genotype, and developmental stage. Stress tolerance of plants characterizes the ability of plant organisms to perform their basic life functions in extreme environmental conditions, and the criterion of tolerance reflects the quantitative aspect of this ability. While every species, cultivar, or even individual plant has stress tolerance, it is a genetically controlled and inherited trait.

Under optimal conditions, this remains hidden and is only detected when the plant is exposed to extreme stress. The study of plant adaptation to various stresses is very important for the development of new strategies for the breeding of tolerant genotypes.

Tolerance of agricultural crops to drought, high or low temperatures, excessive humidity, salinization, etc. to adverse environmental factors such as climate change means that plants are tolerant to these extreme factors. The degree of tolerance inherent in each plant is determined by exposure to extreme environmental factors. As a result of exposure to such stress factors, a number of physiological parameters deviate from the norm, which leads to the loss of many agricultural products. Therefore, the use of plant varieties that are tolerant to environmental stress is of great economic importance. The complexity of breeding work on resistance to abiotic stress consists of control of complex genes with a complex structure to the response of plants to the effect of abiotic stress.

Drought is one of the main abiotic stressors in the environment. The negative effect of this factor slows down the growth of plants, weakens their physiological functions and even destroys the plants. Drought disrupts the normal course of many processes and has various physiological effects on plants. First of all, it causes water loss in plants. In the absence of water, leaf transpiration accelerates the flow of water into tissues, which creates a water deficit. A decrease in the amount of water leads to an increase in osmotic pressure in plants, a weakening of turgor and a closure of the stomata. Decreased transpiration leads to overheating of plants. All these changes make changes the chemical-colloidal composition of the cell cytoplasm (their viscosity and elasticity) and the permeability of the cell membrane. During drought, the amount of phytohormones regulating the growth – auxins, gibberellins and cytokines – decreases, the amount of abscisic acid increases.

These changes adversely affect the process of plant growth, causing the failure of the photosynthetic apparatus. Under conditions of water shortage and high temperatures, chloroplasts are destroyed and the synthesis of chlorophyll a and chlorophyll b is disrupted [1, 2]. Thus, drought has a strong and complex negative impact on many physiological processes. Since the parameters of photosynthesis, especially total chlorophyll, are directly related to photosynthetic potential and initial productivity, it is important to assess the degree of resistance based on the quantitative determination of chlorophyll when studying plant resistance to abiotic stresses.

One of the ways to use arid lands for agricultural production is the creation and cultivation of drought and salt tolerant plants.

Materials and research methods

The study was carried out on 20 samples of peas (*Cicer arietinum* L.) of ICARDA origin. To assess the drought tolerance of these samples planted in the field, leaf samples were taken from them during the flowering phase and the changes in the amount of chlorophyll a, chlorophyll b, chlorophyll a + b, and carotenoids were identified, which are indicators of photosynthesis associated with drought stress in the laboratory [3], and stress-resistant samples were taken.

Evaluation of photosynthetic traits is of great importance in the study of plant stress tolerance. Since photosynthetic pigments are directly related to photosynthetic potential and initial productivity, the physiological state of plants can be assessed by determining the amount of pigments. Photosynthetic pigments determine the activity of plants and are impacted by a number of environmental factors. So it is of great practical importance to determine them on the basis of physiological indicators. The pigment complex of a plant organism is characterized by sensitivity to changing environmental conditions. Under conditions of water shortage and high temperatures, the destruction of chloroplasts occurs and the synthesis of chlorophyll a and chlorophyll b is disrupted, the ratio of chlorophyll-protein-lipid complex of plastids changes.

Research results and discussion

Stressed plants show signs of adaptation, which increases the plant's tolerance to stress. It is known that the amount of photosynthetic pigments depends on the level of the impact of stress. Since an increase in the stress resistance of plant tissues is closely related to the state of the plastid apparatus, an increase in the total amount of chlorophyll can be considered as a plant response to stress caused by drought. It is also known from the literature that the leaves of stressed plants contain a large amount of tightly bound chlorophyll and are less susceptible to changes during stress [4]. Thus, in comparison with plants, sustainable to stress, the pigment system of drought-resistant plants is characterized by smaller changes in the effect of stress. This variability is mainly associated with the labile combined chlorophyll *a*, while chlorophyll *b* is stronger and less susceptible to change. This correlates with the very strong energy bond of the water molecule in chlorophyll *b* compared to chlorophyll *a*. All this proves that the pigment system of plants plays an important role in stress.

The obtained results are presented in the table (Table). According to the technique used, the ratio of the concentration of green pigments in the circles of leaves stored in experimental solutions to the control is considered an indicator of the resistance of the compared samples. This ratio is considered a criterion for evaluating drought and salt tolerant samples among the studied forms. As shown in the table, the studied pea samples – 13297 Flip 13-154C, 6800 F.93-93C, 13296 Flip 13-153C, 13298 Flip 13-194C, 13313 Flip 13-320C, 13299 Flip 13-227C, 13302 Flip 13-247C were considered high drought tolerant, in these samples the change in chlorophyll content due to drought was 105.6% – 126.9%, i.e. the rate of chlorophyll depression was not observed. 13295 Flip 13-151C, 13314 Flip 13-330C, 6785 ILS 482, 13301 Flip 13-240C, 13300 Flip 13-234C, 6814 F.82-150 were considered as tolerant, 13294 Flip13-70C, 13321 Flip 13- 358C, 13322 Flip 13-364C, 13324 Flip 13-376C, 13312 Flip 13-314C, 13306 Flip 13-258C were selected as moderate tolerant. 13323 Flip 13-369C – was rated as a susceptible sample (Table). The resistance of this sample to drought stress was 65%.

There was a positive correlation between the drought tolerance of pea samples and the change in the content of carotenoids in percentage (Table). In these samples, the percentage change for carotenoids was high (120.2% – 98.2%). As we know, carotenoids are an important companion of chlorophyll in the process of photosynthesis. They absorb shortwave radiation and transfer its energy to chlorophyll, increasing the efficiency of light. Carotenoids also have a protective function during photosynthesis [5].

Assessment of drought tolerance of pea (*Cicer arietinum* L.) samples by physiological parameters

№	Sample name (by sowing number)	The amount of chlorophyll in one leaf, mkg				The amount of carotenoids, mg in liter		Change in carotenoid content, %
		Chlorophyll a + b		Changes in the amount of chlorophyll due to drought, %	The degree of stress depression of chlorophyll, %			
		Control	Sucrose			Control	Sucrose	
1	13297 Flip 13-154C	5,33	6,77	126,9	0	0.317	0.381	120.2
2	6800 F.93-93C	7,76	9,6	123,7	0	0.468	0.541	115,6
1	13296 Flip 13-153C	5,71	6,7	117,0	0	0.581	0.603	103.8
4	13298 Flip 13-194C	5,37	6,1	113,0	0	0,460	0,460	100,0
5	13313 Flip 13-320C	7,36	8,29	112,6	0	0,802	0,883	110,0
6	13299 Flip 13-227C	8,25	9,39	111,4	0	0.460	0.502	109,1
7	13302 Flip 13-247C	5,68	6,0	105,6	0	0.506	0.559	110,5
8	13295 Flip 13-151C	6,09	6,24	102,5	0	0,471	0,550	116,8
9	13314 Flip 13-330C	7,36	7,45	101,2	0	0.380	0.390	94.7
10	6785 ILS 482	4,94	4,94	100,0	0	0.306	0.259	84.6
11	13301 Flip 13-240C	10,8	10,65	98,6	1,4	0.340	0.334	98,2
12	13300 Flip 13-234C	7,19	7,04	97,9	2,1	0.353	0.355	100.6
13	6814 F.82-150C	5,41	5,23	97,0	3,0	0,670	0,690	103,0
14	13294 Flip13-70C	7,34	6,86	93,4	6,6	0.474	0.480	101.2
15	13321 Flip 13-358C	9,5	8,47	89,1	10,9	0.325	0.290	89.2
16	13322 Flip 13-364C	9,51	8,31	87,4	12,6	0,432	0,360	83,3
17	13324 Flip 13-376C	10,8	9,44	87,1	12,9	0.347	0.262	75.5
18	13312 Flip 13-314C	8,0	6,8	85,0	15	0.406	0.359	88.4
19	13306 Flip 13-258C	9,38	7,75	82,6	17,4	0,786	0,557	75,4
20	13323 Flip 13-369C	7,03	4,56	65.0	35,0	0.320	0.215	67.2

During the research, the following results were obtained:

7 out of 20 samples of the studied pea plant (*Cicer arietinum* L.) – 13297 Flip 13-154C, 6800 F.93-93C, 13296 Flip 13-153C, 13298 Flip 13-194C, 13313 Flip 13-320C, 13299 Flip 13-227C , 13302 Flip 13-247C were considered high drought tolerant, 6 samples -13295 Flip 13-151C, 13314 Flip 13-330C, 6785 ILS 482, 13301 Flip 13-240C, 13300 Flip 13-234C, 6814 F.82-150 – drought tolerant, 13294 Flip13-70C, 13321 Flip 13-358C, 13322 Flip 13-364C, 13324 Flip 13-376C, 13312 Flip 13-314C, 13306 Flip 13-258C – samples were rated as moderate tolerant. A positive correlation was observed between abiotic stresses of the environment – the degree of resistance of photosynthetic pigments, that is, the total amount of chlorophyll, and the degree of resistance of carotenoids to the studied pea samples. In our opinion, this can be considered as an adaptation of the pigment apparatus to the effects of drought and salinity of the studied plants.

The evaluated samples can be recommended for use as a genetic source of drought resistance in future breeding work.

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STAKEHOLDERS' EXPECTATIONS AND DEMANDS FROM TESOL GRADUATES IN THE XXI CENTURY

Ashim A.A., Ayazbay T.A., Tursynbaeva M.B.

Suleyman Demirel University, Kaskelen, e-mail: ashimaltynay@gmail.com, torgyn.ayazbai@gmail.com, tursynbayeva.mb@gmail.com

As English language expands across the world, quality English teachers are increasingly needed. The model of the good English teacher is still in the process of formulation because the requirements for target language teaching changes time by time. Nowadays, most fresh TESOL graduates are not acknowledged about expectations and demands that are expected by stakeholders. This study attempted to identify stakeholders', specifically school vice principals, in-service teachers and school children, expectations and demands of TESOL graduates in the 21st century. As well, practicing English language teachers' perceptions about stakeholders' expectations and demands were investigated. A written interview and survey were used to discover stakeholders' perception regarding the personal and professional characteristics that English language teachers need to obtain. Overall, four vice principals and 15 in-service teachers were interviewed, whereas 84 students participated in an online survey. The qualitative method was used in order to collect in-depth information from participants via written interview and survey tools. According to the results, the remarkable findings were that most of the stakeholders expect from teachers to have minimum three years of work experience and school administration mostly seek candidates who have IELTS, TESOL and CELTA certificates, as well the letters of recommendation are required. As a result, the study may aid to improve the quality of teacher preparation courses, specifically it will bring benefit for administration to develop the proper curriculum for future graduates.

Keywords: TESOL, EFL, ESL, fresh graduates, stakeholders, in-service teachers

The popularity and relevance of the English language is enormous. Despite the fact that English is not an official language in many countries, the majority of people around the world apply it in various spheres such as economics, international relations and education. Thus, it proves the significance of this language in the global arena including Kazakhstan, where English is taught as a compulsory course in many schools, vocational schools and universities. Learning a target language is considered as a key to success for the local population. In order to meet the learner's desires, they are in need of competent TESOL professionals. TESOL stands for teaching English to speakers of other languages that provides the base for teachers to educate in both non-native English countries and within English speaking countries [1]. However, it is noticeable that the following program might be challenging as it includes different paths of teaching English. The demand for high-quality education in the world produced increases in the standards of TESOL teachers. Even though the program TESOL was established merely three decades ago, scholars who hold graduate and undergraduate degrees in this major are increasing rapidly. Before considering what is expected and demanded from TESOL graduates, the meaning of "TESOL professional" should be determined. It is defined as the one who is aware of recent developments by attending different conferences, reading journals and associating with professionals in the English Language Teaching field [2].

The term stakeholder has been established in society for some time now. However, there are still some people who are not able to understand the genuine meaning of this term. According to Hawrysz and Maj, stakeholders are the individuals who are related to an organization to the point when they might succeed or fail as a result of the organization's performance [3]. In the following study they will be principal and vice principals. Considering the fact that the performance of the school depends on the employees, in the face of teacher graduates, it is important for them to have their employees meet their demands and expectations [4].

By the growth of the number of different types of schools and language centers, the stakeholder's expectations and demands are becoming higher. There are several qualifications that are required from English language teachers (IELTS, TOEFL or CELTA certification), including the organization of extracurricular activities and intercultural experience [5]. Specifically, the first one constitutes coordination of social student clubs for the purpose of entertainment and personal growth. For instance, TESOL teachers may organize "Spelling Bee" contests, debate tournaments and drama clubs. Sometimes, a few international schools publish their monthly magazines whose editorial responsibilities are in the hands of English Language Teachers [6]. While intercultural experience in contemporary handbooks are considered as the fifth skill that ought to be taught along with speaking, writing, listening and reading. Thus, it involves communication and cooperation with multicultural groups with either work experience abroad.

Research objectives

The main objective of this research is to investigate stakeholders' expectations and demands from TESOL graduates in the 21st century. Moreover, the paper will collect data about practicing English language teachers' opinion and knowledge regarding the stakeholders' requirements.

The findings of the research paper will provide a better understanding of the after university career path for prospective English language teachers in private educational organizations and state schools in Kazakhstan. The data and results collected from the research will be helpful for TESOL graduates to be aware of what is expected from them while applying for a job. As the study may aid to improve the quality of teacher preparation courses, specifically it will bring benefit for administration to develop the proper curriculum for future graduates. Despite the fact that the educational system is improving over time, there is a constant need to adapt the traits of teachers in line with Kazakhstani standards.

Methodology

The main aim of this mixed research, qualitative and quantitative, was to identify demands and expectations of stakeholders towards practicing TESOL teachers. Since the quantitative study attempted to identify expectations and demands from TESOL graduates, therefore, the data was collected among school children. The format of the survey included both open ended and close ended questions. The numerical data coded and grouped in accordance with frequency of responses.

Primary data was collected through the written interview and through an online survey. Basically, there are two main categories of stakeholders: vice principals and pupils. For the first type a written interview was conducted that included questions regarding the headhunting process as well as teaching approaches they apply. The second type of stakeholders, pupils, responded to the survey in order to identify main qualities which they expect from their teachers. Most of the questions concern the teacher's ability to manage the lesson, establish a warm atmosphere and improve students' intercultural competence. The last category of participants were practicing teachers who work in different educational organizations. In the same manner with vice principals, teachers received interview questions via Word documents and assigned three days to fulfill them.

The participants of the written interview were four vice principals from various educational organizations, including both male and female with different cultural backgrounds. Distinctive factor that can contribute to research is the length of residence in a vice principal position, as following interviewees range from one to twenty years of experience in school management. As well, the level of obtained higher education is moderately the same, only one participant has a master's degree while other three vice principals have bachelor's degrees. The next category of participants are the school students who are the main part of the quantitative part of the study. Overall, there are 84 students both from public and private schools. Based on the demographic information 49 students are between the age of 15-18, and 34 students are at 11-14 years, whereas only one respondent is between 6-10 years old. Specifically, they have different first languages, and English language proficiency level is derived from elementary to upper intermediate levels. Furthermore, the practicing teachers' total sum is 15, including 13 female and two male teachers, age variation is between 20-50 years but most of them are around 20-30. English language is considered as their second and third language.

Findings and Analysis

Findings are organized by dividing the responses of participants to vice-principals, in-service teachers and school students. Responses of the vice-principals focus on various aspects such as the recruitment process and essential skills that they look for from teachers. In the same vein to ensure data triangulation, answers of teachers were compared to the vice-principals.

Majority of the stakeholders (75%) stated that during the recruitment process, it is obligatory that candidates' should have a minimum 3 years of work experience in the related area. Another 25% of them believe that teaching experience is not required and language proficiency is needed. Furthermore, the 25 % mentioned that in order to gain some experience at least seven years required, undoubtedly, it may differ from person to person. However, in comparison to stakeholders the majority of teachers (67%) responded as it was not required, while the rest of the interviewees (33.3%) were in need to have it, but with a different number of years of experience. Teachers were asked to have an experience with the length of three, two and one years. Exception was used for the teacher who obtained a master's degree level. This participant was not required to have teaching experience. Considering the requirements of GPA and transcript 75% of the participants responded that GPA is not being asked and it is not considered as a main criteria of successful recruitment. Moreover, they claim that the GPA is not an indicator of competency in the teaching field, as the profession directly relates to behaviour and personal characteristics. Meanwhile, 25 % said that it is necessary during the selection process.

Another question was connected with the types of qualifications and language proficiency certificates that are necessary for teachers to get a job (IELTS, TOEFL, TKT, CELTA, DELTA, TESOL, etc.). In this question, the answers slightly differ from each other since 25 % of the stakeholders stated that IELTS/TOEFL and TKT qualifications and language proficiency certificates are required, whereas another 25 % claimed that TESOL, IELTS and TKT results are necessary. The other 25 % noted that TEFL and TESOL certificates are essential to start teaching English as a Foreign Language. Furthermore, CELTA, DELTA and other qualifications should be acquired so that one may go deeper in further training. The last 25 % highlighted that the only diploma (university degree) is needed. On the other hand, the IELTS certificate was one of the most popular certificates to be asked among teachers, as 60 % were in need of it. Whereas, TKT and CELTA certificates took second place, being asked by 13 % stakeholders. The rest 33 % were not obligated to provide any of these certificates.

In case of approaches and methodologies that are expected from a candidate to teach English (PBL, CLT, CLIL, etc.) answers differ entirely, hence 25 % of the respondents stated that teachers can apply various methodologies according to their characters and abilities. Furthermore, if teachers are successful at classroom management and achieve good communication with the students and accomplish the goal of the lesson it is not significant what methodology they apply while teaching. Meanwhile, another 25 % of the participants mentioned that prospective teachers should apply different approaches such as the "Direct Method", "Total Physical Response", "Communicative Language Teaching" and "Task-based Language Learning" approaches and methodologies. But the other 25 % stated that candidates should mostly practice CLIL methodology in teaching English Language. The last 25 % of the stakeholders mentioned that teachers should teach according to the new taught module, however, the explanation of the statement is not provided in the answer. Despite that, 60 % of teachers answered that they were required to present a lesson to prove their proficiency. The criteria for all teachers were mainly to make it understandable for students and creative. The remaining 40 % of teachers were not asked to present any type of lesson.

Finally, all of the stakeholders agreed that basic ICT skills are necessary, specifically the knowledge of Microsoft Word, Powerpoint and Excel programs. Moreover, one of them highlighted that prospective teachers should be able to create engaging videos on different topics. Regarding Emotional Intelligence (EI) 75 % of the stakeholders considered EI as a crucial aspect in the candidate selection process. Among them, one participant claims that they observe a candidate during the internship program. However, another 25 % mentioned that she/he does not consider this criterion, but in the near future it is quite possible. Vice principles of educational organizations shared with their insights on the preferable skills of the candidates and the procedure of recruiting the teaching staff.

Accordingly, 75 % of the respondents consider the recommendation letter as an important criterion that should be presented during the selection process, as it provides reliable information about candidates' professional and personal characteristics to some extent. On the contrary, 25 % of stakeholders assert that the recommendation letter is not required. While considering personal qualities, the ability to develop relationships with their students and parents is highlighted as the most important feature that teachers should have. Following that, personal characteristics as a responsibility, patience, empathy and kindness are required. Considering professional characteristics, knowledge of learners, dedication to teaching and engaging students in learning are recognized as significant aspects. Moreover, 75 % of the stakeholders claimed that intercultural experience is essential as it fosters intercultural learning referring to practical knowledge (attitudes, skills) of the differences and similarities between cultures. Besides, one suggests that internship programs such as the AIESEC program would be a big experience for a candidate. Despite this, 25 % of the participants believe that intercultural experience is not much needed. Majority of vice-principals noted that 75 % of the participants said that candidates search by themselves for a position. However, 25 % mentioned that they look for prospective teachers via websites and acquaintances.

Following section provides the responses of the in-service English language teachers for the interviews and survey. TESOL teachers commented on the personal qualities and skills required while applying for a job. There were various answers to the question about personal qualities and skills. Nevertheless, being "communicative (40 %), hard-working (20 %) responsible (26.6 %)" were the prevailing ones. Moreover, these qualities were less mentioned: open-mindedness, leadership, empathy, flexibility, diligence, being easy-going and sociable (13.4 %). Considering the social and extracurricular activities 87 % of teachers were obligated to arrange an activity with the attendance of students. Most of the activities had to be related to English language. After school activities like debates (40 %) were prevailing among teachers. There were also activities which were not required to be conducted in English such as sport activities, city excursions that were aimed for teachers to get along with students. While 13 % of teachers were not obliged to conduct extracurricular activities.

In relation to the interview the main challenges faced by the novice teachers were:

- balancing diverse learning needs
- mismatch of lesson plan and its implementation
- assessment
- application of active learning (organizing group work, engaging with material)
- performance pressure from school administrators
- time management
- adapting to each learner's psychological characteristics

Additionally, QAC claimed, "I wish I was more relaxed and less of a worrier because I used to spend my free time at night or the weekends preparing and thinking about my work and it was toxic. It is essential that teachers also know how to separate work and personal life".

There are four open ended questions those asked school children regarding their perception of English language teachers where students listed essential personal and professional qualities which TESOL teachers need to have. Professional Qualities: engaging into the lesson, speaks only English, should speak English like a native, good time-management skills, does not put too much pressure on students. In contrast, personal qualities: patience, building rapport, sense of humour, discipline, a man of integrity.

Conclusion

The primary purpose of this thesis was to identify expectations and demands of stakeholders from TESOL graduates in the 21st century. The first research question concerned the demands that vice principals of different educational organizations require from TESOL graduates, therefore professional and personal characteristics of English language teachers are going to be discussed. Then, according to the second research question, expectations and demands of stakeholders were considered from the English language teachers perspectives.

Remarkably, some of the stakeholders and teachers stated that certificates such as TKT, TESOL, CELTA and TEFL should be acquired by the time candidates apply for a job position. However, fresh graduates may not have a clear view and understanding about these qualifications as during the university studies they are not provided. As well, the high price of those certificates could cause issues in their accessibility. Other results indicated that while considering professional characteristics, almost all of the stakeholders require recommendation letters from candidates during the selection process. It is considered as an essential criterion as it provides reliable information about candidates' professional and personal characteristics to some extent. Another quality that is demanded from all of the stakeholders is an intercultural experience, as it fosters intercultural learning referring to practical knowledge (attitudes, skills) of the differences and similarities between cultures. Furthermore, according to a stakeholders questionnaire, the majority of the vice principals claim that three years of work experience is asked from a candidate. However, it complicates the employment process for the TESOL graduates because after the graduation they did not obtain any certified teaching experience, except for the short term internships. While considering personal qualities, the ability to develop relationships with their students and parents is highlighted as the most important feature that teachers should have. It clearly demonstrates that the ability to control emotions (EI) is one of the necessary skills that teachers should obtain, as all stakeholders agreed that it is a crucial aspect in one's personality.

According to the answers given by the practicing teachers, the importance of the IELTS certificate while being hired can be witnessed. The majority of participants, who participated in the questionnaire, admitted that the possession of this international certificate is vital to demonstrate one's language proficiency to the administration of the educational organisation you are applying for. It demonstrates that the stakeholders of today's society find the IELTS certificate reliable while choosing a proper candidate for a position. Another essential aspect that needs to be considered for a teacher while requesting for a job position is to make sure they have qualities such as being communicative, responsible and having EI ability. With the help of the written interview it was discovered that qualities mentioned above were the most required ones. Finally, in-service teachers recommend that in order to keep the passion in your profession there should be a clear balance between work and personal life. As if the teacher does not follow it, they might be exhausted in a short time span.

In order to reach the data triangulation school students' responses were used. According to questionnaire results, the majority of students seek good teaching skills and a high level of English language fluency in their teachers. In addition to this, pupils prefer teachers speaking only in the target language during the lesson. Considering the personal qualities, the majority of students expect patience and ability to establish warm relationships from their educators. Along with integrity, students appreciate when tutors are considerate and entertaining.

In conclusion, it can be noticed that the results' indications of the stakeholders and teachers do not correlate partially in means of the requirements that stakeholder demand and teachers' answers according to these criteria. It might be the result of the fact that only from four educational organizations both stakeholders and teachers could be interviewed. However, ten other teachers' stakeholders were unavailable to contact.

According to results, the first half of the stakeholders require an IELTS certificate but the demands may vary annually. Analyzing teachers' responses, most of them stated that the IELTS was required while applying for a job, meanwhile a few of them claimed that it was not necessary. While considering personal characteristics, it was evident that students and stakeholders mostly seek EI(emotional intelligence) ability from TESOL teachers, specifically in questionnaire school children several times noted that their teachers lack empathy and patience. For the future studies, special care should be taken to ensure that respondents give complete and accurate information about each question. This could be accomplished by accurate and expanded explanation of the research purposes and the background information.

If the favorable conditions are provided, it would be perfect to have sessions with stakeholders, teachers and students several times in order to increase the validity and reliability scale. Considering the problem of inability to contact stakeholders, to fix this obstacle, the help from local authorities and university administration could be requested.

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DIDACTIC PROBLEMS OF THE DIGITALIZATION OF EDUCATION

Kuznetsova A.Ya.

Novosibirsk State Pedagogical University, Novosibirsk, e-mail: phileducation@yandex.ru

The article presents the problem of the development of educational didactics as important for modern society. It is pointed out that elements of modern didactics are presented in numerous works on the theory of education. Attention is paid to the current state of the main components of didactics: the content and methods of teaching. The introduction contains a description of the state of didactics in Russia in the 17th century. The historical steps leading to the transformation of the educational system are outlined. The cultural and historical character of their improvement is emphasized. Based on an analytical review of modern scientific sources, it is shown that the transition to digital forms of education is accompanied by an increase in the activity of pedagogical research on learning processes in Russia. New special concepts used in the description of the distance education process are listed. A description of a number of information technologies that form the foundation of digital learning and upbringing processes is given. The need in the theory of education to update the modern paradigm of education, taking into account the digitalization of didactic models, is noted. Reflection of modern digital education resources presented in scientific literature is carried out. Expansion of didactic opportunities in the context of digitalization of education is noted. The conclusion is made about the need to systematize the already solved problems of distance learning. New problems generated by digitalization are outlined.

Keywords: learning process, teaching method, information technology, digital resources, digital paradigm of education, development of didactics

A cultural-historical analysis of education problems shows that the state of didactics can influence the development of the entire society. Historically, didactic methods have evolved over thousands of years. Practice, reflection and cultural translation of didactics were systematized into pedagogical theories [1]. Turyshev I.K., comprehending the history of the development of pedagogical ideas in Russia, shows how the didactics of Russian education gradually, with great efforts of a practical nature, very slowly moved through scholasticism to creative methods of teaching and thinking [2, p. 84]. In didactics of the early XX centuries. along with the experimental method, he singles out, as the fundamental, the verbal-book method of teaching. Historically, there was a gradual formation of more and more verbal and book teaching methods in terms of the level of development: The primary one is a dogmatic method, based on primitive cramming, on scholasticism. The teacher using this method does not allow the learner to comprehend the content, to convey its meaning in his own words. The main goal of the method is to memorize the text verbatim. To use the dogmatic method, the teacher focuses the student's attention on the need to have a good memory. The learning outcome depends on the possession of the verbal apparatus. Dogmatic teaching excludes the creative nature of mastering knowledge, excludes individual reflection on the content of learning by both the student and the teacher. The method of retelling the content of the text of the textbook by the teacher, its literal reproduction by the student can be attributed to a higher didactic level. Its application presupposes the presence of the rudiments of reflexivity in the activities of the teacher and the possible inclusion of the student's consciousness in the comprehension of the content of education. The method of explaining the material of the textbook by the teacher and the subsequent reproduction of it in their own words by the students raises didactics to an even higher level of verbal and book teaching. The method of explanation does not imply the student's own productive mental work, but his reflexive activity is allowed. The student can retell the content of the text in his own words, which requires comprehension of both the text and his own statement [2, p. 84].

The dogmatic method was the main one in the education system at the Kiev Theological Academy and the Moscow Slavic-Greek-Latin Academy in the 17th century. Physics in these important educational institutions of Russia was taught in the subject of philosophy in Greek and then in Latin. Significant changes in Russian didactics of the 18th century, which led to the transformation of teaching methods and the liberation of the teaching system from the dominance of the dogmatic teaching method, were initiated by the activities of M.V. Lomonosov on the translation of scientific literature into Russian. It marked the beginning of fundamental changes, first in the content of education, and then led to phenomenological changes in the system of national education. In 1976 ye. Wolfian Experimental Physics [3], translated by Lomonosov from latin, was published. This is how the first textbook on experimental physics in russian appeared in Russia. In accordance with a special decree of the Senate, which instructed the translator (M.V. Lomonosov) to lecture on this subject in russian. The transition to russian in the verbal and book teaching method allowed Lomonosov to introduce new concepts of physics and technology: horizon, refraction of rays, atom, molecule, temperature, etc. As a result, the study of physics, the development of technical terminology became available to a wide range of students in Russia already in the 19th century. Without such changes in the content and methods of teaching, intended for all strata of society, Russia would not have had the opportunity to make the historical scientific and technological transformations of the 20th century.

Currently, in the conditions of the scientific and technical information society, the verbal and book teaching method still forms the basis of modern didactics. Along with this, the digitalization of society, education and the training system introduces significant changes in the state of the content, processes and learning outcomes.

Literature review

The modern level of intellectualization of society and education [4], the widespread use of digital distance learning forms in society, the detailing of digital presentation of information, the formation of a digital educational space, the intellectual nature of digital technologies create conditions for the formation of a distance-digital education system (DDSE). The theoretical description of the digitalized education system in modern sources contains a listing and analysis of the content of new concepts of digital didactics: digital school, digital university, open online courses; open educational resources, integrated digital educational environment – concepts that lay the foundation for a new paradigm of digital distance education. The digital school provides free access to electronic educational content; the model of a digital university is reflected in a software package that provides educational, managerial and communicative learning functions [5]. The digitalization of the education system contains the general idea of transformations, which are called the digital revolution. Adapting to the digital revolution means that the education system gets the maximum benefit from digitalization [6]. The transformations associated with the "digital revolution" contain new opportunities for further mastering the personality-oriented paradigm of education: self-development in education; activation of students' cognitive activity; taking into account the individual characteristics of students; increasing the effectiveness of training through the implementation of a student-centered learning model. Revolutionary changes involve the development of a strategy for the development of students' digital competence; integrated implementation of distance online technologies in higher education organizations; increasing opportunities in organizing students' independent work; development and mastering of digital tools for interaction between students and teachers in the educational process [7]. The practical development of digitalization can be effectively used to solve important social and educational problems: increasing the availability and quality of education. The effectiveness of digital technologies as new communication tools affects the expansion of intercultural communication, provides the opportunity to use a wider range of forms of communication in the educational multicultural space of universities [8]. In line with general transformations, universities are embarking on an independent digital transformation of curricula, using the experience of other universities and focusing on opportunities to improve the quality of education through certain solutions for the digitalization of materials and services. as a result of mastering digital didactics, digital renewal of teaching content, development and mastering of digital teaching methods, digital forms and means of education, a university can get a significant improvement in learning outcomes.

The Digital University project developed for its implementation in 2022 serves as an example of digitalization of higher education. It is important to comprehend digitalization aimed at solving the problems of didactics as a general fundamental problem of learning. The digital paradigm is becoming a full-fledged component of modern education. Currently, the use of information technology leads to the transfer of educational materials to a digital environment, to the replication of digital tools. Further immersion of education in the information environment requires a full-fledged development of all elements of didactics that ensure the modern level of quality of education. The possibilities of digital didactics should be extended to planning learning outcomes and optimizing all didactic elements: learning content, methods, means and forms of educational work, the development of digital training and education projects [9].

The rather abrupt transition of educational institutions to distance learning, accelerated by the 2020 pandemic, is associated with the introduction of digitalization of learning processes. Theoretical comprehension of these processes leads to the formation of elements of a new digital paradigm of education. The practice of working in the new digital paradigm also requires detailed reflection on all elements of learning. Formally, a digital learning system begins with a more arbitrary choice of place – time (coordinates) and forms of the learning process. Its organizational capabilities are expanding. Information-digital form of education allows both collective learning and the development and implementation of an individual educational path. Digital technologies enrich didactics with a set of learning forms. The teaching uses: multimedia scripts of lessons and lectures; educational video and audio materials, 3D; educational audio materials, 3D; studying programs; virtual museums, libraries and laboratories; individual control systems of progress, electronic diaries, reports, collections of tests [10]. New forms of learning, in which learners not only actively consume electronic resources, but also master the function of creators of new resources, allow deepening the subject-subject relationship [11]. Distance education poses the problem of mastering information and communication technologies for specialists in the field of education. The use of digital technologies makes it necessary to strengthen the virtual communication of specialists, strengthen the development of scientific, technical, cultural, economic ties, and form a common language of communication [12].

The educational environment of preschool education (PE) is also immersed in the general movement of digitalization. Digital technologies are being updated at the points of development of the formation of a digital educational environment for PE. The creation of a developing environment corresponding to the natural inclinations of a person, an active environment in scientific sources is attributed to the strategic tasks of modern preschool education, which fully corresponds to the classical idea of free education (Russo, Tolstoy). Digital technologies make it possible to develop alternative educational programs, taking into account the individual needs and interests of PE. It is assumed that the development of additional educational programs, as well as the improvement of the basic ones, is purposefully aimed at including children from an early age in active developmental activities in accordance with their natural data. A special place in the study is occupied by the problem of the formation of the ability for professional self-determination of children from an early age; researchers are looking for the possibility of developing the ability for social self-determination in young children [13].

The problem and purpose of the study

The purpose of the article is to show that the transition to digital forms of education and upbringing gives rise to numerous didactic and educational problems in the education system. Many of these problems are in the field of attention of theorists and practitioners of educational activities. The solution of practical problems of digital learning creates new didactic problems: the result of education, which is in conditions of continuous transformation, depends on the quality of solving didactic problems and continuous reflective attention to them. The digitalization of management processes combined with their reflexivity not only expands the set of management tools, but also makes it possible to fundamentally change the quality of the management system of modern education. Among the problems of the formation of a distance-digital environment of education, the following are distinguished as the main didactic problems: digital competence of a teacher; digital management of the process of education, training, upbringing; development of electronic courses; development of electronic controls; improving the quality of the educational process during the transition to digital forms of education [14].

A digital resource in models imitating professional activities is able to ensure the integration of science, technology, digital pedagogical management of the educational process based on existing uniform standards for training highly qualified personnel with professional digital literacy skills [15].

Research results and discussion

The increased attention to the problems of digital didactics is expressed both in the growth of the number of relevant theoretical studies and in the active practical development of digital technologies. Thus, at the Siberian Federal University, work was carried out that made it possible to determine the indicators of digital competence of specialists working in the field of education. Scientists have developed a digital model of competencies for an education specialist, consisting of basic and professional levels. The model was tested in the Siberian region. As a result of the attention of modern researchers to the problems of digital didactics in the practice of education, professional standards for the digital competence of a specialist have been approved. Based on the developed models, scientists were able to improve the training of masters in specialties focused on the practice of digitalization. The digitalization of education and society, the digital revolution also gives rise to new problems, certain humanitarian threats, such as information and psychological security [16].

Analysis of scientific literature shows that the results of digitalization are reflected in the formation of certain new digital forms of didactics. They act as elements of the digital space. digital educational process. Digitalization changes the forms of education and upbringing, the forms of contacts between people in the learning process [11], digital forms of educational information in Internet resources, etc. In the digital educational environment, already existing didactic forms are widely used: organization and control of training, various types of lectures, classical seminars and workshops, collective and individual project assignments, tests and creatively combined forms of training, including at the same time a lecture, an analytical seminar and conference forms of training. The digital environment makes it possible to organize the management of the educational process on the basis of its reflective forms: mutual control and self-control. In addition, the presence of a digital space increases the possibilities for distance learning, the use of new forms: distance educational online technologies, multimedia scripts for lectures, seminars, and lessons. The digital environment allows the wider use of video and audio materials, virtualization programs by transferring the online educational process to museums and libraries [17]. The inclusion of a student in research activities organically fits into the organization of the digital educational process. At webinars, a culture of scientific communication is formed and develops, elements of collective thinking activity are formed. The results of discussions, reports, drawn up in the form of texts, become the basis for preparing material for publication in educational and scientific publications [17]. Research activity, organized as a collective mental activity, using information technical means, most productively allows you to combine individual and collective forms of developmental educational work.

Conclusions

Theoretical work on understanding the digitalization of education leads to the formation of a new pedagogical paradigm [18]. At present, in practice and in reflexive-semantic pedagogical activity within the framework of the digital educational process, separate important constituent elements are distinguished: digital educational environment; digital forms of presentation of educational content; digital educational technologies; digital teaching methods, etc. The latter are distinguished by time savings and acceleration of the processes of working with information. Comprehension of the ongoing digitalization of education, scientific reflection of this understanding, discussion of the results of its analysis requires the development of a new one and filling the existing categorical apparatus with content that corresponds to the conditions of the digital environment. The quality of this methodological activity will affect the success of the formation of the digital education paradigm. Of particular importance for improving the modern educational paradigm are the concepts of the digital information space and the digital educational environment, which become a means of educational activity. For four centuries, the generally accepted verbal and book teaching methods have gone from dogmatic, aimed exclusively at developing the individual's memory, to a productive, creative teaching method. Modern teaching theory includes the methodology and reflection of teaching didactics aimed at the formation of productive thinking.

Many digital methodological forms have already been developed and are ready for use. Further updating of the digital educational environment requires not only their systematization, but also the reflexivity of teachers. The digitalization of educational processes requires a revision and rethinking of the practice of education, ranging from the didactic steps of individual teachers to numerous educational programs of training systems. Currently, the problem of developing productive digital teaching methods that correspond to the creative nature of the students' development is being actualized. Without reflexive consideration of the productivity of the new digital method, it becomes possible to return didactics to the level of dogmatic teaching. The reproductive method of teaching creates conditions for enriching the student with a significant amount of information that is not intended for his personal development. The transition from a book to a digital form of education requires continuous professional pedagogical work to adapt the existing classical didactics to a new digital form of education, provided that the creative nature of learning is ensured. The creation of a project for a digital educational space and reflexive work with its content becomes an additional function of the pedagogical sphere of education.

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THEORETICAL ASPECTS OF STUDYING THE GENRE OF HISTORICAL NOVELS IN MODERN LITERARY CRITICISM

Dautova S.B., Ospanova B.R.

RSE PVC "Kazakh State University Abay", Almaty, e-mail: baian_80@mail.ru

Interest in historical romanticism has always been present in all literature, although this emphasis is particularly important in the comparative context of literary criticism genres. The historical novel, which was formed during romanticism in western European literature, showed its artistic features in the national literature of the later period with a clear and original expression. The comparative and typological consideration of the genre originality of these works is of great importance in the context of general cultural ties and the general evolution of the genre of history.The article is aimed at researching the artistic concepts of the historical personality in the literary process in the milestones in a changing socio-cultural context. On the basis of the latest research strategies, a systematic study of the artistic concept of the historical personality of the great figures of the era of the Golden Horde, who are of key importance in the formation of the statehood of Kazakhstan, will be carried out. A fundamentally new formulation of the problem involves the study of the evolution of the artistic concept of national history on the basis of historical novels of the XX and XXI centuries in the milestones – Soviet, post-Soviet, the period of independence of modern Kazakhstan.

Keywords: that characterize the industry and the application direction for the experts selection: Philology, literary studies, artistic concept, historical personality, historical novel, the Golden Horde era

Since its emergence in the system of literary genres, the genre image of a historical novel has long been a platform for theoretical discussion at a certain level. This is determined by the genre search, both within the boundaries of the structure of the novel's forms and within the architext of the novel, since the novel became the dominant genre among other artistic forms in the twentieth century. If we analyze the formation and change of the historical genre in the context of the changes observed in World Literature, in the sphere of culture in general, without elaborating or concretizing, it should be noted that the historical novel absorbs all these changes, giving it a different look, creating its genre achievements. That is why we consider a comprehensive description of the genre of a historical novel to be the most productive way to study its structural type. In the theory of literature, there are several approaches to the study of genre categories. Summing up, we can say that they are thematic, functional and structural. It is known that there are several facets of genre classification, each of which describes a different area and function of a complex structural type of aesthetic work. When studying the genre nature of a historical novel as a genre formation in a very large social sphere, we must determine what is the static core of the novel type under study and what caused it to undergo dynamic changes. In Literary Studies, a genre is a kind of solid structure characterized by a dichotomic structure with repetitive features, i.e.: "a genre is a stable structure in which some of the content of an event is formed, as well as dialectical harmony, in which different types of lexical and compositional systems and their content beginnings interact".

In some literary works, it is also suggested that 1 genre-forming dominant feature includes a problematic beginning, which becomes a certain type of plot-compositional structure. Other researchers give priority to the role of the structural and compositional form: "the genre, like all art forms, is a form that has been strengthened, transformed into a certain literary structure of content".

In the science of literature, there are other aspects of commenting on a genre. In them, this category of literary studies is considered from different theoretical points of view: on the one hand, the genre is relatively stable, according to which its typological feature is indicated; on the other hand, its mobility, variability is observed, and this aspect is studied by coming from a specific historical point of view. The study of the genre from a typical point of view is considered in the works of V. Kozhinov, G. Pospelov. The study of the latter is connected with time, so it is constantly in motion.

At the turn of the XX-XXI centuries, the novel is undergoing a significant genre change, becoming an experimental (experimental) platform of various artistic approaches, and traditional and non-traditional, ancient and innovative aesthetic forms are mixed. Analyzing the current literary process, researchers believe that the idea that the novel is over may be a sign of something else, that is, the novel's integrity reflects the process of becoming a "meeting place" and a dialogue of different cultural traditions and views. For example, N.T. Rymar concludes that "despite the differences in the content and plot-compositional form of the novel of the twentieth century from the traditional form, the structure of the novel thinking does not disappear, only the form of its presentation in the poetics of the novel changes significantly." The search for new genre forms is also reflected in the structural state of the historical novel.

Hegel's conclusion about the genre content of the novel belongs to him. He was the first to pay attention to its socio-historical origin, thus emphasizing that the aesthetic phenomenon of the genre will be meaningful because it will contain the concept of man and reality. The philosopher considers the origin of the novel genre in connection with a certain social situation in which the conflict between the individual and society becomes clearer and clearer. At the beginning of the formation of the individual, the complication of the individual's self-expression determines the nature of the conflict in the novel.

First of all, the lack of research of the Golden Horde epoch. This was due to an official ban on the Golden Horde in 1944, which was extended to the 1980s. T. Kozyrev notes: "then everything was done to erase the Golden Horde from the memory of the people. ... the historical consciousness of the Kazakhs and other Turkic peoples of the USSR during the Stalinist period underwent a vivisection of unprecedented scale" [1].

Secondly, an important precondition for domestic science, including philological, is the significance of the Golden Age as an object of science. The departure from history, the subsequent study of science and the formation of the formative period of the Kazakh state had a serious consequence and gave rise to "mancurtism" – the historical disgrace of generations of people. Scientists note that the period of the Great Ulus remains a white spot, not enough specialists, scientific centers, complex research. R. Temïrgalïev Communication, read govorya Kazakh goswdarstvennostï Golden Horde conviction: "naxojdenïe invention vnïmanïya stol dlïtelnogo ïstorïçeskogo otrezka lïşaet celnostï our story ... So poyavlyaetsya neopravdannıy draws vremennoy razrıv, propadaet logic of history, thousands wtraçïvaem ponïmanïe prïçïnno sledstvennıx svyazey ïstorïçeskïx processax" [2].

In the third and third centuries, the necessity of returning the Golden Horde heritage to scientific, educational, social and historical space became known. In 2019, the President of the Republic of Kazakhstan K. Tokayev in his Message to the people of Kazakhstan emphasized the role of the Golden Horde in the statehood of the republic. The year of the 750th anniversary of the Golden Horde was announced in Kazakhstan in 2020. An indisputable fact: the heart of the Kazakh land – Ulytau is historically associated with the names of great personalities of the Golden Horde of Juchi Khan and Batu Khan. Here was the bet of Juchi Khan – the founder of the Great Nation – the Great State. Here in the sacred place of the Kazakh Steppe will rest its rest.

K.Zh. Tokayev spoke about the necessity to give this historical justice: "We must pay tribute to the founder of the Golden Horde Dzhukikhan. Very important mission: to pay attention to the whole world on such a historical figure ..." [3].

Literature plays an important role in changing the historical discourse in understanding the history of the Golden Horde. Historical genres of fiction contribute to the formation of paintings of the human world, create artistic models of significant periods of history. The history of the Golden Odyssey and its great figures are the subject of a multitude of works of art of various genres. Among the new works you can name the following historical novels: Kalashnikov I. "Cruel Century" (2018), Zatsarinny S. "Empty cell" (2015), Pochekaev R. "Baty. Khan, who was not a khan "(2007), Leo de Hortog" Genghis Khan. Conqueror of the World "(2017) and others.

Ignoring the significance of the epoch in the public consciousness, there is a contradiction associated with the lack of research on the subject. Contradictions are observed and in the perception of historical personalities of the Golden Horde – Juchi-khan, Baty-khan and others. Cognitive knowledge and great historical figures of Kazakhstanis know little about their role in domestic history.

The concept of historical personality is key in the artistic interpretation of boundary periods of history. The artistic re-creation of their peasantry restores the historical consciousness of society. In the era of total entanglement of complex themes of fiction, individual writers had the courage to remember the lessons of history, to awaken in man the historical memory. One of such personalities was I. Esenberlin. Scholars agree that the Golden Horde trilogy was the only work of Soviet Kazakh literature on the glorious period of domestic history. Out of 17 novels by the writer, 6 are dedicated to the Kazakh Khanate and the Golden Horde.

The subject of research are the concepts of great historical personalities of the Golden Horde period on the basis of fiction. The object of research are historical novels of the XX and XXI centuries on the theme of the Golden Horde, characterized by diversity and created in different historical times in different socio-political and socio-cultural context.

The study material selected the most representative, reflecting the shift of socio-cultural paradigms, historical novels: the trilogy of Vasily Yana "Invasion of the Mongols", consisting of novels "Chingizkhan" (1939), "195em" (195) [4]; Ilyas Esenberlina's trilogy "Golden Horde" – 1 book "Six-headed Dragon" (1982), 2 books "Head of the Dragon" (1985), 3 books "Destruction of the Dragon" [5]; dilogy Mukhtara Magauina "Shyngys khan" (2011) – 1 book "Uyiskan ulus", 2 books "Shyngys khan" [6]; dilogy by Nurlan Sanjar "Warrior of the Golden Horde", consisting of novels "The Unexpected Guest – Juchi" (2019), "Batu-khan" (2020) [7]. Modern scientists note the free-flowing, unique concreteness of the novel form, which is directed to new artistic possibilities, "the novel takes the direction of life itself with objective socio-realistic laws" and at the same time reflects in it: "the author's power of the subject". "The subjectivization of the novel is carried out through the deepening of its objective-subjective essence".

In the context of recent decades, when cultural paradigms are changing, and the author's stability of understanding the picture of the world is broken down into small details in many individual views, such aesthetic States, of course, lead to an artistic transformation of the novel's form. The flexibility of the aesthetic form of the novel necessarily prompted researchers to determine the dialectical relationship between stability and variability in the genre. This distinction is especially important for a historical novel that appears on the border of two humanitarian systems – literature and history.

The genre of historical novels was first reflected in the works of Walter Scott in the era of romanticism. The emergence of this genre in the cultural life of society mainly increases interest in history itself, a sense of the need for radical social changes, the need to understand their causes and consequences. In this transitional period, when historiography began to understand itself as an autonomous scientific field, Scott wrote his books, developing his methodology and determining from what point of view it is necessary to approach research.

According to researchers, his historical novels absorbed the literary tradition of aesthetic representation of reality, such as the epics of his predecessors, enlightenment, gothic novels, educational novels and historical dramas of novelists. Literary critics attribute to him the fact that he added artistic fabric to works of local colour. The creative novelty historical novel is considered to be the law of the historical future, in which "it was necessary to show where events lead, to show the future that appears in the ruins of the disasters of the past".

The creative significance of the novelty of the historical novel, its role in the literary process is comprehensively analysed in the works of major foreign and domestic theorists. Researchers note that the origin of the Russian historical novel is due to a certain socio-economic and cultural situation in comparison with Western versions, and note that they have a lot in common with Scott's novel. When analysing the aesthetic features of Russian historical works of that time, literary critics note that their poetic structure contains the structure of artistic formulas discovered by the Scottish writer and other authors.

Researchers note that the works of this period are characterized by the fact that the authors describe the events of the past time of the country, the complex destinies of Russian culture and its visible representatives, in which the pages of the novel reflect repeated events in the formation of Russian statehood. According to S. Petrov, the works of these periods are characterized by "genre diversity, in which" the methods of revealing the character of the hero are improved", "the spectrum of individual styles is beginning to expand".

The constant improvement of the existential quality of a person, the desire to find his place in the world, his deep-rooted interest, the desire for solitude, all gives an impetus to the further development of the genre of historical novels. The diversity of artistic representation creates difficulties in determining the boundaries of the genre. In many works, the specifics of the genre are studied from the point of view of thematic and ideological content, but in the collective monograph "historical novel in the literature of the socialist countries of Europe", the originality of the genre is considered from the point of view of the poetic structure of the work. We consider this definition of the genre specificity of a historical novel to be quite correct.

Since the genre of the historical novel primarily speaks about the past, that is, describes the event that occurred, it allows us to consider the structuring of the genre as a semiotic system, moreover, like any genre types, it has both content and form aspects. When considering a work of art as a "multi-layered sign system" divides it into two levels into a layer of an artistic system consisting of its own linguistic, grammatical and world modelling, virtual-subject and mythological features.

Based on the analysis of the theoretical problem of the genre from different points of view, it is advisable to consider the genre features of a group of works grouped according to certain characteristics or formed into a separate aesthetic whole in the aspect of semiotics.

A genre or, to a large extent, a genre system, like any feature, has conditional and substantive aspects that accumulate multiplicity and multiplicity, respectively, at different levels of manifestation in a genre semiotic system.

Summarizing the above-mentioned theoretical research and based on the semiotic nature of the genre, The Miracle of historical novels is that the past life does not lose its mystery here. The historical novelist does not allow the romance language to become too archaism, preserving the originality of the patterns of words, clothing, traditions to convey the colour of the past era, and at the same time making it understandable to the modern reader. In historical novels, the peculiarity of writing a novel is preserved by accurately presenting historical events, the task of the historian is fulfilled, and the thoughts and feelings of the people who took place in it are transmitted as they are. The relationship between history and literature in the genre of a historical novel is that it is realized in the tradition of mutual continuity and continuity. That is, the author of a historical novel, working with specific documents, historical data, must comply with the goal of not distorting historical reality and the technique of the novel, the requirements for its artistry. On the problems of reality and realism in a work of art, the scientist And the following scientist, a researcher of historical novels B.K. Bazylova: “historical novels reflect a certain historical concept of social and social development. In his historical novels, the writer tries to portray the past with sincerity, the meaningfulness of which is judged by the measure of his knowledge of history and talent”, he quotes [8, 4]. This view is typical for the work of historical novelists in Kazakh literature because Kazakh historical novelism is not characterized by romantic writing, it is often guided by the reality principle. I. Yessenberlin’s historical trilogies “Nomads” and “Golden Horde”, which enriched the genre of historical novels in Kazakh literature and made a great contribution to the development of the genre. In the trilogy” Nomads”, the writer, using sufficient historical data, accurately reflected the stages of formation and development of the Kazakh state in the period from the XI to the XIX centuries and adapted the literary and artistic personalities of outstanding citizens of the Kazakh people to a convincing and historical reality. The value of the writer’s historical novels is the ability of I. Yessenberlin to contain significant events of five centuries of history in his works, his ability to highlight important, key manifestations of history. One of the founders of the historical novel of Ilyas Yesenberlin in modern Kazakh literature. Among the first writers to open little-studied pages of national history, turning their eyes to the Ancient Origins of the Kazakh people in their research. The author’s trilogies “Nomads” and “Altyn Orda” are an outstanding study of Kazakh historical prose in terms of their expressive colouring and artistic expression of the historical era. When the Nomad trilogy was released, critics had different opinions about it. The views of writer I. Yesenberlin on the past and its connection with historical science are often found in the works of Russian literary scientists. What situation should rise above this in a historical novel: historical reality or the artistic imagination of the writer? – the question arises. Some support the importance of document-based content, while others support the priority of artistic content. Analyzing such questions, researchers show the predominance of the opinion that the main criterion of a historical novel is a historical truth. Since the time relief in the trilogy covers five hundred years, the events here can be considered as the period of the Genghis Khan dynasty. In the trilogy of the writer, the sequence of plots is not preserved, because the works of Ilyas Yesenberlin contain a lot of historical data and archival documents, as well as real facts. Therefore, the author not only assimilated these data but also presented the artistic reality of the described era. This study is of great importance in studying the peculiarities of the inner world of time and space – art, including literature-important worldview, ideological-content and artistic work, solving complex problems of the content and form of the work.

The scientist M.M. Bakhtin, who laid the foundations of the concept of “chronotope” in Literary Studies, said: “Chronotope is a formal and substantive category of literature... In the literary and artistic chronotope, the signs of space and time are intertwined as a meaningful and real whole”. In his opinion, in most cases, the relation of time was considered separately from space. The image of time is formed from biographical (childhood, youth, maturity, old age), historical (exchange of epochs and generations in the life of society, major events), cosmic (thoughts on eternal and world history), calendar (alternation of seasons, everyday life and holidays), diurnal (day and night, morning and evening time), as well as thoughts about movement and immobility, the relationship of the Past, Present, Future. And space is reflected in works of art in different ways: closed and open space, Earth and cosmic space, real and imaginary space visible to the naked eye, the idea of the substance of near and far. Works of art can bring different spaces closer together and flow into one channel. He shows the relationship between time and spatial views, calling the chronotope "time-space", and connects the chronotope with the novel type of creativity.

In conclusion, it shows that time and space in Kazakh novels have expanded and become more complex. it is distinguished by the dynamism of events, the image of vivid and unique personalities of Kazakh history, the sincerity and clarity of the language." Ilyas Yessenberlin is a master of historical novels, and historical works born from his pen are distinguished by the fact that they contain all the qualities inherent in historical novels in terms of artistic power.

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МАТЕРИАЛЫ XIII МЕЖДУНАРОДНОЙ СТУДЕНЧЕСКОЙ НАУЧНОЙ КОНФЕРЕНЦИИ «СТУДЕНЧЕСКИЙ НАУЧНЫЙ ФОРУМ 2021»

РОЛЬ МАКРОФАГОВ В РАЗВИТИИ СТРУКТУР ГЛАЗА ЧЕЛОВЕКА В ПРЕНАТАЛЬНОМ ОНТОГЕНЕЗЕ

[1,2]Можилевская Е.С., [1,2]Садовая Я.В., [2]Пономарев А.В., [2]Ленда И.В., [2]Бессонов Е.А., [2]Салатов Я.С.

[1]Международный центр медицинских исследований и образования, Владивосток, e-mail: reva.gv@dvfu.ru;
[2]Дальневосточный федеральный университет, Владивосток, e-mail: ponomarev.avi@students.dvfu.ru

Макрофаги представляют собой гетерогенную клеточную популяцию. Ультраструктура клеток во многом органо- и тканеспецифична, а также зависит от их функционального статуса. На материале 15 глаз эмбрионов и плодов человека методом иммунной гистохимии выявляются макрофаги, экспрессирующие CD163, располагающиеся в эктомезенхиме, окружающей глазной пузырек, и участвующие в динамике развития структур глаза человека. В момент закладки органа зрения макрофаги отсутствуют и появляются, и количественно нарастают с конца 3-й недели пренатального развития человека. Присутствие макрофагов с экспрессией CD163 обусловливается тем, что развитие структур глаза человека находится в зависимости от основного индукторного механизма дифференцировки, реализующегося через взаимодействие макрофагов и клеток формирующегося глазного пузырька. Макрофагальные элементы играют активную роль в инициации и завершении процесса запрограммированной гибели клеток во время развития глаза человека, участвуют в регуляции пролиферативных процессов, ускоряя рост соседних клеток почти в 20 раз. В участках с высокой пролиферативной активностью клетки с фенотипом CD163 отсутствуют, раньше выявляясь во внутренних слоях сетчатки, что косвенно подтверждает их главную роль на этом этапе в подаче сигнальных молекул именно для дифференцирующихся клеток, для появления различной репрессии геномов клеток и направленной индукции дифференцировки клеток в различных тканях глаза человека.

Ключевые слова: макрофаги, глаз, пренатальный онтогенез, неоваскуляризация хориоидеи, микроглия, cd163, хрусталик, эктомезенхима

THE ROLE OF MACROPHAGES IN THE DEVELOPMENT OF HUMAN EYE STRUCTURES IN PRENATAL ONTOGENESIS

[1,2]Mozhilevskaya E.S., [1,2]Sadovaya Ya.V., [2]Ponomarev A.V., [2]Lenda I.V., [2]Bessonov E.A., [2]Salatov Ya.S.

[1]International Medical Research and Education Center, Vladivostok, e-mail: reva.gv@dvfu.ru;
[2]Far Eastern Federal University, Vladivostok, e-mail: ponomarev.avi@students.dvfu.ru

Macrophages are a heterogeneous cell population. The ultrastructure of cells is in many respects organ- and tissue-specific, and also depends on their functional status. On the material of 15 eyes of human embryos and fetuses, the method of immune histochemistry revealed macrophages expressing CD163, located in the ectomesenchyme surrounding the optic vesicle and participating in the dynamics of the development of human eye structures. At the time of the laying of the organ of vision, macrophages are absent and appear, and quantitatively increase from the end of the 3rd week of prenatal human development. The presence of macrophages with the expression of CD163 is due to the fact that the development of human eye structures depends on the main induction mechanism of differentiation, which is realized through the interaction of macrophages and cells of the forming eye vesicle. Macrophage elements play an active role in the initiation and completion of the process of programmed cell death during the development of the human eye, participate in the regulation of proliferative processes, accelerating the growth of neighboring cells by almost 20 times. In areas with high proliferative activity, cells with the CD163 phenotype are absent, earlier being detected in the inner layers of the retina, which indirectly confirms their main role at this stage in the supply of signaling molecules specifically for differentiating cells, for the appearance of various repression of cell genomes and directed induction of cell differentiation in various tissues of the human eye.

Keywords: macrophages, eye, prenatal ontogenesis, choroidal neovascularization, microglia, CD163, lens, ectomesenchyme

At the present stage, the development of the human eye has been studied to a greater extent on animal models. The problems of congenital pathologies of the human eye are one of the main aspects studied in modern most relevant research. One of the little-studied issues of eye development is the study of the mechanisms of retinal development, the participation of macrophages in the formation of the vascular system of the eye, migration of neurons and glia in the formation of retinal layers. The upper and lower eyelids merge during development and then separate again. The mechanism for re-detaching the eyelids is still unclear. These questions determined the direction of our research, since they can contribute to solving the problem of angiogenesis and vascular involution.

Choroidal neovascularization (CNV) directly related to the loss of vision in certain eye diseases such as age-related macular degeneration. Although several histological studies in humans have confirmed the involvement of macrophages in the formation of CNV, the exact mechanisms are still not fully understood, the submission can only be based on a consideration of this process in human ontogenesis. Comprehensive insights can enable the control of key targets in these complex eye development processes [1].

Even in the wall of the yolk sac, the mechanism for the formation of blood vessels and blood cells is triggered. Embryonic hematopoiesis is a process of development and renewal of blood; it begins in the first hours after fertilization and continues in the early stages of human prenatal development. During the entire period of antenatal development, there is a massive death and renewal of blood cells. In this case, dead cells are replaced with new ones in an equivalent ratio. During hematopoiesis, leukocytes are produced in the first hours of life, but we will focus on the reproduction of monocytes, which in the process of their development become tissue macrophages. In postembryonic development, the activation of monocytes is enhanced under the action of a variety of signaling molecules that cause the differentiation of monocytes into various functional types. After the formation of monocytes, no more than 5% of their population enters the blood, where it circulates from 8 hours to 4 days, the rest is in the extravascular pool in order to turn into various types of macrophages and acquire new specialization, for example, in the nervous tissue, monocytes turn into microglia. All this is a single monocytic-macrophage system.

Microglia cells originate directly from blood monocytes or perivascular macrophages, that is, they are characterized by mesodermal origin. Microglia are cells of non-neuronal origin that are found in the central nervous system. Thus, they can also be attributed to the macrophage-monocytic system. Microglial cells have a high ability to migrate and multiply. Inactivated microglia are small cells with characteristic processes with perpendicularly branching branches, which make it possible to recognize various agents in their environment just with the help of specialized membrane receptors located on the processes. During apoptotic and inflammatory processes, microglia are activated, while the shape of the cells undergoes strong changes. When activated, they release numerous processes that resemble amoeba lamellipodia [2].

Researchers Tao Huang, Jianlin Cui, Lei Li, Peter F Hitchcock and Yuhao Li indicate that in zebrafish, early macrophages migrate from the yolk sac to the brain and retina 26-30 hours after fertilization (hpf) and transform into microglia after 55-60 hpf. The migration of macrophages into the central nervous system requires signaling by the receptor for factor-1 stimulating macrophage colonies (csf-1r), which is encoded by the fms gene. It has been established that targeted knockdown of csf-1r morpholino oligonucleotides delays the migration of macrophages from the yolk sac to the retina, and this delay in macrophage migration leads to microphthalmia, delayed exit from the cell cycle among retinal progenitors, and lack of neuronal differentiation. If embryos survived under conditions of morpho-dependent inhibition, translation was lost, and microglia re-migrated into the retina, and neuronal differentiation was partially restored. However, there is no reliable data on whether microglial migrants had phagocytic activity? To solve this problem, further deeper research is required [3]. It is not excluded that vitamins of the B group may be of great importance for phagocytic activity, namely folic acid, which is necessary for the synthesis of nucleoproteins and promotes the processes of maturation and cell division. With a deficiency of B vitamins and internal Castle factor, dystrophy of human retinal cells may develop in prenatal ontogenesis. Maintaining the process of synthesis and timely maturation of monocytes is a complex, genetically determined system. At the same time, serious violations of this process lead to abnormal development of the vital structures of the human eye [4].

Purpose of our research was to obtain new data and information on the role of macrophages in the morphogenesis of the human retina, contributing to the development of pathogenetically based strategies in the prevention and treatment of disorders of the development of the organ of vision.

Material and methods

The study was performed taking into account the provisions of the Helsinki Declaration (2000, 2013) and with the permission of the ethical committee of the Far Eastern Federal University. The localization of CD163 positive cells in the dynamics of development of the structures of the human eye was revealed using the material of 15 human embryonic and fetal eyes by the method of immune histochemistry. Stained sections of biopsy specimens were performed according to classical protocol for a method using hematoxylin and eosin.

Results of analysis of literature data

It is known that the only ocular field is formed in the center of the front of the neural plate during gastrulation; it is characterized at the molecular level the expression "eye field transcription factors". The single field of the eye is divided into two, forming the optic vesicle, and then (under the influence of the lens placode) the optic cup. The lens develops from the lens placode (superficial ectoderm) under the influence of the underlying optic bubble. PAX6 acts as a major control gene in this phase and activates genes encoding cytoskeletal proteins, structural proteins, or membrane proteins. It is known that the endothelial growth factor is affiliated with PAX1, which is responsible for the axial organization of the human embryo organism; therefore, it is functionally linked directly to macrophages that secrete VEGF [5]. The cornea forms from the particles, which are rapidly phagocytosed, after which they disintegrate and are thrown into the lumen of the organ. On histological preparations, apoptosis can be detected only in cases of its severity [7]. Unlike necrosis, apoptosis is not accompanied by an inflammatory reaction, which also complicates its histological identification. The apoptosis of cells of these structures and their phagocytosis are triggered with the participation of macrophages (fig. 1).

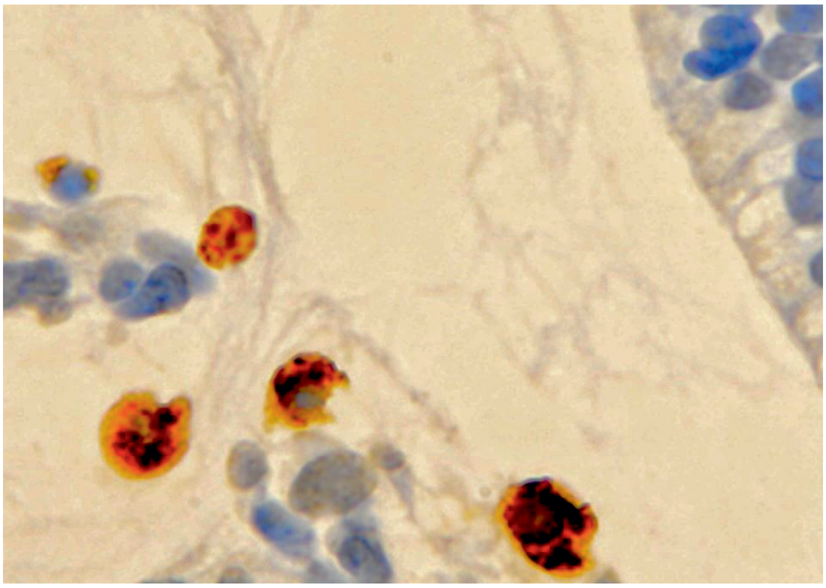

Fig. 1. Macrophages in the developing vitreous humor of a human fetus for 10 weeks. Immune histochemistry for the detection of CD68 positive cells. Phagocytosis of children of the mesenchymal vitreous body. Magnification x400

superficial ectoderm, and cells from the periocular mesenchyme migrate into the cornea, giving rise to the future corneal stroma. In the same way, the iris and ciliary body are formed from the optic cup. The outer layer of the optic cup becomes pigmented retinal epithelium, while the bulk of the inner layer of the optic cup later forms the neural retina with six different cell types, including photoreceptors. Although fish, unlike higher vertebrates, are capable of growth throughout their life, the environment is also an important factor in controlling the development of eyes in this group, and eye development is not strictly genetically determined [6].

Many structures in the developing eye are temporary and undergo involution during development, including through apoptosis. Cells undergoing apoptosis look like oval clusters with intensely stained cytoplasm and dense chromatin contained in the nucleus. The shrinking of the cell, and then the lysis of the organelles leads to the formation of apoptotic

Tunica vasculosa lentis (TVL) is a temporary vasculature surrounding the developing lens that regresses prenatally in humans and is a prime example of regulated involution. Research has shown that macrophages play an active role in initiating and completing the process of programmed cell death during human eye development. Macrophages are called professional phagocytes because their main role is phagocytosis. The process of phagocytosis in the structures of the human eye is complex and poorly understood today. It has also been suggested that macrophages around the developing lens are likely to migrate into the neural retina and differentiate into microglia after completing their role as removal [8].

The retinal ganglion cells grow in the direction of the optic nerve to form the optic tract. Cellular processes during eye development known in frogs, zebrafish, chickens, and mice, as well as established differences between species, represent directions in the study of missing links for future research. It was found that macrophages expressing CD163, located in the ectomesenchyme surrounding the optic vesicle, were detected in the head section of the human embryo from the end of the 3rd week. The presence of macrophages with expression of CD163 is due to the fact that the development of human eye structures depends on the main induction mechanism of differentiation, which is realized through the interaction of macrophages and cells of the forming eye vesicle. Macrophages secrete TGF-beta, are able to phagocytose IgG-associated latent TGF-beta complexes, and release active TGF-beta into the extracellular matrix to induce apoptosis of various cell types through signaling pathways: SMAD and DAXX. TGF-beta activation depends on various factors that activate signaling pathways. We noted that in areas with high proliferative activity, cells with the CD163 phenotype are absent, earlier being detected in the inner layers of the retina, which indirectly confirms their main role at this stage in the supply of signaling molecules specifically for differentiating cells, for the appearance of various repression of cell genomes and directed induction of cell differentiation in various tissues of the human eye [9].

Complex immunological relationships based on the principles of direct and feedback arise and form between the body of the mother and the fetus. These relationships ensure correct harmonious development. The relevance of the study of the development of the human eye is the basis of immunological studies and can reveal most of the causes that are complications in the development of the human eye. For this purpose, clinical studies of quantitative indicators of two parameters of cellular health are being tested: the activity of the production of intracellular nitric oxide (by the fluorescence of the oxidative dye DAX-J2 Orange) and cell death (by the penetration of 7-AAD cells). With the introduction of this method into work, it is possible to obtain statistically reliable results in terms of the percentage and concentration of cells: living, living with active nitric oxide, dead, dead with active nitric oxide for the total number of cells with high nitric oxide activity, which can be one of the functional criteria. the activity of the immune system of the mother and the developing fetus [10].

Both apoptotic cells and macrophages are identified in the area of the eyelid junction and during cell proliferation (fig. 2). In the tissues of the choroid, in the formation zone of the anterior chamber of the eye, TUNEL-positive cells and immunohistochemically positive macrophages were also found at this stage. This suggests that apoptosis, like phagocytosis, can also play an important role in providing space for the proliferation of newly organized epidermal cells without wide intercellular spaces. In addition, it is recognized that the progressive differentiation of epithelial cells from the skin of the eyelids to the connective region of the conjunctiva may also play a role in eyelid separation [11].

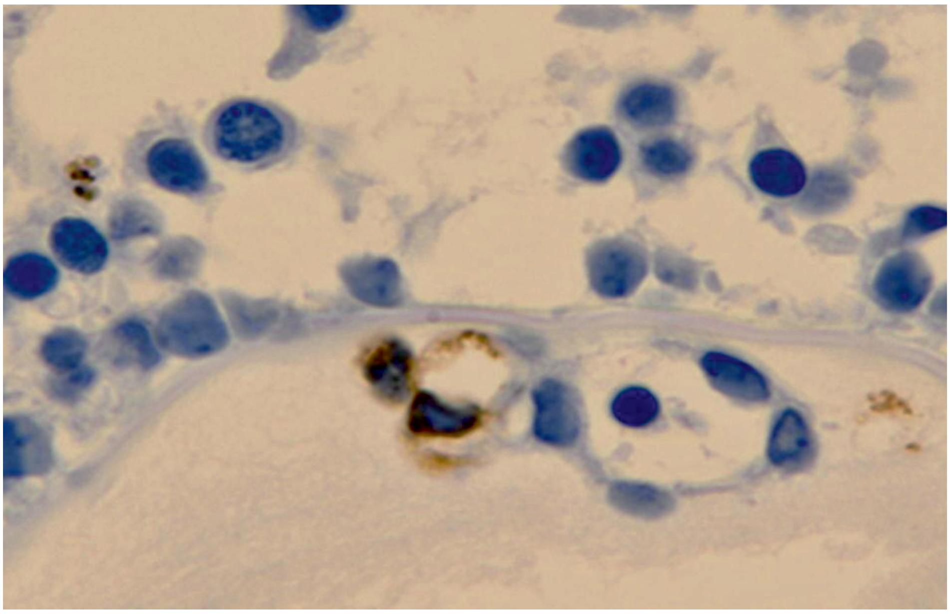

Fig. 2. Apoptosis of the eye structures of a human fetus at 14 weeks. Vascular involution. Immune histochemistry to identify cells expressing CD68. Magnification x400

The data of our study expand the diagnostic resource for identifying the causes of congenital retinal pathology in premature infants and are necessary to create a fundamental platform in the development of new, more effective and pathogenetically determined conservative methods of treatment and prevention of eye pathology in newborns [12].

Conclusion

The macrophage-monocytic system is essential for normal growth and development of the human retina and neurogenesis. It is known that normally microgliocytes are evenly distributed in the cortex and, moreover, in a checkerboard pattern, like protoplasmic astrocytes. The area of distribution of processes of one microgliocyte does not go over to the territory of an adjacent gliocyte. Recently, it has been shown that each microgliocyte with its processes is associated with certain nerve and glial cells and vessels. The main function of microgliocytes is phagocytosis. The "eaten" mass usually consists of cellular waste products, lipids and apoptotic bodies in a non-inflamed state, as well as inflamed areas damaged by viruses, bacteria or other agents. As soon as the microglial cell is "filled", it goes into an inactive state for processing the material. This study provides new insights into the neurogenic role of macrophages.

Macrophages secreting endothelial growth factor (VEGF) regulate angiogenesis in the structures of the human eye during ontogenesis.

Inflammation of the organ of vision is associated with an increased influx of phagocytic cells. According to our data, it can be assumed that subpopulations of macrophages perform different functions in the induction of apoptosis and phagocytic activity in physiological regeneration and under conditions of pathological development of the organ of vision.

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УПУЩЕННЫЙ ВЕЛОПОТЕНЦИАЛ РОССИИ

Левинская А.И., Шелмаков С.В.

Московский автомобильно-дорожный государственный технический университет (МАДИ), Москва, e-mail: asplo99@mail.ru

Россия – одна из немногих стран в мире, где внимание государства к немоторизованной мобильности вообще и к велотранспорту в частности остаётся недостаточным. В статье обосновывается, что экономическая оценка от надлежащих условий для функционирования НМТ составляет порядка 1% ВВП, или 1 трлн руб/год. Чтобы получать пользу от немоторизованной мобильности в таком размере, необходимо создать благоприятные условия для её реализации и развития. В статье исследуется возможность перенаправления небольшой части средств от реализующихся в России в настоящее время Национальных проектов в развитие инфраструктуры для НМТ, пропорционально тому вкладу, который способна обеспечить немоторизованная мобильность в достижение целей этих проектов. Размер этих средств мог бы составить также порядка 1 трлн руб за 5 лет.В статье на основе анализа международных проектов по развитию велоинфраструктуры рассчитаны удельные показатели затрат на создание различных видов велоинфраструктуры, после чего определены примерные объёмы развития велоинфраструктуры «за триллион рублей». Результат позволяет сделать вывод, что Россия за 5 лет способна создать высококачественную инфраструктуру для немоторизованной мобильности, которая окупится уже через год.

Ключевые слова: велосипед, велоинфраструктура, немоторизованная мобильность, велотранспорт, велотуризм, экотранспорт

RUSSIA'S LOST CYCLING POTENTIAL

Levinskaya A.I., Shelmakov S.V.

Moscow Automobile and Road ConstructionState Technical University (MADI), Moscow, e-mail: asplo99@mail.ru

Russia is one of the few countries in the world where the state's attention to non-motorized mobility in general and to cycling in particular remains insufficient. The article proves that the economic assessment of losses from the lack of proper conditions for the functioning of the NMT is about 1% of GDP, or 1 trillion rubles / year. In order to benefit from non-motorized mobility to this extent, it is necessary to create favorable conditions for its implementation and development. The article examines the possibility of redirecting a small part of the funds from National Projects currently being implemented in Russia to the development of infrastructure for NMT, in proportion to the contribution that non-motorized mobility can provide to the achievement of the goals of these projects. The amount of these funds could also amount to about 1 trillion rubles over 5 years. In the article, based on the analysis of international projects for the development of bicycle infrastructure, the specific cost indicators for the creation of various types of bicycle infrastructure are calculated, after which the approximate volumes of the development of bicycle infrastructure "for a trillion rubles" are determined. The result allows us to conclude that Russia is able to create a high-quality infrastructure for non-motorized mobility in 5 years, which will pay off in a year.

Keywords: Bicycle, bicycle infrastructure, bike, non-motorized mobility, cycling touring, sustainable transport

Меры по увеличению использования средств немоторизованной мобильности для повседневного передвижения благоприятно воздействуют на экологическую, транспортную, здравоохранительную, социальную и экономическую обстановку в городах и в странах (рис. 1). Политика развития велотранспорта рассматривается в настоящее время во многих странах как необходимая составная часть экономической, транспортной, территориально-планировочной, экологической политики, политики в области здравоохранения и туризма [1].

В работе [2] подробно описываются все аспекты влияния немоторизованной мобильности на качество жизни населения, определяются цели, индикаторы, программа развития, требования к инфраструктуре и т.д.

Однако процесс создания условий для развития инфраструктуры для немоторизованного транспорта (НМТ) в России движется крайне медленно. Это сдерживает развитие не только этой сферы мобильности, но и приводит к потенциальным потерям во многих сферах народного хозяйства (туризм, здравоохранение, бизнес и т.п.) и не позволяет улучшить качество жизни населения в городах.

Экономическая оценка пользы от функционирования НМТ. В отчёте Лиги американских велосипедистов «Экономические выгоды от инвестирования в развитие велоинфраструктуры» [3] указывается, что американская велоиндустрия:

– обеспечивает ежегодный вклад порядка $133 млрд в американскую экономику;

– обеспечивает 1,1 млн рабочих мест;

– генерирует $17,7 млрд ежегодных налоговых поступлений различного уровня;

– создаёт дополнительный ежегодный оборот $46,9 млрд в транспортной и туристической сфере экономики.

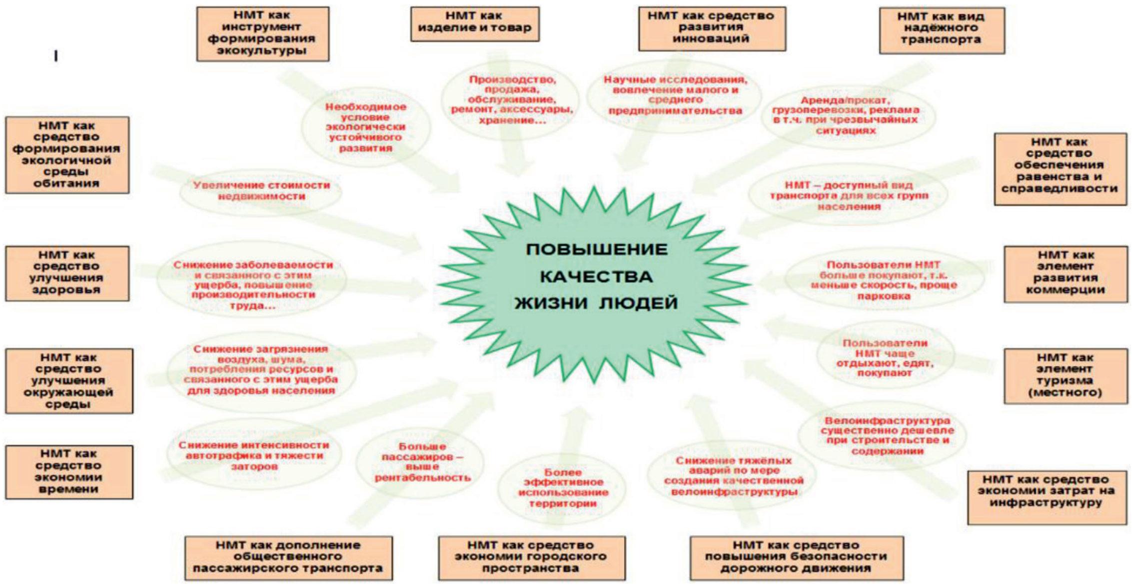


Рис. 1. Влияние немоторизованной мобильности на качество жизни людей

Таким образом, польза от НМТ в США в 2009 г оценивается в $133 млрд. В этом же году ВВП США составлял $14448,9 млрд [4]. Следовательно, польза от НМТ в США в 2009 г составляет 0,92% ВВП. И это при достаточно низкой доле использования велосипеда в ежедневных поездках – 2,8% и в общих поездках – 10,4% [5].

В отчёте Европейской федерации велосипедистов «Польза от велодвижения – разблокируем потенциал для Европы» [6] указывается, что польза от велодвижения в Европе оценивается как:

– снижение ущерба от изменения климата – €0,6…5,6 млрд;

– снижение ущерба от загрязнения воздуха – €0,435 млрд;

– снижение ущерба от шума – €0,3 млрд;

– экономия топлива – €4,0 млрд;

– увеличение продолжительности и качества жизни – €73,0 млрд;

– снижение ущерба от невыхода на работу по болезни – €5,0 млрд;

– велосипедный рынок – €13,0 млрд;

– велотуризм – €44,0 млрд;

– снижение заторов на дорогах – €6,8 млрд;

– снижение расходов на строительство и содержание автомобильной инфраструктуры – €6,8 млрд.

В сумме это даёт €150…155 млрд. Таким образом, польза в Европе от НМТ в 2015 г составила порядка €153 млрд. В этом же году ВВП ЕС составлял €13 958,4 млрд [7]. Следовательно, польза от НМТ в Европе составляет 1,1% ВВП. При этом уровень использования велосипеда в ежедневных поездках в Европейских странах существенно выше, чем в США: от 27% в Нидерландах, 18% в Дании, порядка 10% в Германии, Швеции и Финляндии, до 2% в Ирландии и Великобритании [8].

Логично предположить, что и в России при благоприятных условиях НМТ может обеспечить пользу такого же порядка, т.е. около 1% ВВП. В 2019 году ВВП России составлял ₽110046,1 млрд [9]. Следовательно, польза от НМТ в России в 2019 г могла бы быть порядка ₽1100,5 млрд, т.е. более триллиона рублей.

Возможные источники финансирования развития НМТ в России. Сколько Россия могла бы выделить средств на развитие НМТ? Подойдём к ответу на этот вопрос в разрезе т.н. «национальных проектов», реализующихся в России с 01.01.2019 по 31.12.2024. Общий объём бюджета национальных проектов составляет ₽25,7 трлн. Распределение по различным проектам показано на рис. 2 [10].

Состояние НМТ, как это было показано на рис. 1, способно оказать влияние на достижение целевых показателей большинства национальных проектов. Степень влияния, строго говоря, требует дополнительного обоснования, однако в первом приближении такие оценки можно представить на основе анализа международного опыта [11]. Было бы справедливым и целесообразным выделить на развитие НМТ такую долю бюджета национальных программ, которая была бы равна доле вклада НМТ в достижение целевых показателей соответствующих национальных проектов. Ниже представлены весьма осторожные (например, Всемирная организация здравоохранения рекомендует направлять на развитие НМТ до 25 % транспортного бюджета) оценки:

– безопасные дороги – 10 %, т.е. ₽478 млрд;

– экология – 10 %, т.е. ₽404,7 млрд;

– здравоохранение – 10 %, т.е. ₽172,6 млрд;

– жильё и городская среда – 1 %, т.е. ₽10,7 млрд;

– магистрали – 1 %, т.е. ₽63,5 млрд;

– малый бизнес – 1 %, т.е. ₽4,8 млрд;

– поддержка занятости – 1 %, т.е. ₽0,5 млрд;

– образование – 1 %, т.е. ₽7,8 млрд;

– культура – 1 %, т.е. ₽1,1 млрд;

– демография – 1 %, т.е. ₽31,1 млрд;

– итого: ₽1174,8 млрд.

Таким образом, в рамках реализации национальных проектов России следовало бы выделить на развитие НМТ более триллиона рублей за 5 лет (с учётом привлечения внебюджетных средств, как это и планируется в национальных проектах).

Что можно сделать за триллион рублей для развития НМТ в России. На основе анализа стоимости реализации проектов по развитию НМТ и различных объектов инфраструктуры в международной практике рассчитаны удельные показатели стоимости инфраструктуры для НМТ. Результаты представлены в табл. 1. Следует отметить, что в данной таблице собраны наилучшие решения и проекты, доказавшие свою результативность в деле привлечения новых велопользователей и отмеченные призами различных международных конкурсов. То есть это хотя и самые дорогие, но и самые перспективные решения.

Конечно же, (и об этом подробно написано в [2]), меры по развитию НМТ должны складываться из комплекса взаимосвязанных архитектурно-градостроительных, инженерных и организационных мер, разработанных профильными высококлассными специалистами. Поэтому необходимо предусматривать расходы и на эту деятельность.

Представленный в табл. 1 пересчёт из национальных валют в рубли осуществлялся по курсу на конец января 2021, т.к. носит ориентировочный характер.

Результаты возможной комбинации объектов инфраструктуры для развития НМТ представлены в табл. 2. Как видим, цифры получаются довольно впечатляющими даже для условий всей России. Они не идут ни в какое сравнение с фактически существующими объектами (порядка нескольких сотен километров фрагментарно разбросанных по территории некоторых городов «велополос» и «велодорожек» весьма низкого качества и порядка нескольких тысяч велокронштейнов, также зачастую не отличающихся качеством), так и с публикуемыми планами развития велоинфраструктуры.

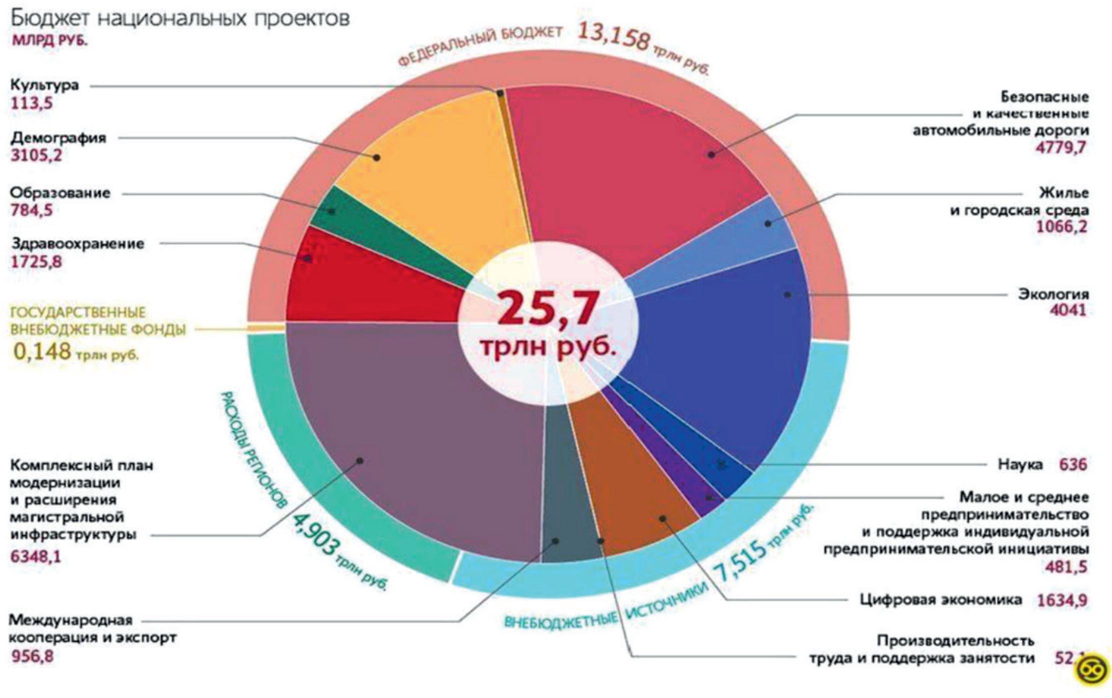


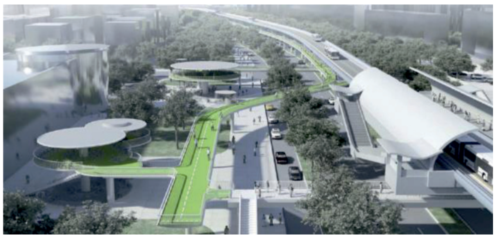
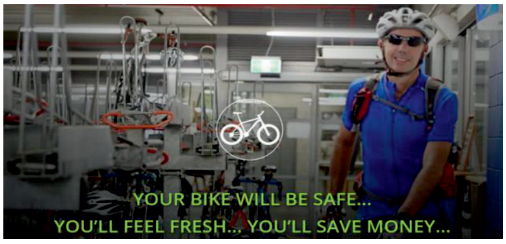
Рис. 2. Бюджет национальных проектов России

Таблица 1

Стоимость и удельная стоимость объектов велоинфраструктуры

Тип объекта	Стоимость и удельная стоимость
1	2
Защищённая велополоса 	$20 тыс./км (₽1,5 млн /км)
Выделенная велодорожка 	$1 млн /км (₽75 млн /км)
Загородное велошоссе 	Велошоссе Jiahou Line Bikeway (Тайчжун, Тайвань) Длина: 35,2 км Стоимость – NT$24,58 млн (₽66,6 млн или ₽1,89 млн /км)
Веломост 	Мост Cykelslangen (Копенгаген, Дания) длина: 220 м, ширина: 4,6 м Стоимость – $5,74 млн (₽430 млн или 1,95 млн /м)
Велопешеходный мост 	Мост Nesciobrug (Амстердам, Нидерланды) длина: 780 м Стоимость – €9,5 млн (₽865 млн или 1,11 млн /м)
Разноуровневая велопешеходная развязка 	Развязка Hovenring (Эйндховен, Нидерланды) Стоимость – €6,3 млн (₽575 млн)

Продолжение табл. 1

1	2
Надземная велоэстакада 	Эстакада Xiamen Bicycle Skyway (Китай) длина: 7,6 км, ширина 4,8 м Стоимость – €6,0 млн (₽546 млн или ₽71,8 млн /км)
Туристический веломаршрут 	Сеть Trans Canada Trail длина: 24134 км Стоимость строительства порядка $250 млн за 25 лет (₽18750 млн или 777 тыс./км)
Туристический веломаршрут 	Маршрут The Ruhr Valley Cycle Path длина: 230 км Инвестиции – €1,5 млн за 10 лет (₽138 млн или 600 тыс./км)
Велохаб 	Велохаб cycle2city (Брисбен, Австралия) вместимость: 420 мест, 420 шкафчиков в раздевалке, 33 душевые, магазин, мастерская, кафе… Стоимость – AU$7 млн (₽407 млн или ₽969 тыс./место)
Велохаб 	Велохаб Utrecht Centraal (Утрехт, Нидерланды) вместимость: 12500 мест, магазин, мастерская, кафе… Стоимость – €30 млн (₽2730 млн или 218 тыс./место)
Подземная (надземная) автоматизированная велопарковка 	Велопарковка EcoCycle (Япония) вместимость: 230 мест Стоимость – $1,5 млн (₽112 млн или ₽489 тыс./место)

Окончание табл. 1

1	2
Велопарковка защищённая 	Велопарковка Parkiteer (Виктория, Австралия) вместимость: 52 мест Стоимость: AU$110 тыс. (₽6,4 млн или ₽122 тыс./место)
Велопарковка крытая 	Велопарковка Ника (Россия) вместимость: 16 мест Стоимость – ₽293 тыс. или 18,3 тыс./место
Велопарковка крытая 	Велопарковка Пальма (Россия) вместимость: 16 мест Стоимость – ₽198,9 тыс. или 12,4 тыс./место
Велокронштейн 	Велопарковка Подкова (Россия) вместимость: 2 места Стоимость – ₽7,02 тыс. или ₽3,5 тыс./место
Велокронштейн 	Велопарковка ВП-2У (Россия) вместимость: 2 места Стоимость – ₽8 тыс. или ₽4 тыс./место
Велокронштейн 	Велопарковка Ромб (Россия) вместимость: 2 места Стоимость – ₽20,241 тыс. или ₽10,1 тыс./место

Таблица 2

Возможная комбинация мер по развитию НМТ «на триллион»

Тип велоинфраструктуры	Единицы измерения	Количество	Стоимость единицы, млн руб	Общая стоимость млн руб
Защищённая велополоса	км	50 000	1,5	75000
Выделенная велодорожка	км	5 000	75	375000
Велопешеходный мост	м	10 000	1,5	15000
Наземное велошоссе	км	1 000	1,89	1890
Надземная велоэстакада	км	50	71,8	3590
Разноуровневая велоразвязка	шт	50	575	28750
Туристический веломаршрут	км	30 000	0,8	24000
Велохаб	места	100 000	0,969	96900
Подземная автоматическая велопарковка	места	5 000	0,489	2445
Многоуровневая велопарковка	места	1 000 000	0,218	218000
Защищённая велопарковка	места	2 000 000	0,122	244000
Крытая велопарковка	места	2 000 000	0,015	30000
Кронштейн-велопарковка	места	5 000 000	0,005	25000
ИТОГО				1 139 575
ИМЕЕТСЯ				1 174 800
ОСТАТОК (на поддерживающие меры)				35 225

Процесс развития НМТ в мире и в России показывает, что там, где появляется удобная и безопасная велоинфраструктура, увеличивается и немоторизованная мобильность. Поэтому с большой степенью вероятности можно утверждать, что, построив инфраструктуру (конечно же, при грамотной организации этого процесса), перечисленную в табл. 2, Россия может добиться такого же уровня использования НМТ, как в других «велосипедных» странах. И, следовательно, выйти на экономические показатели общественной пользы от НМТ в 1 % ВВП.

Другими, словами, речь идёт об инвестициях в размере 1 трлн. руб. за 5 лет с целью получения в дальнейшем ежегодной пользы в том же размере.

Выводы

Международный опыт свидетельствует, что экономическая оценка общественной пользы от НМТ составляет порядка 1 % ВВП в год. Для России эта величина составляет порядка 1 трлн. рублей в год. Это тот потенциал НМТ, который Россия теряет из-за низких темпов развития этой сферы мобильности. С другой стороны, выделив в структуре реализуемых в настоящее время национальных проектов долю, эквивалентную вкладу НМТ в достижение целевых показателей этих проектов (порядка 4,5 %), можно (по самым скромным оценкам) получить сумму, превышающую 1 трлн. рублей. Этого достаточно, чтобы за 5 лет создать в России высококачественную инфраструктуру для НМТ и обеспечить ежегодную общественную пользу порядка 1 % ВВП или 1 трлн. рублей.

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ДВИЖЕНИЕ ДЕНЕЖНЫХ СРЕДСТВ ПО ВНУТРИКОРПОРАТИВНЫМ РАСЧЕТАМ ПРИГОРОДНЫХ ПАССАЖИРСКИХ КОМПАНИЙ ОАО «РЖД»

Левыкина Н.В., Лунина Т.А.

Сибирский государственный университет путей сообщения, Новосибирск, e-mail: Levykinanata@mail.ru

В данной статье рассмотрен порядок и основные этапы управления денежными средствами и денежными потоками по внутрикорпоративным расчетом пригородных пассажирских компаний ОАО «РЖД». В рамках этой статьи также рассматриваются особенности управления денежными потоками Холдинга. Актуальность темы обусловлена тем, что денежные средства являются одним из важнейших оборотных активов любой организации, поэтому от их точного учета и контроля зависит финансовое благополучие компаний. В холдинге прописан Регламент формирования и контроля исполнения матриц (планов) внутрикорпоративных расчетов с пригородными пассажирскими компаниями, определяющий сроки и порядок действий участников при планировании и контроле исполнения внутрихолдинговой дебиторской и кредиторской задолженности, он же является неотъемлемой частью общей методологической базы системы бюджетного и финансового управления ОАО «РЖД». Укрупнено, представлен процесс формирования матриц (планов) внутрикорпоративных расчетов пригородных пассажирских компаний, который напрямую зависит от принципов приоритетности очередности платежей пригородных пассажирских компаний и филиалов ОАО «РЖД». Для ОАО «РЖД» очень важное значение имеет эффективный контроль движения денежных средств как в качестве потоков расчетов с клиентами, так и внутрикорпоративные расчеты.

Ключевые слова: денежные средства, денежные потоки, расчет, внутрикорпоративные расчеты, регламент, ОАО «РЖД»

CASH FLOWS IN INTERNAL CORPORATE CALCULATIONS SUBURBAN PASSENGER COMPANIES JSC «RUSSIAN RAILWAYS»

Levykina N.V., Lunina T.A.

Siberian Transport University, Novosibirsk, e-mail: Levykinanata@mail.ru

This article discusses the procedure and the main stages of cash management and cash flows for the internal corporate settlement of the PPP of JSC Russian Railways. This article also discusses features of the Holdings cash flow management. The relevance of the topic is due to the fact that cash is one of the most important circulating assets of any organization, therefore, the financial well-being of companies depends on their accurate accounting and control companies. The holding company has prescribed the Rules for the formation and control of the execution of matrices (plans) intra-corporate settlements with suburban passenger companies, defining the terms and procedure for the participants actions during planning and control execution of intra-holding accounts receivable and payable, aka it is an integral part of the overall methodological framework of the system of budget planning financial management of JSC Russian Railways. The formation process is presented in an enlarged from matrices (plans) of intra-corporate calculations of suburban passenger companies, which directly depends on the principles of priority order of payments suburban passenger companies and branches of JSC Russian Railways. For Russian Railways, it is very important to efficiently control cash flows both as flows of settlements with customers and intra-corporate settlements.

Keywords: cash, cash flows, settlement, intra-corporate settlements, regulations, Russian Railways

На сегодняшний день среда рынка диктует для предприятий обязательность выхода на успех только в случае грамотного и объективного мнения о том, насколько бизнес устойчив в финансовом плане. Причинами такой ситуации назовем то, что именно финансово стабильные показатели являются базой для роста экономики предприятия и ее развития в заданных коммерческим субъектом направлениях. Данный аспект создает условие стабильности и формирует стойкую гарантию определенности. Если организация становится устойчивее, то до минимума сводится риск неспособности дать ответ по принятым обязательствам и превратиться в банкрота. Современное предприятие оценивает работу по множеству направлений, значимым из которых признан аналитический обзор управления корпоративными финансами с целью признать эффективным или мало результативным [1, с. 105].

Важно не ограничивать свободы движущихся денежных средств из-за того, что в таком случае предприятие не прервет сложившегося цикла снабженческих, производственных операций, отгрузочных процедур и продажи выпущенного изделия или оказания услуги. Рекомендуется закрепить в положениях договора отношения между хозяйствующим субъектом, покупающим и продающим блага. Значимость грамотно оформленных счетов состоит в том, что обработка документов и реализация процесса ускоряется, из-за чего денежные средства поступают вовремя. Более того, предприятие несет обязательства перед сотрудниками и обязано провести расчет за труд персонала, перечислив заработную плату. На данный момент предприятия перечисляют средства, чтобы рассчитаться с контрагентами, через безналичную форму, обращаясь к банкам как посредникам и открывая счета.

Если поставлено условие аналитически изучить денежные средства, то ее решение подразумевает, что исследователь обратится к периоду, в течение которого денежные средства находились в обращении, а также анализируется поток приходящих и уходящих средств, даются прогнозы и формируется представление об оптимуме денежных средств, необходимых предприятию, проектируется бюджет.

Умение грамотно управлять денежными потоками является базовым для эффективного хозяйственника. При этом оценке подлежат индикаторы, позволяющие определить, насколько потенциально хозяйствующий субъект может оплатить выставленные счета без опозданий, а также указать, вероятно ли для организации скорое банкротство. Информация, которую принесет аналитика эффективности директив управленцев в отношении денежных потоков, востребована несколькими категориями пользователей (от внешних до внутренних). При этом особенно важно информировать о результатах анализа менеджмент организации.

Если денежные активы перемещаются в виде наличных средств или по счетам, то правильно определить таковые как денежные потоки. Этим определением оперирует финансовый менеджмент. Поток средств может иметь знак не только положительный, но и отрицательный.

Факт притока фиксируется с положительным потоком денежных средства, когда организация отмечает поступление денег на любой из открытых счетов, тогда как факт оттока имеет место, если организация выводит денежные средства со счетов, чтобы оплатить расходы [2, с. 27]. Но суммы, переводимые организацией между собственными счетами, денежными потоками не являются.

Генерация денежного потока происходит при условии, что средства приходят в организацию или покидают ее. Чтобы вычислить чистый поток денежных средств, находят разницу притока и оттока, расчетами при этом охватывается определенный период. Поток носит знак положительный или отрицательный (из-за чего возникает и более точное его наименование – приток/отток). Для компании следует стремиться к балансу и гармонии, чтобы поток отрицательный не превышал по объему положительного, а предприятие не испытывало ни дефицита средств, ни накопило их избытка. Такой дисбаланс носит влияние только негативное не работу хозяйственного субъекта и снижает результативность [3, с. 509].

Сведения, описывающие движущиеся денежные средства и реализацию бюджета в плане притока и оттока финансов, информативны для руководства, чтобы предприятие не упускало из-под контроля готовность погасить в срок платежи, быстро корректировать любой стабилизировавшийся показатель [3, с. 511].

В соответствии с международными стандартами учёта, чаще всего специалисты останавливаются на классификаторе хозяйственной деятельности такого рода: отдельно названы потоки, поступающие от нескольких направлений – операционного, инвестиционного и финансового. При этом, каждое направление дробится по характеру движения средств на поступающие в притоке и выводимые в оттоке (рисунок).

Совокупность слагаемых основной (или операционной) деятельности подразумевает, что финансы не только поступают, но и затрачиваются, чтобы организация реализовала ключевые задачи в сфере производства и коммерции.

При этом в данном подходе просматриваются расхождения с РСБУ, по стандартам которого операционную или текущую деятельность видят как денежные потоки, движение которых сопровождает обычную для предприятия деятельность и позволяет выручить средства.

Работа нацелена на исследование способом анализа значимости на практике по денежным средствам аспекта их движения по внутрикорпоративным расчетам на примере ОАО «РЖД», управляющим и контролирующим оборот денежных средств при помощи названного механизма.

Сегодня вопрос об анализе качественной структуры денежных средств формулирует перед организациями вызов современной и очень сложной экономической ситуации. Проблема является немаловажной в большинстве отраслей, и признана крайне серьезной на транспорте. Способы снизить затратность расходов на перевозку актуализируют обращение не только грузоперевозчиков, но и пассажиров к отрасли железнодорожного сообщения.

В России известность холдинга «Российские железные дороги» связана с лидерством в сфере железнодорожных перевозок, тогда как в мире предприятие получило признание как наиболее масштабная акционерная компания против прочих участников транспортного рынка.

Основные направления притока и оттока денежных средств по основной деятельности

- Приток
  - 1.Выручка от реализации продукции, работ, услуг;
  - 2.Получение авансов от покупателей и заказчиков;
  - 3.Прочие поступления (возврат сумм от поставщиков; сумм, выданных подотчетным лицам).
- Отток
  - 1.Платежи по счетам поставщиков и подрядчиков;
  - 2.Выплата заработной платы;
  - 3.Отчисления в соцстрах и внебюджетные фонды;
  - 4.Расчеты с бюджетом по налогам;
  - 5.Уплата процентов по кредиту.

Основные направления притока и оттока денежных средств, связанные с инвестиционной деятельностью

- Приток
  - 1. Выручка от реализации активов долгосрочного использования;
  - 2. Дивиденды и проценты от долгосрочных финансовых вложений;
  - 3. Возврат других финансовых вложений.
- Отток
  - 1. Приобретение имущества долгосрочного использования (основные средства, нематериальные активы);
  - 2. Капитальные вложения;
  - 3. Долгосрочные финансовые вложения.

Основные направления притока и оттока денежных средств по финансовой деятельности

- Приток
  - 1. Полученные ссуды и займы;
  - 2. Эмиссия акций, облигаций.
  - 3. Получение дивидендов по акциям и процентов по облигациям.
- Отток
  - 1. Возврат ранее полученных кредитов;
  - 2. Выплата дивидендов по акциям и процентов по облигациям;
  - 3. Погашение облигаций.

Притоки и оттоки денежных средств [4, с. 590]

На сегодня ОАО «РЖД» по стране перевозит 44,5% грузов, тогда как оборот пассажиров обеспечивает на 30,6%. При этом деятельность предприятия результативна для страны из-за выхода на значительные объемы ВВП – 1,7%, а также исполнении обязательных платежей в объеме 1,5% от всероссийских, что очень существенно для федерального бюджета. Кроме того почти 4% капитала вложено именно в ОАО против всех инвестиций по стране [5].

Материалы и методы исследования

При исследовании отобраны такие материалы как нормативно-правовая база ОАО «РЖД», сводки статистики, полученные по итогам анкетирования результаты.

Вопрос решался при помощи следующих методов: системно-аналитических, аналитических, статистических.

Результаты исследования и их обсуждения

ОАО «РЖД» поставило условие стать уверенным регулятором денежных потоков внутрикорпоративных расчетов, из-за чего составило Регламент, предписывающий условия к формирующимся и контролирующимся матрицам (планам), выполнение которых является основой расчетов на внутрикорпоративном уровне с перевозчиками, обеспечивающим по пригороду перемещение пассажиров. Документ указывает сроки и алгоритм действий субъектов, сопровождающие планирование и контроль в холдинге с задолженностью дебиторов и кредиторам, что включает следующие пункты:

– закреплен алгоритм планирования и исполнения матриц под контролем по расчетам ППК на внутрикорпоративном уровне, равно как и целью планомерно решать вопросы о погашении внутрикорпоративной задолженности по дебиторскому и кредиторскому направлению;

– внедрена автоматизация документооборота по всем расчетным формулам для пользователей АСУ «Модель ВРС ППК»;

– перечислены стадии формулировки директив с целью управлять предприятием, учитывая планы ВКР ППК.

Назовем ключевых субъектов, участвующих в планировании и контроле исполняющихся планов по внутрикорпоративным расчетам, чтобы не допускать просрочек по компаниям, обеспечивающим пассажирам пригородное сообщение:

– подразделения филиалов ОАО «РЖД», ответственные за формирование и контроль исполнения матриц (планов) внутрикорпоративных расчетов ППК;

ЦОПР – Центр по корпоративному управлению пригородным комплексом;

РЦФК – Региональный центр Департамента «Казначейство»;

РЦКУ – Региональный центр корпоративного управления (железная дорога филиал ОАО «РЖД»);

ЦДМВ – Центральная дирекция моторвагонного подвижного состава – филиал ОАО «РЖД»;

ЦДПО – Центральная дирекция пассажирских обустройств – филиал ОАО «РЖД»;

ЦДИ – Центральная дирекция инфраструктуры – филиал ОАО «РЖД»;

ЦТ – Дирекция тяги – филиал ОАО «РЖД»;

ЦДТВ – Центральная дирекция тепловодоснабжения – филиал ОАО «РЖД»;

– подразделения аппарата управления ОАО «РЖД», ответственные за принятие управленческих решений на основании матриц ВКР ППК, а именно:

ЦФ – Департамент корпоративных финансов,

ЦФК – Департамент «Казначейство»;

ППК – пригородные пассажирские компании, входящие в перечни, определенные периметрами планирования матриц ВКР ППК, ответственные за формирование и контроль исполнения матриц (планов) внутрикорпоративных расчетов ППК.

– другие подразделения ОАО «РЖД», филиалов ОАО «РЖД» и аппарата управления ОАО «РЖД», определенные периметром планирования матриц внутрикорпоративных расчетов.

Акцентируем, что Регламент позволяет не только формировать, но и контролировать исполнение матрицы (планов) по внутрикорпоративным расчетам с ППК, а данный документ рассматривают как обязательное слагаемое управления ОАО «РЖД», нацеленное применить общеметодологические инструменты, чтобы обеспечить своевременные директивы в сектор бюджетный и финансовый [5].

В настоящее время можно визуализировать схему как укрупненный процесс, в ходе которого формируются матрицы (планы) для расчетов исключительно внутри корпорации в отношении ППК, состоящий из, последовательных и взаимосвязанных этапов. Детализируем схему в таблице.

Контроль обязательно реализуется и в форме промежуточного, и итогового, чтобы по факту выявить отклонения Сторон от взаимно принятых обязательств, чтобы провести точно в соответствии с соглашением встречные платежи и не нарушить планов ВКР ППК.

Назначая платежам очередность, не следует нарушать логики, вытекающей из подписанных ранее договоров и учитывать условие приоритета из-за таких принципов:

1-я очередь: персонал должен получить как выплаты заработную плату, затем начисляются обязательные платежи, не упуская из внимания входящей задолженности и сроков погасить ее в текущем периоде, а также начало и конец конкретного налогового периода, перечисление владельцам акций дивидендов, переводы вырученных как транзитные средств (по факту выручено средств сторонними контрагентами);

2-я очередь: платежи, поступающие на счета ОАО «РЖД»;

3-я очередь: платежи, поступающие на счета дочерних и зависимых обществ ОАО «РЖД» (в т.ч. ППК);

Только в порядке последней очереди разрешено провести иные виды платежей, которые поступают сторонним контрагентам, чтобы не допустить не погашенных в срок долгов относительно различных контрагентов.

Для филиалов ОАО «РЖД» также по платежам установлена строгая очередность, учитывая определенные приоритеты:

– к 1-ой очереди отнесены платежи, внесенные в план как обязательные и поступающие на открытый ОАО «РЖД» центральный расчетный счет, переводящие вырученные как транзитные средства (перечисляется по факту полученная от стороннего контрагента сумма);

Этапы формирования матриц внутрикорпоративных расчетов ППК ОАО «РЖД» [5]

Этап 1. Предоставление пользователями ВРС ППК данных по расчетам	Калькуляции передаются пользователям ВРС ППК, задача которых состоит в том, чтобы внести данные без отклонений от требований периметра планов ВКР ППК, где в АСУ «Модель ВРС ППК» разработана и функционирует особая форма ввода данных.
Этап 2. Сверка данных по взаимным расчетам	Каждый пункт данных о взаимно проведенных расчетах перекрестно сверяется, тогда как основой сопоставления «зеркальных» индексов стала информация, поступившая от пользователей ВРС ППК в АСУ «Модель ВРС ППК». В итоге не допускается даже минимальных нестыковок.
Этап 3. Подписание планов внутрикорпоративных расчетов Сторонами	Стороны ставят визу, если соглашаются с планами проведения расчетов на внутрикорпоративном уровне. У пользователя ВРС ППК в АСУ «Модель ВРС ППК» есть доступ, позволяющий поднять статус информации в системе до уровня «Подписано» или использовать статус с оговоркой «Подписано с разногласиями».
Этап 4. Утверждение матрицы внутрикорпоративных расчетов ППК	Предназначенную для расчетов на внутрикорпоративном уровне матрицу облекают в форму сводной, формат утверждает руководство ОАО, начиная от президента, его заместителя в секторе экономической и финансовой ситуации, а также заместителем, курирующим сектор пассажирских перевозок. Согласовав сводную форму, таковую маркируют статусом «Утверждено» в АСУ «Модель ВРС ППК»
Этап 5. Контроль за исполнением Сторонами утвержденных матриц ВКР ППК на соответствующий период	Обязательно осуществление контроля сторон, исполняющих после утверждения матрицы ВКР ППК на оговоренный при согласовании отчетный период.

– к 2-ой очереди причислены средства, которые представляют собой заработок числящегося в филиалах ОАО «РЖД» персонала, отчисления в бюджет и различные фонды всех видов обязательных платежей, непременное погашение любых сумм из категории входящей задолженности, с учетом начала и завершения периода подачи налоговой отчетности;

– в 3-ую очередь входят средства, перечисляемые ППК, включая все виды обществ, которые зависят от ОАО «РЖД»;

– к последней очереди причислены иные виды платежей, перечисляемых иным контрагентам.

Опираясь на рекомендованную матрицу по факту ее утверждения, ЦФК каждую неделю составляет отчет об выполненной матрице в разрезе планируемых и фактических величин, чтобы показать на уровне внутрикорпоративном расчеты ППК, через сумму вывести итог с нарастающей а также, учитывая условия Методических указаний, направить матрицу ЦОПР, ЦФ, РЦКУ и пользователям ВРС ППК в АСУ «Модель ВРС ППК», чтобы стороны-адресаты отреагировали на динамику исполняемых планов [5].

Как контролеры, рассматривающие исполняемые матрицы, на основании которых проводятся внутрикорпоративные расчеты, перейдя к 5-ому этапу, обозначены ЦОПР, РЦКУ, ЦФ, ЦФК, а также пользователи ВРС ППК. Эти лица могут принимать дисциплинарные меры и воздействовать на администрацию разных уровней ППК и зависимых от ОАО «РЖД» подразделений, отступивших от норм финансово-расчетной дисциплины. При этом воздействие оговорено в положениях регламента.

При этом нарушениями признаются ситуации, где данные за квартал показывают, что руководство Подразделений ВРС ППК нарушило план и подняло объем задолженности, не погасив положенную часть расчетов внутрикорпоративного характера.

Заключение

На основании изложенного выше, резюмируем, что ОАО «РЖД» видит предпосылку к успешности стратегии, позволяющей управлять денежными потоками, как базис, от которого оттолкнется управленческий сектор компании для выхода на эффективность и результативность ее работы. В данное время аналитики денежных потоков применяют массу информативных показателей, чтобы уверенно координировать движение финансов, учитывая потенциал платежеспособности и риски обанкротиться, а также характеризует способы оптимизировать управление работой и процессами компании. Полученную информацию видим актуальной для пользователей внутренней категории, но, без сомнения, востребована и для категории внешних. Последние оперируют отраженными выше данными с таким целями: для анализа перспективных бизнес-партнеров, в то время как внутренние заинтересованные лица могут использовать собранную информацию для поиска слабых мест в работе компании и поиска путей оптимизации.

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ПОВЫШЕНИЕ ЭФФЕКТИВНОСТИ ФУНКЦИОНИРОВАНИЯ ВОКЗАЛЬНЫХ КОМПЛЕКСОВ ОАО «РЖД» НА ОСНОВЕ ВОВЛЕЧЕНИЯ АРЕНДОПРИГОДНЫХ ПЛОЩАДЕЙ В КОММЕРЧЕСКИЙ ОБОРОТ

Рябикин Р.В., Никонова Я.И.

Сибирский государственный университет путей сообщения, Новосибирск, e-mail: ryabikinrv@mail.ru

Железнодорожные вокзалы в России развиваются в соответствии с целевой моделью, предъявляющей определенные требования к вокзальным комплексам. В качестве одной из главных целей Дирекции железнодорожных вокзалов и ее филиалов определено повышение доходной составляющей своего бизнеса. В статье обоснована необходимость повышения эффективности функционирования вокзальных комплексов ОАО «РЖД» в условиях устойчивой тенденции снижения количества отправленных пассажиров с вокзалов. Основным методом сбора информации в работе послужил опрос в ходе как опосредованного (анкетирование – для потребителей сектора B2B), так и непосредственного (личное интервью – для потребителей сектора B2C) социально-психологического общения. Выборка респондентов производилась без специализированного отбора по полу и возрасту. В результате проведенного опроса были выявлены факторы, ограничивающие и стимулирующие развитие розничной торговли и услуг на вокзале. В качестве инструмента повышения эффективности функционирования вокзальных комплексов ОАО «РЖД» предложено вовлечение арендопригодных площадей в коммерческий оборот. Выявлен ряд проблемных вопросов, препятствующих наиболее полному вовлечению арендопригодных площадей в коммерческий оборот и разработаны мероприятия для минимизации влияния негативных факторов на процесс передачи площадей в аренду.

Ключевые слова: вокзальные комплексы, эффективность функционирования, вовлечение арендопригодных площадей в коммерческий оборот

IMPROVING THE EFFICIENCY OF THE RAILWAY STATION COMPLEXES OF JSC «RUSSIAN RAILWAYS» BY INVOLVING LEASABLE AREAS IN COMMERCIAL TURNOVER

Ryabikin R.V., Nikinova Ya.I.

Siberian Transport University, Novosibirsk, e-mail: ryabikinrv@mail.ru

Railway stations in Russia are developing in accordance with the target model, which imposes certain requirements on railway station complexes. One of the main goals of the Directorate of Railway Stations and its branches is to increase the revenue component of its business. The article substantiates the need to improve the efficiency of the railway station complexes of JSC «Russian Railways» in the context of a steady trend of reducing the number of passengers sent from railway stations. The main method of collecting information in the work was a survey in the course of both indirect (questionnaire – for B2B consumers) and direct (personal interview – for B2C consumers) socio-psychological communication. The sample of respondents was made without specialized selection by gender and age. As a result of the survey, the factors limiting and stimulating the development of retail trade and services at the railway station were identified. As a tool for improving the efficiency of the functioning of the railway station complexes of JSC «Russian Railways», the involvement of leasable areas in commercial turnover is proposed. A number of problematic issues have been identified that prevent the most complete involvement of leasable areas in commercial turnover and measures have been developed to minimize the impact of negative factors on the process of leasing space.

Keywords: railway station complexes, efficiency of functioning, involvement of leasable areas in commercial turnover

Одной из главных целей деятельности ОАО «РЖД» является извлечение прибыли [1]. Данная цель транслируется по иерархии на бизнес-блоки, филиалы и структурные подразделения. Дирекция железнодорожных вокзалов (ДЖВ) – филиал ОАО «РЖД» является обособленным подразделением открытого акционерного общества «Российские железные дороги», образованным во исполнение решения совета директоров от 3 марта 2006 года. Для Дирекции железнодорожных вокзалов и ее филиалов одной из главных целей является повышение доходной составляющей своего бизнеса.

Однако, на сегодняшний день существует ряд немаловажных факторов, оказывающих существенное влияние на данный показатель деятельности Дирекции железнодорожных вокзалов. Так, последние несколько лет прослеживается устойчивая тенденция снижения количества отправленных пассажиров с вокзалов Дирекции. Особенно остро это ощущается на вокзалах «зауральной» части России. Еще одним фактором, определяющим доходность бизнеса ОАО «РЖД» в целом и Дирекции железнодорожных вокзалов в частности, является общая экономическая ситуация в стране. На фоне экономической нестабильности в России существенно снижается транспортная активность населения, а также платежеспособный спрос на товары и услуги, сопутствующие услугам железнодорожного транспорта [2]. Серьезной проблемой на сегодняшний день также является излишняя забюрократизованность процесса вовлечения в коммерческий оборот площадей вокзальных комплексов. Все указанные выше факторы существенно влияют на эффективность функционирования вокзальных комплексов.

Цель исследования: предложить направления повышения эффективности функционирования вокзальных комплексов ОАО «РЖД» на основе вовлечения арендопригодных площадей в коммерческий оборот.

Материалы и методы исследования

Основным методом сбора информации в работе послужил опрос в ходе как опосредованного (анкетирование – для потребителей сектора B2B), так и непосредственного (личное интервью – для потребителей сектора B2C) социально-психологического общения.

С целью изучения потребительского спроса на услуги, предоставляемые на железнодорожных вокзалах, был проведен опрос потребителей, которыми являются пассажиры и другие посетители вокзального комплекса, методом личного интервьюирования. Выборка респондентов производилась без специализированного отбора по полу и возрасту. Анкета состояла из 8 вопросов закрытого типа. Всего было опрошено 202 человека.

Анализ данных потребителей сектора B2B был проведен методом анкетирования. В анкете руководителю организации предлагалось назвать три фактора, ограничивающих развитие розничной торговли и услуг на вокзале, и три фактора, стимулирующих развитие розничной торговли и услуг на вокзале.

Результаты исследования и их обсуждение

На сегодняшний день в управлении Дирекции железнодорожных вокзалов находится 353 крупнейших вокзала России, которые сгруппированы в рамках 15 региональных структурных подразделений [3]. Общий годовой пассажиропоток на вокзалах Дирекции в 2019 году составил более 330 миллионов человек [4]. В управлении Дирекции находится 1,31 миллиона квадратных метров площадей пассажирских зданий и 2,98 миллиона квадратных метров платформ. 353 вокзала Дирекции железнодорожных вокзалов компании «Российские железные дороги» имеют различные эксплуатационные и технологические характеристики. Усредненные показатели приведены в табл. 1.

Анализ деятельности вокзальных комплексов в Европе показал, что ключевым фактором их успешного развития является концентрация всех видов транспорта в одной точке для обеспечения максимально удобного для пассажира пользования услугами любого вида транспорта [5]. На базе европейских вокзалов успешно реализуется концепция транспортно-пересадочных узлов, интегрирующих в себе, кроме железнодорожного транспорта, метро, такси, каршеринг, автобусы, велосипеды, самокаты и т.д. [6].

Анализ важнейших показателей вокзалов ОАО «РЖД» в сравнении с вокзалами немецких железных дорог (DB Service&Station), приведен в табл. 2.

О низкой «маркетинговой» эффективности бизнес-процессов на вокзалах говорит низкий процент вовлечения площадей в коммерческий оборот, т.е. долю нетранспортного сектора, она составляет только 12% и ниже показателя зарубежных вокзалов на 7%. С низким пассажиропотоком связана и более низкая ставка аренды [7].

15 региональных дирекций железнодорожных вокалов соответствуют в территориальном аспекте структурным подразделениям ОАО «РЖД» – железным дорогам, которые выполняют функции региональных центров корпоративного управления. По количеству, переданных в управление вокзалов, Западно-Сибирская РДЖВ занимает второе место на сети дорог, обслуживая 42 вокзальных комплекса (рис. 1).

Таблица 1

Эксплуатационная и технологическая характеристика вокзалов Дирекции

Малые вокзалы по классам	количество, ед.	Усредненные характеристики вокзалов			Суточный пассажиропоток, чел.	в т.ч. по видам сообщения:	
		площадь здания, кв.м.	этажность здания, этажей	количество платформ, ед.		дальнее	пригородное
Всего	348	1485	2,9	3,3	2598	748	1850
из них:							
внеклассные	38	22140	4,9	7,5	11984	5870	6114
1 класс	84	3542	3,2	3,2	2320	981	1339
2 класс	82	2168	2,1	2,5	864	307	557
3 класс	126	1188	1,8	2,2	436	112	323
без класса	18	554	1,4	1,6	239	21	218

Таблица 2

Показатели работы вокзальных комплексов компании «Российские железные дороги» в сравнении с вокзальными комплексами DB Service&Station

Показатель	Ед.изм	Вокзалы ДЖВ			Вокзалы DB Service& Station
		малые	крупные	всего	
Вокзалов	ед.	226	122	348	5400
Общая площадь	тыс. кв.м.	365	864	1229	12500
Удельные операционные расходы на 1 кв.м. площади	тыс. руб/кв.м. в год	14,6	11,3	12,3	2,7
Удельные операционные расходы на 1 посетителя	руб/чел.	104	29	39	11
Доля площадей, вовлеченных в коммерческий оборот	%	6	14	12	19
Ставка аренды	тыс.руб/кв.м. в год	4,1	10,8	9,3	12,1
Интенсивность использования площадей для обслуживания потребителей	чел. в год/ кв.м.	141	387	315	245

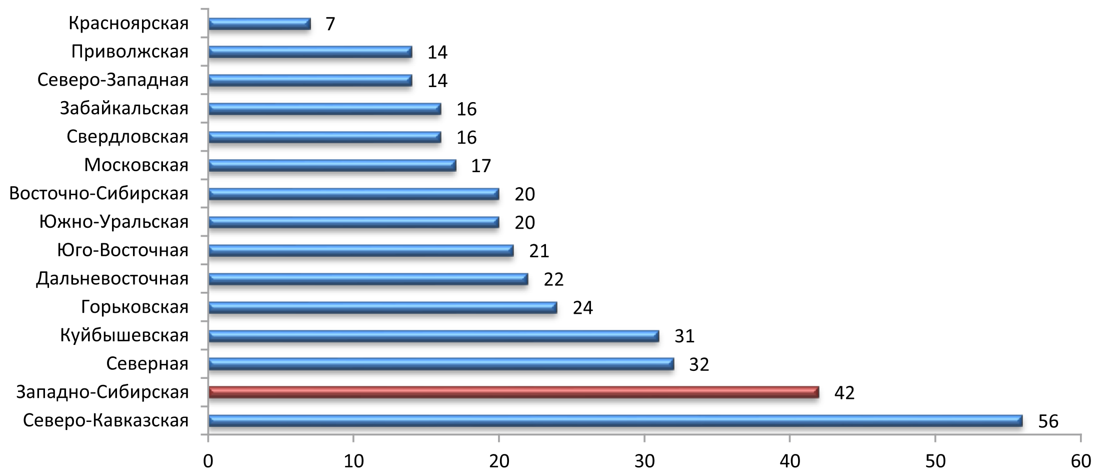

Рис. 1. Распределение вокзалов ДЖВ по региональным дирекциям

В целом по Западно-Сибирской РДЖВ наблюдается положительная динамика роста прибыли от прочих видов деятельности (рис. 2).

Рост прибыли достигается за счет такого высокорентабельного вида деятельности, как передача в аренду площадей вокзальных комплексов [6]. Доходы от передачи в аренду недвижимого имущества в 2019 году составили 78,3 млн. руб., что на 1,9 млн. руб. (-2,4 %) ниже уровня 2018 года. Средняя доходная ставка 1 кв.м. в 2019 году составила 11,668 тыс. руб. в год. В 2018 году средняя доходная ставка составляла 11,328 тыс. руб. на 1 кв.м. переданного в аренду имущества. Количество переданных в аренду площадей в 2019 году снизилось по сравнению с 2018 годом. Распределение площадей, переданных в аренду, по состоянию на 31.12.2019 представлено на рис. 3.

Значительная часть переданных в аренду площадей используется для размещения предприятий общественного питания (43 %), предприятий торговли (19 %), помещений авиакасс, автокасс, залов ожидания для пассажиров автомобильного транспорта (19 %), а также для размещения автопарковок (11 %). Данные сегменты рынка не являются высокодоходными. Средняя доходная ставка 1 кв.м. переданного в аренду для размещения предприятий общественного питания составляет 8044,65 руб. в год, помещений авиакасс и автовокзалов – 5319,83 руб. в год, автопарковок – 1607,97 руб. в год.

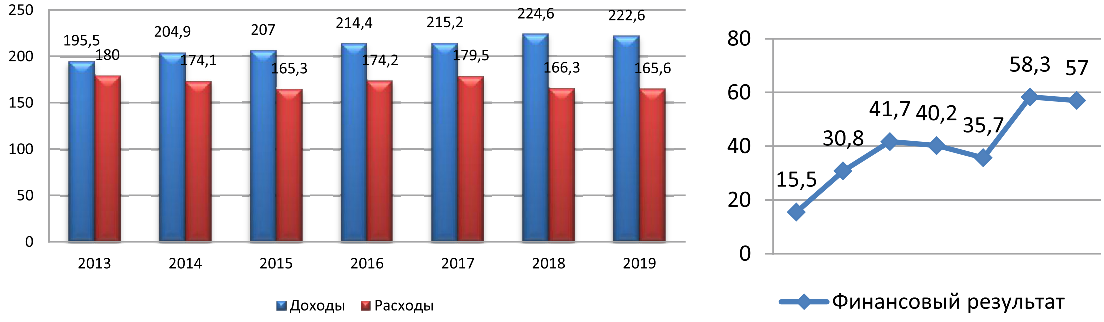

Рис. 2. Динамика финансового результата по прочим видам деятельности Западно-Сибирской РДЖВ, млн. руб.

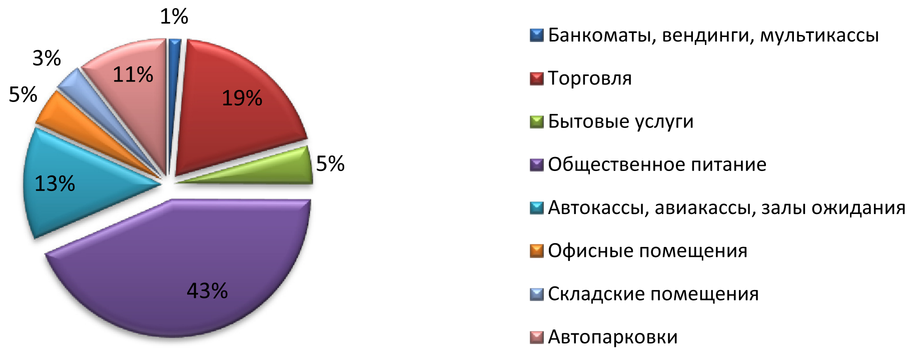

Рис. 3. Распределение площадей, переданных в аренду

Наиболее высокодоходным сегментом является передача площадей в аренду для размещения банкоматов, вендинговых и торговых автоматов, платежных терминалов и мультикасс. Занимая всего 1 % переданных в аренду площадей, данные договоры приносят 6 % доходов.

В 2019 году более половины доходов от передачи в аренду недвижимого имущества было получено за счет размещения предприятий торговли и общественного питания.

Таким образом, вовлечение арендопригодных площадей в коммерческий оборот является одним из наиболее перспективных направлений развития вокзальных комплексов ОАО «РЖД» (рис. 4).

На железнодорожном вокзале Новосибирск-Главный на сегодняшний день осуществляют свою деятельность 57 организаций-арендаторов. Основная доля арендаторов в количественном отношении – это торговля непродовольственными товарами (35,1 %), однако в общем объеме арендуемых площадей их доля составляет лишь 12,5 %. Прямо противоположная ситуация с арендаторами из сектора общественного питания: 12,3 % от общего количества и 41,4 % от общей арендуемой площади. Данная ситуация свидетельствует о необходимости проявления дифференцированного подхода к расчету арендной платы для арендаторов различных видов бизнеса.

Для анализа данных потребителей сектора B2B была разработана анкета, в которой руководителю организации предлагалось назвать три фактора, ограничивающих развитие розничной торговли и услуг на вокзале, и три фактора, стимулирующих развитие розничной торговли и услуг на вокзале.

В результате проведенного опроса были выявлены факторы, ограничивающие и стимулирующие развитие розничной торговли и услуг на вокзале (рис. 5).

К основным факторам, ограничивающим развитие розничной торговли и услуг на вокзале, арендаторами отнесены: высокая арендная плата, снижение трафика пассажиров и высокая конкуренция. К основным стимулирующим факторам арендаторами отнесены: высокая концентрация клиентов в одном месте (на вокзале), устойчивый спрос на отдельные виды товаров и услуг и круглосуточный режим работы вокзала.

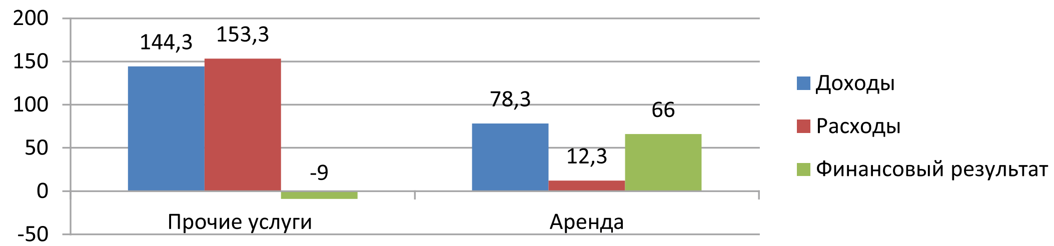

Рис. 4. Динамика финансового результата от прочих услуг и аренды

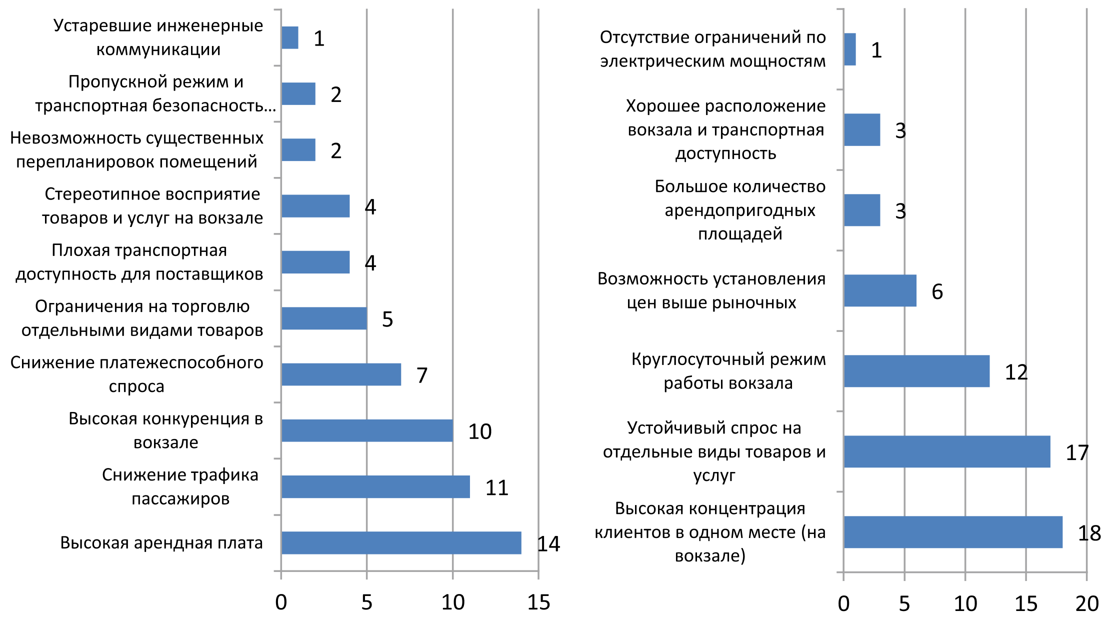

Рис. 5. Факторы, ограничивающие и стимулирующие развитие розничной торговли и услуг на вокзале (частота упоминаний фактора в анкетах)

Несмотря на то, что площадь арендуемых помещений вокзала достигает 2,5 тыс. кв.м. на сегодняшний день имеется еще не менее 2 тыс.кв.м. пригодных для аренды площадей, что говорит о хороших возможностях расширения перечня арендаторов.

В то же время существует ряд проблемных вопросов, препятствующих наиболее полному вовлечению арендопригодных площадей в коммерческий оборот:

1. Процедуры по проведению торгов занимают до 5 месяцев от момента поступления предложения от потенциального арендатора до заключения договора. Потенциальные арендаторы рассчитывают на срок заключения договора не более 1-2 месяцев.

2. Процедура торгов по аренде сопряжена с определенными барьерами для участников (внесение обеспечения в размере 10 % годовой арендной платы, необходимость подготовки пакета документов для участия). Данные ограничения сужают круг потенциальных участников.

3. При проведении оценки рыночной стоимости (арендной ставки) при формировании цен по объектам-аналогам, учитываются не все ценообразующие факторы, специфические для вокзальных комплексов. В результате цена по сравнительному методу формируется необъективной (завышенной).

4. Применяемая ДЖВ методика оценки подразумевает учет в арендной ставке затрат на амортизацию и налог на имущество. В результате по основным сегментам сервисов (общепит, торговля, бытовые услуги) предложения по цене не являются конкурентными на рынке.

5. Отсутствует действенный механизм понижения цены при отсутствии интереса потенциальных арендаторов к предложениям по аренде.

Для минимизации влияния негативных факторов на процесс передачи площадей в аренду предлагается проведение ряда мероприятий:

1. Делегировать на постоянных условиях полномочия по принятию решения о проведении торгов на вокзальных комплексах региональной дирекции начальнику региональной дирекции. Это позволит ускорить процедуру принятия решения о заключении сделок по аренде (проведении торгов).

2. Упростить процедуру проведения торгов. За образец процедуры целесообразно принять процедуру «конкурентный отбор», используемую в ОАО «РЖД» для закупки товаров, работ и услуг с ценой договора до 1,0 млн. руб. Это значительно ускорит проведение торгов, снизит барьеры для участия в торгах.

3. Целесообразно, при проведении рыночной оценки учитывать специфические факторы, характерные для вокзалов и не учитывать затраты на амортизацию и налог на имущество.

4. Необходим механизм понижения начальной цены (цены предложения). Данный механизм может базироваться на принципе поэтапного снижения цены на определенный процент по результатам проведения процедур продажи арендных площадей.

Заключение

В современных условиях функционирования железнодорожного транспорта повышение доходности услуг и вывод их на безубыточный уровень является залогом устойчивой работы подразделений ОАО «РЖД». Развитие новых сервисов, интеграция вокзалов в социально-культурное и бизнес-пространство городов, клиентоориентированный подход к пассажиру позволит российским вокзалам соответствовать мировым стандартам качества обслуживания потребителей и пользователей, обеспечит надежность их функционирования и достижение максимальной экономической эффективности.

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