SOI: 1.1/TAS
DOI: 10.15863/TAS
Scopus ASJC: 1000

ISSN 2308-4944 (print)
ISSN 2409-0085 (online)

№ 06 (98) 2021

Teoretičeskaâ i prikladnaâ nauka

Theoretical & Applied Science

Philadelphia, USA

Teoretičeskaâ i prikladnaâ nauka

Theoretical & Applied Science

06 (98)

2021

International Scientific Journal

Theoretical & Applied Science

Founder: **International Academy of Theoretical & Applied Sciences**

Published since 2013 year. Issued Monthly.

International scientific journal «Theoretical & Applied Science», registered in France, and indexed more than 45 international scientific bases.

Editorial office: http://T-Science.org Phone: +777727-606-81

E-mail: T-Science@mail.ru

ISSN 2308-4944

9 772308 494218 06

International Scientific Journal

Theoretical & Applied Science

Editorial Board:

International Scientific Journal

Theoretical & Applied Science

ISJ Theoretical & Applied Science, 06 (98), 782.
Philadelphia, USA

Impact Factor ICV = 6.630

Impact Factor ISI = 0.829
based on International Citation Report (ICR)

The percentage of rejected articles:

ISSN 2308-4944

Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 9.035	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2021 **Issue:** 06 **Volume:** 98

Published: 01.06.2021 **http://T-Science.org**

QR – Issue QR – Article

M. Rahimkhani
Tehran University of Medical Sciences
M.D. & Ph.D, Associated Professor, Faculty of Allied Medical Sciences,
Tehran, Iran. Phone number: 09124253368
rrahimkhani@sina.tums.ac.ir

K. Kazemian
Tehran University of Medical Sciences
Al.Mahdi Clinic, Tehran, Iran

M. Zarebavani
Tehran University of Medical sciences
Faculty of Allied Medical Sciences, Tehran, Iran

A. Khavarydaneshvar
University of Tehran
Faculty of Engineering, Tehran, Iran

M.S. Safari
Science and Research Branch of Azad University
Faculty of veterinary, Tehran, Iran

SEROPREVALENCE OF TOXOPLASMA IgG AND IgM ANTIBODIES IN IRANIAN YOUNG WOMEN BEFORE PREGNANCY

Abstract: *Background: Toxoplasmosis is an infection caused by an intracellular parasite called Toxoplasma gondii. One of the most common methods of diagnosis and screening of women in terms of these infectious agents is serological tests.*

Material and methods: The totals of 103 women were referred to the laboratory for pre-pregnancy tests. One of the pre-pregnancy tests was to determine the amount of serum Toxoplasma gondii antibodies of both types IgG and IgM antibodies.

Results: A total of 103 women were enrolled during the study period with the mean age ± standard deviation (SD) of 28.02 ± 6.07 years. The prevalence of specific anti -Toxoplasma gondii IgG and IgM was of 18.4% (19/103) and 0.97%(1/103) respectively. 32.4% of studied women kept cats at home or have been in contact with cats for some time.

Conclusion: In this study the incidence of acute Toxoplasmosis was very low and also the rate of IgG antibody positive was less than other previous reports. Women's awareness about transmitting ways of the Toxoplasmosis has a very important role in the prevention and prevalence of Toxoplasmosis in society.

Key words: *Toxoplasma gondii, IgG antibody, IgM antibody, pre-pregnancy.*

Language: *English*

Citation: Rahimkhani, M., Kazemian, K., Zarebavani, M., Khavarydaneshvar, A., & Safari, M. S. (2021). Seroprevalence of Toxoplasma IgG and IgM Antibodies in Iranian young women before pregnancy. *ISJ Theoretical & Applied Science, 06 (98)*, 1-5.

Soi: http://s-o-i.org/1.1/TAS-06-98-1 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2021.06.98.1

Scopus ASCC: *2700.*

Introduction

Toxoplasma gondii is an obligate intracellular parasitic protozoan eukaryote that causes the infectious disease toxoplasmosis. T. gondii is capable of infecting virtually all warm-blooded animals, but domestic cats, are the only known definitive hosts in which the parasite may undergo sexual reproduction.(1) In humans, T. gondii is one of the most common parasites in developed countries. Serological studies estimate that 30–50% of the global population has been exposed to and may be chronically infected with T. gondii, although infection rates differ significantly from country to country. (2) For example, estimations have shown the highest percentage of people infected is in France, at 84%, as of 2000.Although mild, flu-like symptoms occasionally occur during the first few weeks following the exposure, infection with T. gondii produces no readily observable symptoms in healthy human adults.(3)

The lifecycle of T. gondii may be broadly summarized into two components: a sexual component that occurs only within cats (felids, wild or domestic), and an asexual component that can occur within virtually all warm-blooded animals, including humans, cats, and birds. (4)

Toxoplasmosis is a parasitic disease caused by *Toxoplasma gondii*. Infections with toxoplasmosis usually cause no obvious symptoms in adults. Occasionally, people may have a few weeks or months of mild, flu-like illness such as muscle aches and tender lymph nodes. Toxoplasmosis is usually spread by eating poorly cooked food that contains cysts, exposure to infected cat feces, and from an infected mother to her baby during pregnancy. Rarely, the disease may be spread by blood transfusion. It is not otherwise spread between people. The parasite is known to reproduce sexually only in the cat family.However, it can infect most types of warm-blooded animals, including humans. (5)

Toxoplasmosis Infection has three stages:

1. Acute

Acute toxoplasmosis is often asymptomatic in healthy adults. However, symptoms may occur and are often influenza-like: swollen lymph nodes, headaches, fever, and fatigue, or muscle aches and pains that last for a month or more. It is rare for a human with a fully functioning immune system to develop severe symptoms following the infection. People with weakened immune systems are likely to experience headache, confusion, poor coordination, seizures, lung problems or blurred vision caused by severe inflammation of the retina (ocular toxoplasmosis).Young children and immunocompromised people, such as those with HIV/AIDS, those taking certain types of chemotherapy, or those who have recently received an organ transplant, may develop severe toxoplasmosis. Infants infected via placental transmission may be born with either of these problems, or with nasal malformations, although these complications are rare in newborns.

2. Latent

Due to the absence of obvious symptoms, hosts easily become infected with T. gondii and develop toxoplasmosis without knowing it. Although mild, flu-like symptoms occasionally occur during the first few weeks following the exposure, infection with T. gondii produces no readily observable symptoms in healthy human adults.(6)

3. Skin

While rare, skin lesions may occur in the acquired form of the disease, including roseola and erythema multiforme-like eruptions, prurigo-like nodules, urticaria, and maculopapular lesions. Newborns may have punctate macules, ecchymoses, or "blueberry muffin" lesions. (7)

The diagnostic test for the detection of T. gondii (oocyst, tachyzoite, and bradyzoite) in a suspected tissues of humans or animals has evolved greatly over time, but serological test is frequently more common [17], followed by molecular techniques [18], and then histological techniques [19]. Other diagnostic methods with less reportage include bioassay in mice or cat, tissue culture, and microscopy. (8)

Reviews of serological studies have estimated that 30–50% of the global population has been exposed to and may be chronically infected with latent toxoplasmosis, although infection rates differ significantly from country to country.This latent state of infection has recently been associated with numerous disease burdens, neural alterations and subtle gender-dependent[dubious – discuss] behavioral changes in immunocompetent humans as well as a increased risk of motor vehicle collisions.(9)

The serological test measures the antibodies and determines the seroprevalence of the infection by checking the immunoglobulin G (IgG), immunoglobulin M (IgM), and IgG avidity levels in a sample, usually serum from the blood of the specific host. This is the simplest and the easiest test but mostly is characterized by either false-positive or false-negative results. (10)

The aim of this study was to evaluate the level of Toxoplasma antibodies (IgG & IgM) in Iranian young women during their pre-pregnancy.

Material and Methods:

This study was a cross-sectional study and in 9 months during 2020-2021, the levels of serum Toxoplasma IgG and IgM antibodies for 103 young women were evaluated. These pregnant women were admitted to the AlMahdi clinic for pre-pregnancy tests. Al-Mahdi Clinic is in the south of Tehran and is under the supervision of the Tehran University of Medical Sciences Vice Chancellor.

Data on demographic and potential risk factors were collected from each study participant using

structured questionnaire. Moreover, venous blood specimens were collected and tested for IgM and IgG anti-T. gondii antibodies by quantitative immunoassay with the immunoassay method and using Immolite 2000 auto-analyzer (Siemens, Germany) and according to the instructions of the manufacturer of the kit and the device mentioned above. All positive and suspicious results of antibodies were tested two times.

The normal range of serum Toxoplasma IgG antibodies was as follows:

- Reactive >8 IU/ml
- Inter 6.5-8 IU/ml
- non-reactive <6.5 IU/ml

The normal range of serum Toxoplasma IgG antibodies was as follows:

- Reactive >1.1 IU/ml
- Inter 0.9-1.1 IU/ml
- non-reactive <0.9 IU/ml

The data entry was carried out using Excel software and analyzed by Statistical Package for the Social Sciences (SPSS). Percentages were used to analyse of the categorical variables and quantitative variables are presented as mean ± standard deviation (±SD).

Results:

A total of 103 women were enrolled during the study period with the mean age ± standard deviation (SD) of 28.02 ± 6.07 years.

Mean age and distribution of age in studied women are shown on table1.

Table 1: distribution of age in women

variable	mean	maximum	minimum	SD
Age	**28.02**	**42**	**17**	**6.07**

Seroprevalence of Toxoplasma and demographic characteristics in the studied women are shown on table 2.

Table 2: Univariate analysis of Toxoplasma IgG in relation to socio-demographic characteristics among the studied women in south of Tehran

variable	Toxoplasma seroprevalence (IgG positive)	P-value
Category age		
17-19	14 (1/7)	0.85
20-29	11.9 (5/42)	0.78
>30	24 (13/54)	0.05
Occupation		
Housewife	17.5 (16/91)	0.05
Others	25 (3/12)	0.01
Education level		
Primary school	0 (0/4)	-
Diploma	18.3(16/87)	0.93
Bachelor science and more	25 (3/12)	0.78
Present of cat at home or have been in contact with cats for some time.		
Yes	32.4 (12/37)	0.01
No	10.6 (7/66)	0.24

The prevalence of specific anti -Toxoplasma gondii IgG and IgM were of 18.4% (19/103) and 0.97%(1/103) respectively. Frequency distribution of Toxoplasma IgG antibody positive (> 8 IU/ml) and Toxoplasma IgM antibody positive (>1.1 IU/ml) in the studied women were shown in table 2.

Table2: Frequency distribution of Toxoplasma IgG antibody positive (> 8 IU/ml) and IgM antibody positive (>1.1 IU/ml) in the studied group.

variable	frequency	Percent (%)
IgG positive	19	18.4
IgG negative	84	81.6
IgM positive	1	0.97
IgM negative	102	99.03

Discussion:

Toxoplasmosis is one of the most prevalent zoonotic diseases infecting wide range of warm-blooded animals including humans. The presence of Toxoplasma has been reported in every country and its prevalence ranges from 30% to 60% in both developed and developing countries.

Generally, countries in Latin America and Southeast Africa with warm and humid climates were found to have high seroprevalences, moderate seroprevalences were found in Central and Southern Europe, and lower seroprevalences were reported in North America, North Europe, Southeast Asia, China, and Korea. (11)

There are many investigations about seroprevalence of Toxoplasma gondii in different groups of population i.e. pregnant women, healthcare personnel, students, housewives, etc. the present study is seroprevance of Toxoplasma gondii in young women who admitted to Almahdi clinic (south of Tehran) for pr- pregnancy tests.

Serological tests to detect specific anti-T. gondii IgG and/or IgM antibodies are the first step in the diagnosis of toxoplasmosis. A 2-fold rise in IgG titre or positive IgM indicates recent/acute infection. A high incidence of seroprevalence of up to 92.5% was reported in Ghana but a moderate to low seroprevalence was reported in most South Asian countries.(12)

The prevalence of anti -Toxoplasma gondii IgG antibodies was observed 31.1% in pregnant women from urban areas of Burkina Faso. (13) This percentage was higher than what we achieved in the present study. Based on another study in Pakistan, eastern neighboring country, The overall seroprevalence of T. gondii infection in women of childbearing age, pregnant women and non-pregnant women were57.28%, 56.46% and 43.53% respectively but in the present study 18.4% of non-pregnant women were IgG antibody positive. (14) That's almost twice the percentage that was achieved in this study.

Some investigations figured out that, there is a technique that can be effective and specifically diagnose Toxoplasma infections in women with high risk of spontaneous abortion. The findings of the present investigation suggest that loop-mediated isothermal amplification (LAMP) assay is a preferred method for determining Toxoplasma infection in pregnant women with serological tests. (15)

In the present study, the seroprevalence of T. gondii among women who had cats was higher than in women who did not. A significant connection was found between the presence of cats in the household and T. gondii seropositivity (P=0.01), Similar results were shown by studies conducted in Luanda (Angola). (16)

Women's awareness about transmitting ways the Toxoplasmosis has a very important role in the prevention and prevalence of diseases in society. (17) Therefore, although 18.4% of the women in our study were IgG antibody positive, only one person was an IgM antibody positive. This means that only one person had an acute illness, despite the fact that 32.4% of women kept cats at home or have been in contact with cats for some time. Therefore, in our studied women group, due to moderate level of knowledge and literacy, the incidence of acute Toxoplasmosis was very low and also the rate of IgG antibody positive was less than other previous reports. Fortunately, 99% of the women in this study had at least a high school education, and their subjects described the toxoplasma parasite.

· **Ethics Approval and Consent to Participate:** This study was approved by local conventional manner and by the ethical committee of Tehran University of Medical Sciences by number: IR.TUMS.SPH.REC.1398.089.

Consent for Publication: All the authors approved the paper.

· **Funding:** There has been no financial support for this work.

· **Availability of Data and Materials:** All data and information is available.

· **Conflict of Interest:** The authors declare that they have no conflict of interests**.**

References:

1. Dubey, J. P. (2010). *"General Biology". Toxoplasmosis of Animals and Humans* (Second ed.). (pp.1-20). Boca Raton, London, New York: Taylor and Francis Group.
2. Pappas, G., Roussos, N., & Falagas, M.E. (2009). "Toxoplasmosis snapshots: global status of Toxoplasma gondii seroprevalence and implications for pregnancy and congenital toxoplasmosis". *International Journal for Parasitology*, 39 (12): 1385–94.
3. Berdoy, M., Webster, J.P., & Macdonald, D.W. (2000). "Fatal attraction in rats infected with Toxoplasma gondii". *Proceedings of the Royal Society of London B: Biological Sciences*, 267 (1452): 1591–94.
4. Kami Kim, 1., & Weiss, L.M. (2004). Toxoplasma Gondii: The Model Apicomplexan. Perspectives and Methods. *Int J parasitol.*, 34(3): 423-32.
5. Liu, Q., Wang, Z., Huang, S., & Zhu, X. (2015). Diagnosis of toxoplasmosis and typing of Toxoplasma gondii. *Parasites and Vectors*, 8: 292.
6. Ybañez, R. H. D., Ybañez, A. P., & Nishikawa, Y. (2020). Review on the Current Trends of Toxoplasmosis Serodiagnosis in Humans. *Front Cell Infect Microbol*, 10: 204.
7. Layon, A. J., Gabrielli, A., & Friedman, W. A. (2013). Central Nervous System Infections. *Textbook of Neurointensive Care*, 427–517.
8. Dubey, J.P., & Dubey, J.P. (2010). Toxoplasmosis of Animals and Humans, 2nd ed. (p.313). CRC Press: Boca Rato, FL, USA.
9. Parlog, A., Schlüter, D., & Dunay, I.R. (2015). "Toxoplasma gondii-induced neuronal alterations". *Parasite Immunology*, 37 (3): 159–170.
10. Mohammed Nasiru Wana, Mohamad Aris Mohd Moklas, Malaika Watanabe, Norshariza Nordin , Ngah Zasmy Unyah, Sharif Alhassan Abdullahi, Ashraf Ahmad Issa Alapid, Tijjani Mustapha, Rusliza Basir, Roslaini Abd. Majid. (2020). A Review on the Prevalence of Toxoplasma gondii in Humans and Animals Reported in Malaysia from 2008–2018. *Int. J. Environ. Res. Public Health*, 17: 4809.
11. Kuo Zhang Guigao Lin, & Yanxi Han Jinming Li (2016). Serological diagnosis of toxoplasmosis and standardization. *Clinica Chimica Acta*, 461: 83-89.
12. Al-Shammari, N., & Iqbal, J. (2021). Decreasing trend in toxoplasma seroprevalence among pregnant women in Kuwait. *Eastern Mediterranean Health Journal*, 27(1): 67-75.
13. Bamba, S., Cissé, M., Sangaré, I., Zida, A., Ouattara, S., & Guiguemdé, R. T. (2017). Seroprevalence and risk factors of Toxoplasma gondii infection in pregnant women from Bobo Dioulasso, Burkina Faso. *BMC Infect Dis.*, 17(1): 482.
14. Khan, M.A., Islam, Z., Jan, A.U., Khan, K., & Shah, A. (2021). Seroepidemiology of toxoplasma gondii infection in child bearing age women in dir Khyberpakhtunkhawa, Pakistan. *Pakistan Journal of Zoology*, 53(1): 375-378.
15. Kheirandish, F., Fallahi, S., Mahmoudvand, H., Araban, A., Anbari, K., Rouzbahani, A.K., & Akbari, S. (2021). A loop-mediated isothermal amplification (LAMP) assay for detection of Toxoplasma gondii infection in women with spontaneous abortion. *Archives of Microbiology*, 203(2):763-769.
16. Vueba, A. N., Faria, C. P., Almendra, R., Santana, P., & do Céu Sousa, M. (2020). Serological prevalence of toxoplasmosis in pregnant women in Luanda (Angola): *Geospatial distribution and its association with socio-demographic and clinical-obstetric determinants*, 15(11): e0241908.
17. Ait Hamou, S., & Laboudi, M. (2021). An analytical study on the awareness and practice relating toxoplasmosis among pregnant women in Casablanca, Morocco. *BMC Public Health*, 21(1): Article number 507.

Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 9.035	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS
International Scientific Journal
Theoretical & Applied Science
p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)
Year: 2021 **Issue:** 06 **Volume:** 98
Published: 01.06.2021 **http://T-Science.org**

QR – Issue QR – Article

Alexander Vasilievich Kozhemyachenko
ISOP (branch) of DSTU in Shakhty
Doctor of Technical Sciences, Professor of the Department «ATTO»

D.N. Lyubimov
LLC IC «Lik»
Candidate of Technical Sciences Associate Professor
Surgut

I.F. Pustovoy
LLC «Intech»
St. Petersburg

PARTICLE OF FRICTION GEOMODIFIER IN AQUATIC MEDIUM

Abstract: *The work is devoted to the study of the issue of the influence of viscous lubricants on sediment deposition of mechanical impurities and geomodifiers introduced into the lubricant as functional additives, it is shown that a viscous medium weakens the process of sediment formation, but at the same time affects the mechanical activation of the friction surface and the formation of protective antifriction layers.*

Key words: *friction geomodifiers, serpentine, viscosity, lubricating medium, sedimentation, mechanical activation, additive.*

Language: *Russian*

Citation: Kozhemyachenko, A. V., Lyubimov, D. N., & Pustovoy, I. F. (2021). Particle of friction geomodifier in aquatic medium. *ISJ Theoretical & Applied Science, 06 (98),* 6-10.

Soi: http://s-o-i.org/1.1/TAS-06-98-2 ***Doi***: https://dx.doi.org/10.15863/TAS.2021.06.98.2

Scopus ASCC: *1600.*

ЧАСТИЦА ГЕОМОДИФИКАТОРА ТРЕНИЯ В ВОДНОЙ СРЕДЕ

Аннотация: *Работа посвящена исследованию вопроса влияния вязких смазочных средств на выпадение осадка механических примесей и геомодификаторов введенных в смазку в качестве функциональных добавок, показано, что вязкая среда ослабляет процесс образования осадка, но в то же время влияет на механоактивацию поверхности трения и формирования защитных антифрикционных слоев.*

Ключевые слова: *геомодификаторы трения, серпентин, вязкость, смазочная среда, седиментация, механоактивация, присадка.*

Введение

Эффективность включения в смазочную композицию дисперсных наполнителей на основе минерального спроса, такого как серпентин, внешняя простота их практического применения сделала их использование достаточно популярным направлением в современной триботехнике [1;2]. Однако тщательное изучение фрикционных процессов, сопровождающих использование минеральных модификаторов трения (ММТ) обнаружил достаточный сложный механизм их влияния, как на смазочный материал, в который вводится ММТ, так и на фрикционные характеристики угла трения.

Как было показано в работах [3;4], сами частицы ММТ не обладают достаточными антифрикционными характеристиками, но образуя сильную адгезионную связь с металлической поверхностью трения формируют устойчивый смазочный клин, обеспечивающий высокие трибохимические свойства угла трения. По сути ММТ имеет вид многофазной

гетерогенной малоконцентрированной свободнодисперсной системы, компоненты которой обладают определенной степенью совместимости. Причем ММТ оказывает влияние на геологические характеристики смазочного материала [5].

Добавление в базовое масло присадки ММТ приводит к изменению её вязкости (как правило, увеличению). Увеличение вязкости представляется нежелательным эффектом, особенно в процессе пуска, т.к. последней в данном случае, сопровождается излишними потерями мощности. Тем не менее, оценивая влияние ММТ на свойство масел можно сделать вывод о том, что введение ММТ в смазочный материал повышает долговечность последнего. Интересно отметить, что кинетическая совместимость является свойством системы находится в состоянии метастабильного равновесия, регулируемого электрическим взаимодействием компонентов, протекание процессов адсорбации, диффузии и химических реакций между компонентами трибосистемы. Термодинамические совместимые компоненты при определенных условиях могут быть не совместимы кинетически, что может привести к коалесценции и выпадению одного из них в осадок. Для выхода из этой ситуации в составы дисперсных систем ММТ с целью стабилизации вводят ПАВ, а также повышают дисперсность частиц ММТ.

С диспергированием минеральных частиц увеличивается и удельная поверхность, соответственной растет и поверхностная энергия, определяющая и физико-химическую активность при измельчении минеральных материалов оптимальную дисперсность устанавливают опытным путём. При отклонении от этих размеров, энергетическая активность поверхности настолько возрастает, что происходит самопроизвольное агрегирование частиц с появлением комкованности и соответственно уменьшением их удельной поверхности и однородности, приводящее к снижению поверхностной активности и ухудшению триботехнических свойств смазочного материала [1].

Главным условием седиментационной устойчивости является малый размер частиц, при котором действие сил тяжести не может преодолеть стремления частиц к равномерному распределению по всему объему, зажатому дисперсной средой. При этом характерный размер частицы (в приближении её шарообразности) задается радиусом r. Данный параметр характеризует распределение частиц в приближении монодисперсной системы при которой можно определить при задаваемых параметрах относительную скорость накопления осадка их требуемый размер, соответствующий ϑ [1]:

$$\vartheta = \left(\frac{9\eta \cdot H}{2g\,(\rho - \rho_0)\,t}\right)^{1/2} \qquad (1)$$

где η - вязкость среды, H – расстояние, на котором изначально находились ρ, ρ_0 – плотность частиц дисперсной среды и собственно среды, свойственно, t – время седиментации.

Из соотношения (1) становится очевидным два возможных варианта уменьшения скорости седиментации: уменьшение размера частиц дисперсной фазы. Если последний способ связан с выбором способов размола частиц с весьма неоднозначным и итоговым результатом [8], то уменьшение плотности дисперсионной фазы, а следовательно и разности плотностей в формуле (1), решается переводом частиц ММТ из состояния механической взвеси в коллоидную форму. Однако такое решение требует дополнительной смазки.

Постановка задачи и цели работы

Рассмотрим взаимодействие отдельной частицы ММТ с поверхностного трения. Как это было показано в работах [1-4], такие частицы могут упруго отражаться от поверхности трения или в результате пластической деформации последней закрепляться на ней, образуя очаги будущего слоя фрикционного переноса. То есть, если величина кинетической энергии частицы ММТ, определяемая её скоростью, достаточно велика, то этой величины оказывается достаточно для пластической деформации поверхности, ее механоактивации и образование сильных адгезионных связей между материалами поверхности и частицей, что необходимо для образования слоя фрикционного переноса, ответственного за фрикционные характеристики трибосопряжения [6]. Наличие же вязкой среды, препятствующей выпадению частиц ММТ в осадок неизбежно в соответствии с выражением (1) приводит к уменьшению кинетической энергии частиц ММТ, а следовательно и к замедлению процесса формирования слоя фрикционного переноса. Таким образом, создание вокруг частиц ММТ вязкого слоя влечет за собой двоякий процесс, с одной стороны улучшающий реологические характеристики смазочной композиции включающей ММТ, а с другой стороны пассивирует механоактивацию поверхности трения, вызываемую взаимодействием отдельных частиц ММТ с поверхностью трения. Поэтому возникает необходимость проанализировать данные фактически перекрестные процессы с целью нахождения оптимума свойств смазочных композиций включающий в себя ММТ.

Теоретическая модель.

Рассмотрим движение частицы массы m, имеющую шарообразную форму радиусом r в некой вязкой среде, которая определяется заданием некого условного параметра β. Сила сопротивления, действующая на частицу со стороны среды в соответствии с законами классической физики оказывается пропорциональной скорости данной частицы [7]. Тогда можно записать в дифференциальной форме уравнение второго закона Ньютона, описывающего движение такой частицы:

$$m\ddot{x}1 - \beta\dot{x}1 = m\ddot{x}2 \quad (2)$$

где m –масса частицы, $\dot{x}_1\ddot{x}_1$ - исходная скорости ускорения частицы ММТ, $\ddot{x}_2$ - ускорение которое приобретает частицы ММТ в результате взаимодействия с вязкой средой

В результате действия на частице со стороны внешней среды силы $\beta\dot{x}_1$ происходит её торможение, вследствие которого скорость частицы уменьшается до $\ddot{x}_2$, что можно задать уравнением:

$$\dot{x}2 = \dot{x}1\, exp\,(-\alpha t), \quad (3)$$

где α - параметр определяющий скорость частица, t – время

Продифференцировав $\dot{x}_2$ из уравнения (3) по времени и подставив результат в силовое уравнение (2) получаем:

$$m\ddot{x}1\,[1 - exp(-\alpha t)] = \dot{x}1\,[\beta - \alpha m exp(-\alpha t)], \quad (4)$$

которое легко преобразуется к виду:

$$\ddot{x}1[1 - exp(-\alpha t)] = \dot{x}1[\beta m - 1 - \alpha exp(-\alpha t)] \quad (5)$$

Используя известное приближение вида exp(-αt) = 1-2t приходим к уравнению вида:

$$\ddot{x}1 = \dot{x}2\,[\beta\alpha - 1\,m - 1\,t - 1 - t - 1 + \alpha] \quad (6)$$

Если ввести новую переменную y= $\dot{x}_1$, то уравнение (6) преобразуется к виду:

$$ln(yt - \gamma) = \alpha t \quad (7)$$

где γ – 0.5 βm^{-1} -1,

или

$$y = y0\; t\gamma\; exp\;(\alpha t) \quad (8)$$

где y_0 - размерная постоянная интегрирования

Определим физический смысл параметров α и β, входящих в уравнения (2-8)

Легко видеть что, несмотря на то, что α и β являются характеристиками вязкостных свойств среды – это разные по физическому смыслу величины, имеющие различные размерности $с^{-1}$ и $кг \cdot с^{-1}$ соответственно. Из уравнения (1), записанного в допредельной форме:

$$ma1 - \beta v1 = ma2 \quad (9)$$

где $a_1 = v_1/t$, $a_2 = (v_2 - v_1)/t$ - ускорение, а V_1, V_2 - скорости частицы m, можно получить уравнение связи между параметрами α и β.

$$\alpha = \frac{m - \beta t}{mt} \quad (10)$$

В то же время из уравнения Стокса для силы сопротивления движению частиц в вязкой среде [7;8] вытекает, что:

$$\beta = 6\pi\eta r, \quad (11)$$

где η - вязкость среды, r – радиус тела массы m.

Из уравнения (9) можно получить выражение для соотношения скоростей V_1 и V_2 движения частицы в вязкой среде

$$V2 = V1\, exp(-\frac{\beta t}{m})$$

Которая с учётом (11) принимает вид:

$$V2 = V1 \exp\,(-\frac{6\pi\eta r}{m}t) \quad (12)$$

Поскольку уравнение (12) по своей сути эквивалентно выражению (3), что позволяет уточнить физический смысл величины α введенной нами ранее:

$$\alpha = \frac{6\pi\eta r}{m} \quad (13)$$

которое связано с вязкостью среды и параметрами частицы геомодификаторов: массой и размером. Необходимо отметить, что в уравнениях (3-8, 12) присутствует время выпадения осадков t, которое нуждается в доопределении.

Необходимо вспомнить, что процессы трения представляют собой физическое явление, сопровождаемое генерированием тепловых потоков. При этом время t возможно выразить из закона Ньютона для теплопередачи [9].

$$t = \frac{\Delta Q_1}{\lambda \Delta T S} \quad (14)$$

где ΔQ_1 - количество теплоты, образуемое в процессе теплопередачи π - коэффициент теплопроводности s- площадь поверхности, через которую происходит теплопередача.

Подставим значение для определения времени t (14) соотношение (13):

$$\alpha t = \frac{6\pi\eta r \Delta Q_1}{m \Delta T \lambda S} \quad (15)$$

Считая, что частицы геомодификатора находятся в тепловом равновесии с вязкой средой, в которой происходит их движение, можно выразить температуру ΔT и массу частицы через теплоемкость C и теплоту аккумулируемую частицей геомодификатора ΔQ_2.

$$\alpha t = \frac{6\pi\eta r}{s}\,\frac{C}{\lambda}\,\frac{\Delta Q_1}{\Delta Q_2} \quad (16)$$

Поскольку, в нашем приближении частицы имеют шарообразную форму, то уравнение (16) преобразуется к виду:

$$\alpha t = 1{,}5\,\frac{\eta}{r}\,\frac{C}{\lambda}\,\frac{\Delta Q_1}{\Delta Q_2} \quad (17)$$

Отношение $\frac{\Delta Q_1}{\Delta Q_2}$ входящее в уравнение (17) близко по физическому смыслу к коэффициенту распределения тепловых потоков k - безразмерной величиной показывающей, какая часть теплоты, генерируемая трением направляется в отдельные элементы трибосопряжения [9]:

$$\alpha t = 1{,}5\,\frac{\eta}{r}\,\frac{C}{\lambda}\,k \quad (18)$$

Отношение $\frac{C}{\lambda}$ определяют теплофизические характеристики трибосистемы частицей геомодификатора (C) и вязкой среды (λ), которую можно так же обозначить L:

$$\alpha t = 1{,}5\,\frac{\eta}{r}\,Lk \quad (19)$$

С помощью записи коэффициента λ вида (19) можно переписать уравнение (12) в виде:

$$V2 = V1 \exp\left(-\frac{1,5}{r}\eta Lk\right) \qquad (20)$$

Анализ полученного уравнения и выводы из него вытекающие

Уравнение (20), указывает на два очевидных способа существенного увеличения времени выпадения осадка в системе смазочная среда – частицы ММТ. Это, во-первых, увеличение вязкости среды η и уменьшение пути размола линейных размеров частиц ММТ. Однако достаточно очевидно, что эти требования имеют и ограничения, например, крупность помола имеет свои оптимальные значения [1], а вязкость соответственно ограничивается условиями эксплуатации конкретного трибосопряжения

Известно, что коэффициент распределения тепловых потоков в первом приближении можно написать в явном виде [9;10]:

$$k = \sqrt{\frac{\rho_1 C_1 \lambda_1}{\rho_2 C_2 \lambda_2}} \qquad (21)$$

где $\rho_1, C_1, \lambda_1, \rho_2, C_2, \lambda_2$ - соответственно плотности, теплоемкости и теплопроводности вязкой среды и ММТ

Тогда уравнение (19) может быть записано в виде:

$$\alpha t = 1,5\frac{\eta}{r}\rho_{от}^{1/2}\sqrt{\frac{\rho_1 C_1 \lambda_1}{\rho_2 C_2 \lambda_2}} \qquad (22)$$

где $\rho_{от} = \frac{\rho_1}{\rho_2}$ - относительная плотность материала трибосопряжения

Тогда соотношение (20) можно записать в виде:

$$V2 = V1 \exp\left(-1,5\frac{\eta_1}{r}\rho_{от}^{1/2}\sqrt{\frac{\rho_1 C_1 \lambda_1}{\rho_2 C_2 \lambda_2}}\right) \qquad (23)$$

Уравнение (23) конкретизирует дополнительные требования, предъявляемые к материалам рассматриваемого трибосопряжения. Для максимального уменьшения процесса выпадения осадка, помимо высокой вязкости материала смазки необходимым условием является близость его плотности к плотности частицы ММТ. При соблюдении этого условия также необходимо чтобы материалы трибосопряжения обладали высокой теплоемкостью при слабой теплопроводностью. Соотношение (23) может быть выражено через параметр, называемый температуропроводностью $\alpha = \lambda/c\rho$ [8]:

$$V2 = V1 \exp\left(-\frac{1,5}{r}\frac{\eta_1}{\rho_2}\frac{1}{\sqrt{a_1 a_2}}\right) \qquad (24)$$

Выражение (24) делает анализ формул (12,23) более простым ввиду меньшего количества задействованных в данном выражении параметров. В соответствии с (24) выпадение осадка происходит тем сильнее, чем больше масса частицы и больше температуропроводность компонентов трибосопряжения. Выпадения осадка замедляется при использовании более вязких средств, который вводится ММТ.

Влияние снижения скорости выпадения осадка на антифрикционные характеристики трибосопряжения.

Как отмечалось ранее защитно-антифрикционный эффект от введения ММТ в смазочный материал определяется ударным воздействием отдельных частиц ММТ на поверхность трения приводящая к механоактивации поверхности фрикционного контакта, обеспечивающее образование сильных адгезионных связей между отдельными частицами ММТ и поверхностью трения [1-3]. Очевидно, что формирование поверхностной пленки в данном случае определяется значением кинетической энергии, на летающих на поверхности трения частиц ММТ. Однако, влияние вязкой среды сводится к уменьшению скорости на летающих частиц на величину $\exp\left[\left(-\frac{3}{r}\eta_1/\rho_2 .(\sqrt{a_1 a_2})\right]\right.$. Последний уменьшает механоактивирующие воздействия со стороны частиц ММТ на поверхность трения и соответственно снижению вероятности образования адгезионных связей между материалом ММТ и поверхностью фрикционного контакта. Следовательно, увеличение вязкости смазочного материала на ряду со снижением процесса формирования осадка может сказаться на кинетике образования антифрикционных поверхностных плёнок, что существенно снижает эффективность применения геомодифицированных присадок. Следовательно, решение вопроса снижении выпадения осадка может ухудшить антифрикционные действия ММТ.

References:

1. Dolgopolov, K.N., Poteha, V.L., & Lubimov, D.N. (2014). *Tribologija geomodificirovannyh smazochnyh materialov*: monografija. (p. 429, pp.120-121). Grodno: GGAU.

2. Dzhost, H.P. (1990). Proshloe i budushhee tribologii. *Trenie i iznos*, №1 (11), pp. 149-159.
3. Lubimov, D.N., & Dolgopolov, K.N. (2010). *Formirovanie smazochnyh sloev pod vozdejstviem na poverhnost` trenija mineral`nyh modifikacij trenija.* sb.nauch. trudov X Mezhdunarod. konf. «Tribologija i nadezhnost`» (pp.264-270). SPb: Peterburgskij un-t putej i soobshhenija.
4. Dolgopolov, K.N., Lubimov, D.N., Ponomarenko, A.G., Chigarenko, G.G., & Bojko, M.V. (2009). Struktura smazochnyh sloev, formiruemyh pri trenii v prisutstvii prisadok mineral`nyh modifikatorov trenija. *Trenie i iznos*, (30) №5, pp. 516-521.
5. Lubimov, D.N., Dolgopolov, K.N., & Kozhemjachenko, A.V. (2008). Mehanizm formirovanija pokrytija v processe petrotribotehnicheskogo metoda obrabotki metallov treniem. *Vestnik Vostochnoukrainskogo nacional`nogo universiteta im. V.Dalja*, № 2 [120], pp.197-201.
6. Hajnike, G. (1987). *Tribohimija*. (p.635, 141). Moscow: Mir.
7. Kuhling, H. (1983). *Spravochnik po fizike*. (p.520, 227). Moscow: Mir.
8. Xajkin, S.Je. (1971). *Fizicheskie osnovy mehaniki*. (p.751, 451). Moscow: Nauka.
9. Shvedkov, E.L., Rovinskij, D.Ja., Zozulja, V.D., & Braun, Je.D. (1979). *Slovar`-spravochnik po treniu, iznosu i smazke detalej mashin.* (p. 188, 62). Kiev: Nauk. dumka.
10. Kolesnikov, V.I., Sychev, A.P., Dosov, D.G., & Cibulin, V.V. (2005). Raschet temperaturnogo polja antifrikcionnogo metallopolimernogo kol`cevogo diska. *Vestnik RGUPS*, №2, pp.9-18.

Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 9.035	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2021 **Issue:** 06 **Volume:** 98

Published: 01.06.2021 **http://T-Science.org**

QR – Issue QR – Article

Shukhrat Narzullaevich Ubaydullaev
Namangan State University
Ph. D., Associate Professor

Obitzhon Odilzhonovich Abdivaliev
Namangan State University
Lecturer

Malohat Khamidullo qizi Erkinova
Namangan State University
student

Dildora Mamasoli qizi Uvraimova
Namangan State University
student

COLOR PHRASEOLOGICAL UNITS IN UZBEK, RUSSIAN, AND GERMAN

Abstract: *The problems of definition and principles of proverbs and sayings' differentiation on the basis of German, Russian and Uzbek languages' materials are reviewed in the article. The conception and standpoints of linguists on the problem of lingual phenomena data differentiation are also analyzed there too. In their turn, the authors offer their new own criteria and principles of proverbs and sayings' delimitation in comparative languages.*

Key words: *logic and semantic categories, judgments and concepts, a proverb and a saying, the comparative analysis.*

Language: *Russian*

Citation: Ubaydullaev, S. N., Abdivaliev, O. O., Erkinova, M. K., & Uvraimova, D. M. (2021). Color phraseological units in Uzbek, Russian, and German. *ISJ Theoretical & Applied Science, 06 (98)*, 11-14.

Soi: http://s-o-i.org/1.1/TAS-06-98-3 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2021.06.98.3

Scopus ASCC: *1203.*

ЦВЕТОВЫЕ ФРАЗЕОЛОГИЗМЫ В УЗБЕКСКОМ, РУССКОМ И НЕМЕЦКОМ ЯЗЫКЕ

Аннотация: *В предлагаемой статье предпринимается попытка рассмотреть существующие определения пословиц и поговорок и внести ясность в проблему их разграничения. Материалом исследования послужили примеры из немецкого, русского и узбекского языков.*

Ключевые слова: *логические и семантические категории, суждения и понятия, пословица и поговорка, сопоставительный анализ.*

Введение

Пословица - это в народе возникшее и в народной молве ходящее кратко выраженное наблюдение («*Alte Liebe rostet nicht*») или суждение, содержащее поучение, предупреждение («*Ein Sperling in der Hand ist besser als seine Taube auf dem Dach*») [2]. Это общее положение, выраженное в виде наблюдения или суждения, так сказать, аксиома народной философии, зачастую несёт в себе метафорический образ*:(«Hunger ist der beste Koch).* Любая пословица, украшенная узором метафоры или нет, содержит в себе законченную мысль, что отличает её от поговорки (Redensart) и речевого оборота (Redewendung).

Пословицы создавались на протяжении сотен поколений. Они живут в каждом народе, переходят из века в век. В этих кратких и мудрых изречениях запечатлены извечные ценности: любовь к родине, мужество, храбрость, вера в торжество справедливости, понятия о чести.

Обсуждение пословиц и поговорок затрагивает и современное состояние ценностного содержания идеологии данных народов. Увлекательно чувствовать себя наследниками богатейшего устного творчества, полного философского и жизненного смысла. Пословицы и поговорки в речи героев, персонажей это клад поучительных нравственных ценностей, идеология, мудрость и дальновидность древних высококультурных народов.

Сравнительно-сопоставительный анализ текстов с содержанием пословиц и поговорок подводит к очевидности, что идеалами каждого народа всегда являлись Истина, Честь, Красота, Добро, Совесть, Любовь, Мир, Труд. Знакомство с этнической культурой, проводником которой являются пословицы и поговорки, помогает разгадать образ мыслей и мироощущения, а также идеалы и стремления предков. Понимание влечет за собой желание быть причастным к ним, продолжить достигнутое, добиться того, чего наши предки хотели достичь в будущем и т.д.

Несмотря на национальные особенности и различия в обычаях народов, имеется, как уже подчеркивалось, много общего: поклонение природе, солнцу, воде, огню, праздники, воспитывающие в молодежи бережное отношение к природе, её ценностям, выполнение общих для всех вероисповеданий религиозных заповедей.

Цвета олицетворяют дифференциацию, нечто явленное, разнообразие, утверждение света. Цвета, отражающие свет, например, *зарғалдоқ – оранжевый – orange, сариқ – желтый – gelb (gold)* и *қизил – красный – rot, – активны, теплы*, направлены на смотрящего. Те, которые поглощают свет, например, *кўк – синий – blau* и *сиёҳранг – фиолетовый – violett, – пассивны, холодны*, не бросаются в глаза. *Яшил – зеленый – grün* цвет объединяет их свойства. *Қора – черный – schwarz* и *оқ – белый – weiss* символизируют отрицательное и положительное и все противоположности

Цвет – одна из интереснейших и сложнейших проблем в языке и культуре. В паремиях, обозначающих цвет, отражаются тысячелетний опыт русского, узбекского и немецкого народов, его психосоматические особенности, географические условия, социально-экономические и культурно-исторические особенности страны и этноса. В наскальной живописи первобытных народов чаще всего встречаются три цвета – *белый, черный* и *красный*, что позволяет сделать вывод об особой роли этих цветов в жизни древних людей.

Сложившись в глубокой древности, цветовая триада функционировала в разных культурах, получая иногда не совсем традиционное наполнение. Символическое и магическое значение цвета изменялось под воздействием и специфических климатических условий, и религиозных представлений, рода хозяйственной деятельности.

Каждый цвет обладает определённой символикой и связан, в основном, с предметами окружающего мира. Ощущения и эмоции, вызываемые каким-либо цветом, аналогичны ощущениям, связанным с предметом или явлением, постоянно окрашенным в данный цвет. В процессе цветовосприятия человек выделяет определённые признаки, качества, стороны разных объектов и явлений.

В целом, *белый – оқ – weiss* цвет в русском, узбекским и немецком языках означает *sauber – чисто – тоза, eherenhaft – честный – ҳалол, добро – яхшилик – gut, счастье – бахт – Glück*. Это обобщенное значение белого универсально для всех первобытных народов. Белый для них – символ бытия, мира, жизни. Например: *“оқ сут”* (wörtl. “weiße Milch”; reine, saubere Milch), *„оқ киймоқ”* (wörtl. “weißes Brautkleid”, „Hochzeitskleid”).

Оқ қарға — дословный перевод “белая ворона”. Так говорят о человеке, который чем-то отличается от других. Это выражение – калька с лат. Alba avis, albus corvus. Вошло в узбекский язык через русский.

Немецкое прилагательное *weiß* – уз. *оқ* (белый) происходит от германского корня *kuei*, что означает «светить, мерцать».

Вторым важнейшим цветом в жизни первобытных людей был *черный* цвет. Прилагательное *schwarz* – уз. *қора* (чёрный,) в немецком языке восходит к латинскому слову *sordere*, что означало первоначально «быть грязным». *Unglück, unehrlich / unwahr, Unglück, Verleumdung, Hilflosigkeit, Hoffnungslosigkeit, Kummer.*

Если *оқ* (белый) означал *ёруғлиғ* (свет), то *қора* (черный) – *зулмат* (мрак), если *оқ* (белый) – *ҳаёт* (жизнь), то *қора* (черный) – *ўлим* (смерть), *оқ* (белый) – *тозалик, софлик* (чистота), *қора* (черный) – *ифлослик* (грязь и хаос). Тем самым, черный – антипод белого.

Прилагательные яшил – *зеленый – grün, қора – черный – schwarz , кўк –синий – blau* издавна входят в состав узбекской, русской и немецкой идиоматики.

В Древней Руси черный цвет считался цветом смерти и царства мертвых. У язычников был обычай приносить в жертву какое-нибудь черное

животное, дабы умилостивить богов нижнего мира.

Определение «чёрный» очень богато на идейные смыслы. Если попытаться построить синонимический ряд, то в него подадут прилагательные с ярко выраженной негативной окраской: *чёрный* (қора) – мрачный (қабиҳлик) – тёмный – враждебный (душмунлик) – неизвестный (номаълум) – опасный (ҳавфли) – дремучий – злой (ёвуз) и т. д.

Ряд выражений, содержащих слово *schwarz – қора – чёрный,* основан на соотнесении этого слова с черными чернилами или черной типографской краской: *schwarz auf weiß – черным по белому*.

Черный цвет в немецком языке, как и в русском и узбекском, ассоциируется с печалью, скорбью и трауром: eine Trauerkarte mit schwarzem Rand ‘открытка с соболезнованиями с чёрной полосой’; in schwarz gekleidet ‘одетый в черное, в трауре’. Также черный цвет у немцев ассоциируется с чем-то тайным, используемым против других людей: die schwarze Liste ‘черный список, список лиц, чем-либо неугодных власти, администрации и т.п., тайно составляемый с тем, чтобы в удобный момент расправиться с ними’.

Schwarz – қора – чёрный в языке, напротив, наделен чаще положительной семантикой, хотя, безусловно, в ряде сочетаний наблюдается и отрицательное значение (например, қора бет – бесстыдник/бесстыдница; қора булут – чёрная туча).

В ряде сочетаний эпитет *schwarz – черный – қора* эвфемистически указывает на противозаконность, преступность какой-либо деятельности: *der schwarze Markt – черный рынок (незаконный) – қора бозор. Schwarze Kühe geben auch weiße Milch – И черные коровы дают белое молоко – Қора сигир оқ сут беради,* невежество, ограниченность

В своём первоначальном смысле «*чёрный*» – это обозначение цвета, но почти всегда за цветовым обозначением скрыто (более или менее явно) второстепенное значение эпитета. Определение «*чёрный*» настолько сильно ассоциируется с негативом в узбекском и русской культуре, что практически никогда не лишается эмоционально – отрицательной нагрузки.

Интересным с точки зрения семантики является узбекский оборот *қора халқ* – простонародье, тёмный люд, простого происхождения [Баскаков, с. 375]. Отсюда следует, что в данных языковых культурах чёрным цветом номинируется простой народ. В узбекском языке чёрный цвет связан с тяжёлой, “*чёрной*” работой, поэтому словосочетание *қора ишчилар* обозначает *чернорабочих*.

Тёмный и чёрный цвета ассоциировались, по всей вероятности, с загробным миром, хотя у узбеков есть и другие ассоциации, связанные с чёрным цветом, положительные.

Об усердно работающем человеке, трудящимся в поте лица, в узбекском языке говорят *қора терга ботмоқ* – (букв.) *обливаться чёрным потом*, т.е. работать в поте лица [Садыкова, с. 312]

В отличие от понятия русского народа о чёрном цвете, для узбекского народа исторически сложилось понимание чёрного цвета в несколько иных семантических оттенках: *непривлекательность, холодность и опасность*.

Қора кийим – чёрная одежда – у узбекского народа считается траурной: *қора киймоқ – die schwarzen (Kleider) umbinden* – носить траур, быть в трауре. Чёрный цвет одежды в узбекском языке связан с горем и несчастьем, т.е. трауром. В узбекском языке и культуре чёрный цвет связан с нечистой силой и злым духом: узб.: қора босди – (рел. суев.) злой дух напал, нечисть душит (кого-либо во сне) [Садыкова, с. 312]

К историзмам относится узбекский фразеологизм *қора курсида ўтирмоқ*, который используется для номинации подсудимого человека и связан с историей, когда скамья подсудимых окрашивалась в чёрный цвет. Продолжают активно употребляться бранные узбекские выражения с лексемой “қора”, обозначающей также силуэт, тень: *қоранг ўчгур*! – (бран.) чтоб тебе сгинуть! уходи прочь!; *қоранг ўчсин*! – (бран.) чтоб твоего духа (ноги твоей) здесь не было! вон отсюда! [Садыкова, с. 313].

Употребление данных выражений привело к формированию других фразеологизмов, являющихся результатом вышеуказанных: *қораси ўчди* – (пренебр.) он исчез, скрылся, поминай как звали; *қорасини кўрсатмади* – он не показывается на глаза, он куда-то исчез, он скрывается, не появляется. Между прочим, в узбекском языке лексема “*қора*” обозначает силуэт: *узоқдан бир қора кўринди* – вдали показался чей-то силуэт [Баскаков, с. 375].

Сочетание слов *юзи қора – лицо чёрное – Gesichtsschwarze haben* или *қора юз қилмоқ – jemandes Gesicht schwarz machen* несёт в себе семантику враждебности, эпитет «глаза круглые» дополняет сочетание «лицо чёрное» физической реакцией проявления злости. Например: *бахти қора бўлмоқ – ein schweres Los haben, қора ҳабар – schwarze Nachricht; Unglücksbotschaft, Todesnachricht.*

Обратим внимание на цветовую сгущённость прилагательных в приведённых примерах. Усилие цветовой насыщенности усиливает и эмоциональное воздействие. *Чёрный туман – қора булут* несёт в себе метафорическое значение опасности.

Для русской, узбексой и немецкой картины мира цветовая символика базируется на

природных явлениях и идет от язычества (истоки) к христианству и ислама. Со временем значения тех или иных цветов (либо их сочетаний) изменяется, но основой своей, сущностью, они все же восходят к древности. Там, в колыбели девственной природы и не такого затуманенного, развращенного сознания человека, в глубинах его психики закладывались основы человечества, его мировоззрение, миропонимание. И уже тогда сначала осознанно, потом просто по традиции каждый цвет приобретает свои характеристики, свое определенно-личное значение. Толкование этого значения представляется интересным ряду исследователей различных наук, для литературы же растолкование значения символики цвета позволяет проникнуть в глубины художественного творчества, изучить его историю и теорию.

Как показывает проведённый анализ, лексемы с обозначением чёрного цвета используются для описания эмоционально-психического состояния (траур, несчастье), профессиональной занятости, социального статуса (простолюдин) и личностных характеристик (тёмная душа, непорядочный человек).

References:

1. Bazyma, B.A. (2001). *Cvet i psihika*. (p.172). Har`kov: Izd-vo HGAK.
2. Bajer, H., & Bajer, A. (1989). *Nemeckie poslovicy i pogovorki*. (p.184). Moscow: Vysshaja shkola.
3. Binovich, L.Je., & Grishin, N.N. (1975). *Nemecko-russkij frazeologicheskij slovar`*. (p.656). Moscow: Russkij jazyk.
4. Podgornaja, L.I. (2001). *Russkie poslovicy i pogovorki i ih nemeckie analogi*. (p.231). Sankt-Peterburg : KARO.
5. Rajhshtejn, A.D. (1980). *Sopostavitel`nyj analiz nemeckoj i russkoj frazeologii*. (p.130). Moscow: Prosveshhenie.
6. Sadykova, M. (1989). *Kratkij uzbeksko-russkij frazeologicheskij slovar`*. (p.336). Tashkent: Glavnaja redakcija Uzbekskoj Jenciklopedii.
7. Chernysheva, I.I. (1970). *Frazeologija sovremennogo nemeckogo jazyka*. (p.200). Moscow: Vysshaja shkola.
8. Ubajdullaev, Sh.N. (2019). Formirovanija sociokul`turnoj kompetencii na osnove frazeologicheskih edinic. *Theoretical & Applied Science. teoreticheskaja i prikladnaja nauka* (issn: 2308-4944 eissn: 2409-0085). Philadelphia (USA), № 12(80), pp.281-284.
9. Ubajdullaev, Sh.N. (2019). Simvolicheskoe znachenie cveta v frazeologicheskih edinicah na materiale anglijskogo, nemeckogo, russkogo i uzbekskogo jazykov. *Theoretical & Applied Science. teoreticheskaja i prikladnaja nauka* (issn: 2308-4944 eissn: 2409-0085), Philadelphia (USA), № 12(80), pp.41-44.
10. Ubajdullaev, Sh.N. (2021). The use of mental cards when teaching a foreign language for university students. *International Journal of Progressive Sciences and Technologies* (IJPSAT) (ISSN: 2509-0119). Vol. 25 No. 2 March, pp.90-93. http://ijpsat.ijsht-journals.org

Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 9.035	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS
International Scientific Journal
Theoretical & Applied Science
p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)
Year: 2021 **Issue:** 06 **Volume:** 98
Published: 01.06.2021 **http://T-Science.org**

QR – Issue QR – Article

Shukhrat Narzullaevich Ubaydullaev
Namangan State University
PhD in philosophy, docent,

Komila Toxirdjonovna Turaeva
Namangan State University
teacher

EFFECTIVE USE OF INTERACTIVE FORMS AND METHODS IN GERMAN LANGUAGE LESSONS

Abstract: *The article highlights the problem of increasing the level of foreign language communicative competence of students through the use of interactive methods and forms of work in foreign language lessons. The concept of "foreign language communicative competence" and its components (linguistic, speech and sociolinguistic) are considered, a brief analysis of the "Deutsch" teaching material is given for the presence of an interactive form of work in it, the process of using some interactive forms and methods in foreign language lessons is described.*

Key words: *foreign language communicative competence, work in small groups, interactive methods, Brownian movement, ideological carousel, change of position, aquarium.*

Language: *Russian*

Citation: Ubaydullaev, S. N., & Turaeva, K. T. (2021). Effective use of interactive forms and methods in German language lessons. *ISJ Theoretical & Applied Science, 06 (98)*, 15-18.

Soi: http://s-o-i.org/1.1/TAS-06-98-4 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2021.06.98.4

Scopus ASCC: *1203.*

ЭФФЕКТИВНОЕ ИСПОЛЬЗОВАНИЕ ИНТЕРАКТИВНЫХ ФОРМ И МЕТОДОВ НА УРОКАХ НЕМЕЦКОГО ЯЗЫКА

Аннотация: *В статье освещается проблема повышения уровня иноязычной коммуникативной компетенции учащихся с помощью применения на уроках иностранного языка интерактивных методов и форм работы. Рассматривается понятие «иноязычная коммуникативная компетенция» и ее компоненты (языковой, речевой и социолингвистический), приводится краткий анализ УМК «Deutsch» на предмет наличия в нем интерактивной формы работы, описывается процесс использования некоторых интерактивных форм и методов на уроках иностранного языка.*

Ключевые слова: *иноязычная коммуникативная компетенция, работа в малых группах, интерактивные методы, броуновское движение, идейная карусель, смени позицию, аквариум.*

Введение

В российской лингвистике и методике преподавания иностранных языков определение иноязычной коммуникативной компетенции дают такие ученые, как И. А. Зимняя, Н. И. Гез, А. Н. Щукин, И. Л. Бим, Е. И. Пассов, В. В. Сафонова. В отечественной лингводидактике преподавания иностранных языков изучением понятие «социокультурная компетенция», которой занимались такие методисты, как Ж.Ж.Жалолов, Г.Х.Бакиева, Л.Т.Ахмедова, Г.Т.Махкамова, Ш.Н.Убайдуллаев и др.

В своей работе мы придерживались определения иноязычной коммуникативной компетенции, предложенного Надеждой Ивановной Гез: «коммуникативная компетенция есть способность человека понимать и порождать иноязычные высказывания в разнообразных

социально детерминированных ситуациях с учетом лингвистических и социальных правил, которых придерживаются носители языка» [2, с. 933]. Н. И. Гез выделяет следующие компоненты иноязычной коммуникативной компетенции: *лингвистический* (языковая компетенция), *прагматический* (речевая компетенция), *социолингвистический*.

Именно эти три компонента иноязычной коммуникативной компетенции мы оценивали и развивали в опытной работе с классом. Перед проведением опытной работы мы провели краткий анализ УМК на наличие интерактивных форм и методов работы и пришли к выводу, что учебник «Menschen» делает больший упор на парную работу. Большинство интерактивных заданий имеют следующие установки: *Sagen Sie es Ihrem Partner, besprechen Sie es paarweise und vergleichen Sie es mit Ihrem Partner.* Некоторые методисты и психологи, как, И. А. Зимняя, Е. В. Коротаева и К. Н. Волков, отмечают низкий коммуникативный потенциал парной работы, поскольку учащиеся общаются только друг с другом [1, с. 156]. Парная работа – только одна сторона интерактивного обучения. Групповые речевые упражнения в учебнике встречаются достаточно редко. Также не всегда лексические или грамматические навыки выходят в речь.

Поэтому мы решили проверить на практике, насколько групповые интерактивные формы и методы эффективны при развитии иноязычной коммуникативной компетенции, и постараться разнообразить упражнения учебника, придать им более интерактивный характер и приблизить их к реальному общению. Нами была выдвинута следующая гипотеза: развитие иноязычной коммуникативной компетенции учащихся станет более эффективным, если на уроках иностранного языка будут чаще применяться интерактивные методы и формы работы, основанные на взаимодействии учащихся внутри малой группы. На констатирующем этапе мы провели диагностику уровня сформированности иноязычной коммуникативной компетенции по трем критериям: *языковому, речевому* и *социолингвистическому* – и выявили экспериментальную группу.

Учащиеся выполняли три блока заданий: «Лексика и грамматика», «Виды речевой деятельности», «Социолингвистические знания».

Первый блок состоял из *лексико-грамматического теста* с вариантами ответа.

Второй блок включал задания *по чтению, аудированию, построению монологического и диалогического высказывания*.

Третий блок включал 6 вопросов *на соотнесение стимульных и ответных клишированных реплик*.

На формирующем этапе мы отобрали интерактивные методы и формы работы, логично вписывающиеся в программу учебника: работа в малой группе, дискуссия, мозговой штурм, четыре угла, смени позицию, броуновское движение, идейная карусель, большой круг, карусель, ПОПС-формула, метод 1х2х4, аквариум. Опытная работа проходила в течение первой семестра на материале двух модулей «Kommunikation – Общение» и «Essen und Trinken – Еда» и «Im Wahrenhaus – в магазине».

Мы не стали выделять методы отдельно для формирования языковых, речевых и социолингвистических навыков, так как все названные навыки и умения формируются в совокупности согласно методическому принципу интеграции и дифференциации. Опишем некоторые из использованных нами методов.

Идейная карусель. Данный метод мы использовали при отработке лексики по теме «Черты характера». Отрабатывалась следующая лексика:, *optimistisch – pessimistisch, schüchtern – selbstbewusst, selbstsüchtig – großzügig, zuverlässig, hartnäckig – flexibel, aufrichtig, einfühlsam, kontaktfreudig, geduldig, locker, fleißig, humorvoll, herrisch, vernünftig, gereizt, kreativ.*

Учащиеся работали в группах по 4 человека. Им было предложено подумать над тем, какими чертами характера должны обладать идеальный друг, учитель, врач и родители. Каждый член группы получил карточку с соответствующим человеком и писал по одному прилагательному.

Затем карточки передавались в группе по часовой стрелке, и каждый член группы дописывал новое прилагательное к новой карточке. Заранее оговаривалось, что прилагательные не должны повторяться. Работа заканчивалась, когда карточка возвращалась к владельцу. Таким образом, на каждой карточке было по 4 прилагательных. На следующем этапе внутри группы обсуждалось содержание каждой карточки, и составлялся окончательный список прилагательных. На заключительном этапе группы представляли свои результаты. Такое задание не только помогло закрепить лексику, но и помогло учителю узнать, каким его хотят видеть его ученики.

Карусель. Этот метод помог нам при работе над диалогической речью по теме «Покупки». За основу был взят диалог из учебника, в котором двое друзей обсуждают покупку, место и цену покупки. Чтобы учащиеся быстро запомнили реплики диалога и дома осознанно подготовили собственный диалог, мы поработали в карусели. Учащиеся выстроились во внешний и внутренний круг и образовали пары. Каждая пара получала карточку с указанием товара, места покупки и цены. Меняясь парами по часовой стрелке и обмениваясь карточками, учащиеся с разными

партнерами обсудили разные покупки, используя реплики из диалога-образца. Таким образом к концу работы по данному методу большинство учащихся уже воспроизводили реплики диалога, не подглядывая в учебник.

Броуновское движение. Используя этот метод, мы отрабатывали сравнительную и превосходную степень прилагательных. Учащимся было предложено провести опрос среди одноклассников по следующим вопросам: Wie alt bist du? Was für ein Handy hast du? Wie viele Sprachen sprichst du? Wann stehst du normalerweise auf? Wie weit ist dein Haus von der Hochschule?

Предварительно учащиеся сами ответили на эти вопросы. В целях экономии времени, учащиеся опрашивали не всех, а 4 учащихся. Собрав необходимую информацию, учащиеся представляли результаты опроса в виде трех предложений в сравнительной степени и трех предложений в превосходной степени. К примеру, Ich bin der älteste von uns. Mein Handy ist teurer als sein. Er lebt weiter als ich. Sie spricht die meisten Sprachen von uns.

Данный метод помог вывести грамматический навык в речь. Таким образом, мы одновременно закрепляли грамматический навык и развивали навыки аудирования и говорения. Также этот метод отлично подходит для развития социолингвистической субкомпетенции, так как помогает отработать умения правильно запрашивать информацию, учитывая ситуацию общения и собеседника. К примеру, мы использовали данный метод для отработки фраз-клише по теме «Nach Anweisungen fragen / geben».

В упражнении была дана таблица с предлогами места и фразами, чтобы указать направление: Gleich die Straße runter, gleich um die Ecke, gegenüber, geradeaus, es ist auf der linken / rechten Seite, fünf Minuten zu Fuß von hier entfernt и т. д. Также были даны фразы-клише для запроса: Gibt es hier in der Nähe ein…? / Wo ist der nächste ... / Wir haben nicht mehr ... и т.д.

Конечно, учащиеся также повторили фразы для благодарности и привлечения внимания прохожих. На этапе непосредственной работы по методу «Броуновское движение» каждый учащийся получал список с тремя предметами, которые ему необходимо купить, и карту. Перед группой была поставлена коммуникативная задача: представьте, что вы впервые в новом городе и вам срочно нужно купить предметы из вашего списка. Попросите прохожих указать вам дорогу на карте. По каждому предмету можно спрашивать только одного прохожего. Учащиеся свободно перемещались по классу, представляя, что это город. Все были и в роли приезжего, и в роли прохожего. За счет смены партнеров и частого повторения реплик, учащиеся быстро запомнили лексические единицы. При выполнении подобного задания у учащихся совершенствовались все субкомпетенции: языковая, речевая и социолингвистическая. Учащимся было интересно, так как ситуация было приближена к реальной жизни. Поэтому они все выполняли осознанно.

Метод «Аквариум». Данный метод представляет собой спектакль, где некоторые учащиеся разыгрывают ситуацию, а остальные наблюдают и анализируют ее. Мы использовали данный метод для отработки прилагательных и идиом по теме "Körpersprache".

Отрабатывались следующие прилагательные: nervös, wütend, überrascht, ungeduldig, gelangweilt, unsicher, besorgt, verwirrt – следующие идиомы: Handflächen schwitzen, kratzen am Kopf, tippen auf den Fuß, beißen sich auf die Lippe, verschränken die Arme, zucken mit den Schultern, beißen die Zähne zusammen, heben die Augenbrauen.

Некоторые учащиеся выбирались в качестве актеров. Они получали карточку с тем или иным прилагательным, описывающим эмоциональное состояние и идиомой, описывающей язык тела, и зачитывали диалог, изображая эмоциональное состояние и язык тела на карточке. Остальные наблюдали и отгадывали, какое эмоциональное состояние было загадано. Но они не просто называли прилагательное, но обосновывали свое решение идиомой. Например, Ich denke, Karim ist besorgt, weil er sich auf die Lippe beißt. Разыгрывание проходило в несколько раундов, чтобы отработать все лексические единицы, поэтому многие учащиеся смогли побыть и в роли актеров, и в роли экспертов. Диалог может быть на любую тему, так как актеры доносят не содержание диалога, а эмоциональное состояние.

Смени позицию. Был проведен урок, посвященный онлайн шопингу. Источник материалов для чтения и упражнений. Тренировочные упражнения в формате ГИА». Учащиеся проработали текст по плюсам и минусам онлайн шопинга, ответили на вопросы по содержанию текста, выполнили упражнения на грамматику и словообразование по формату ГИА по теме урока. В конце урока, чтобы закрепить материал и вывести его в речь, мы использовали метод «Смени позицию». Учащиеся работали в группах по 4 человека. Группа разделилась на две пары, которые сели друг против друга. Первая пара выступала в пользу онлайн шопинга, вторая пара – против. Используя аргументы из текста и упражнений, а также свои собственные идеи, они по очереди отстаивали свою позицию, представляя аргументы и контраргументы. Через несколько минут учитель просил пары поменяться позициями, и обсуждение продолжалось уже в другом русле. Через несколько минут учитель просил группу обсудить проблему в свободном

режиме, когда каждый выражал свою личную точку зрения. С помощью данного метода учащиеся не только закрепляли лексику и совершенствовали навыки монологической речи, но и обучались четко аргументировать свою точку зрения, принимать чужое мнение и ставить себя на место оппонента. На контролирующем этапе учащимся были предложены аналогичные задания по пройденному во время опытной работы материалу, для того чтобы выяснить, как изменились их знания, умения и навыки по языковому, речевому и социолингвистическому критериям. При оценке результатов мы придерживались тех же показателей, что и на констатирующем этапе.

Сравнив результаты на констатирующем и контролирующем этапах, мы можем убедиться, что благодаря использованию на уроке немецкого языка интерактивных методов и форм работы умения и навыки учеников экспериментальной группы по языковому, речевому и социолингвистическому критерию значительно улучшились и достигли наибольшего роста по сравнению с результатами контрольной группы. Таким образом, нам удалось эффективно усовершенствовать языковую, речевую и социолингвистическую субкомпетенции, следовательно, повысить уровень иноязычной коммуникативной компетенции в целом. Выдвинутая нами гипотеза была подтверждена.

Стоит отметить, что использование интерактивных форм и методов работы не только помогло нам усовершенствовать иноязычную коммуникативную компетенцию, но и повысило мотивацию многих учащихся. Учащимся было интересно и комфортно. С помощью этих методов мы превратили скучные грамматические и лексические упражнения, когда учитель контролирует каждый шаг, в интересное самостоятельное взаимодействие учащихся. Учитель только направлял общение.

References:

1. Gal`skova, N. D., & Gez, N. I. (2005). *Teorija obuchenija inostrannym jazykam. Lingvodidaktika i metodika*. (p.336). Moscow: Akademija.
2. Eremeeva, O. V. (2014). Process obuchenija inostrannomu jazyku: principy otbora neverbal`nyh sredstv kommunikacii. *Innovacionnye proekty i programmy v obrazovanii*, № 5, pp. 3-6.
3. Korotaeva, E. V. (2013). *Osnovy pedagogiki vzaimodejstvij : teorija i praktika :* monografija. (p.203). Ekaterinburg : Izd. UrGPU.
4. Lemberg, S. N. (2013). Metod proektov kak sredstvo sovershenstvovanija sociokul`turnoj kompetencii uchashhihsja osnovnoj i srednej shkoly na urokah inostrannogo jazyka. Vestnik *Cheljabinskogo gosudarstvennogo pedagogicheskogo universiteta*, № 10, pp.119-130.
5. Nizaeva, L. F. (2016). Kommunikativnaja kompetencija: sushhnost` i komponentnyj sostav. *Molodoj uchjonyj*, № 28 (132), pp. 933-935.
6. Nogaeva, V. U. (2006). *Obuchenie interpretacii neverbal`nyh sredstv obshhenija kak opory dlja ponimanija inojazychnoj rechi na sluh*: Francuzskij jazyk, jazykovoj vuz: avtoref. dis. . kand. ped. nauk, (p.24). Moscow.
7. Polat, E. S. (2005). *Novye pedagogicheskie i informacionnye tehnologii v sisteme obrazovanija*. (p.272). Moscow: Akademija.
8. Ubajdullaev, Sh.N. (2019). *Metodika formirovanija mezhkul`turnoj kompetencii*. Monografija. (p.146). Namangan: NamGU.
9. Ubajdullaev, Sh.N. (2019). Simvolicheskoe znachenie cveta v frazeologicheskih edinicah na materiale anglijskogo, nemeckogo, russkogo i uzbekskogo jazykov. *Theoretical & Applied Science. teoreticheskaja i prikladnaja nauka* (ISSN: 2308-4944 eissn: 2409-0085), Philadelphia (USA), № 12(80), pp.41-44.
10. Ubajdullaev, Sh.N. (2021). The use of mental cards when teaching a foreign language for university students. *International Journal of Progressive Sciences and Technologies* (IJPSAT) (ISSN: 2509-0119). Vol. 25 No. 2 March, pp. 90-93. http://ijpsat.ijsht-journals.org.

Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 9.035	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS
International Scientific Journal
Theoretical & Applied Science
p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)
Year: 2021 **Issue:** 06 **Volume:** 98
Published: 02.06.2021 **http://T-Science.org**

QR – Issue QR – Article

Zokir Taxirovich Arifdjanov
International Islamic Academy of Uzbekistan
Teacher of the Department of
"Uzbek language and Classical Oriental Literature"
Tashkent, Uzbekistan
(93)5799579
zokir-zarrinpaint@inbox.ru

FUNCTIONAL EQUIVALENTS AND GROUPS OF MEANINGS OF SIMPLE VERBS IN PERSIAN LANGUAGE

Abstract: *The article examines the functional equivalents that are the type of variant. Theoretical views on the interpretation of functional equivalents in linguistics are presented and analyzed. In expressing the meanings of the verb خواستن [xāstan] to ask, to beg, to demand, 18 verbs are used as alternatives to this verb, the places of use of each of them are given and analyzed by examples. خواستن [xāstan] to express the meanings of the simple verb to ask, to beg, to demand, to divide the functional equivalents of this verb into six groups of meanings according to their meanings is offered.*

Key words: *Functional equivalent, synonym, variant, lexical variant, formal variant, خواستن [xāstan] simple verb, semantic groups, main word.*

Language: *English*

Citation: Arifdjanov, Z. T. (2021). Functional equivalents and groups of meanings of simple verbs in Persian language. *ISJ Theoretical & Applied Science, 06 (98),* 19-23.

Soi: http://s-o-i.org/1.1/TAS-06-98-5 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2021.06.98.5

Scopus ASCC: *1203.*

Introduction

Due to the fact that there are different views on the types and number of variants at different levels of language, in this article we cite on some ideas about functional equivalents, and we will explain in detail on their usage and subgroups.

Russian linguist E.V. Kuznetsova says that the functional equivalent the type of formal (formal) variant which differs in form but performs the same semantic function in the language [9:123], based on the Russian linguist S.O. Kartsevsky's view that ambiguity and synonymy are the main types of variant relations in language [7] Sh. Bally suggests that different words associated with functional equivalence relation as opposed to semantic variants to be called lexical variants [4:87]. But L.V. Kropotova calls them functional equivalent or formal variant because lexical variants are used in linguistics in relation to other types of variants [8:158].

In our view, it is impossible not to agree with the views of these linguists, who talk about the functional equivalents of words. It should be noted that the functional equivalents of words, which play an important role in the phenomenon of language variation and play a key role in expanding the expressive potential of the language. Below we discuss the variants (functional equivalents) of the simple verb خواستن [xāstan], their usage and semantic groups.

Among the verbs that exist in modern Persian language, the simple verb خواستن [xāstan], which has a special place with its active participation in the expression of important actions and processes, means to ask, to beg, to demand. We have identified the following places of use of verbs used as an alternative to this verb in the expression:

درخواست کردن *darxāst kardan* is the most active of the compound verbs involved in expressing the meanings of the verb to ask, to beg, to demand and is used in all the contexts which are necessary to express

these meanings. In other words, this compound verb participates in the expression of the meaning of asking, which has the meaning of begging , and the meaning of asking , which has the meaning of demanding. Example:

از او درخواست کردم ... از خانه ما خارج شود. [5:167]

I demanded him to leave our house.

از نمایندگان مجلس که در حال بررسی بودجه سال 93 هستند درخواست می‌کنیم ردیفی نیز برای جمع‌آوری معتادان از خیابان ها در نظر بگیرند. [19]

We ask the members of parliament who are discussing the Hijri-Shamsi 1393 (AD 2014) budget to include a point to clear the streets of drugs as well.

واعظی در این دیدار از وزیر اقتصاد ترکیه درخواست کرد نسبت به ایجاد تسهیلات لازم برای برقراری ارتباط میان دو کشور و اقدام کند («نمایندگان ایران و ترکیه در کمیسیون مشترک اقتصادی ... راه های گسترش همکاری ها را بررسی کردند»). [24]

During the meeting, Voiziy (the spokesman) asked the Turkish Minister of Economy to take measures to establish the necessary conditions for the establishment of relations between the two countries, ("Representatives of Iran and Turkey on Joint Economic Cooperatio) discussed ways to expand cooperation at the commission meeting ").

تقاضا کردن *taγāzā kardan* the compound verb is used relatively actively to express the meanings of to ask, to beg, to demand. However, it is observed that this compound verb in most cases means to ask, which has the meaning of to begg, and in rare cases, to mean to ask, which has the meaning of to demand. Examples:

تقاضا کرد که کمی پیانو بزند.[5:147]

He asked if I could play the piano a little.

موعد مرخصی اداری ام سر آمده بود... یک هفته تمدید مرخصی تقاضا کردم. [12:44]

My vacation was over ... I asked them to extend it for another week.

چرا شورای نگهبان از روحانی تقاضا کرد به منزل هاشمی برود؟ [22]

Why did the Supervisory Board demand the priest to go to Hashemi's house (meaning 'demanded')?

خواستار شدن *xāstār (-e chizi) šodan (چیزی)* the compound verb is used relatively actively to express the meanings of to ask, to beg, to demand. However, it is observed that this compound verb in most cases means to ask, which has the meaning of to demand and in rare cases, to mean to ask , which has the meaning of to begg. Examples:

تظاهر کنندگان در تایلند خواستار استعفای نخست وزیر شدند.[22]

Protesters in Thailand have demanded the resignation of the Prime Minister.

تونی بلر مداخله غرب در سوریه را خواستار شد. [23]

Mr. Blair demand for the West to intervene in Syria.

خواهان بودن *xāhān (-e chizi) budan (چیزی)* is a relatively active verb to express the meanings of *to ask, to beg, to demand* but خواستار شدن regarding this verb acts as a variant of the verb. Example:

با توجه به اقتصاد پویا و فرصت های بسیار خوب در ترکیه، خواهان افزایش سرمایه گذاری ایتالیا در کشورمان هستیم («عبد الله گل خواستار افزایش سرمایه گذاری ایتالیا در ترکیه شد»). [24]

Regarding the dynamic economy and very favorable conditions in Turkey, we ask for an increase in Italian investment in our country ("Abdullah Gul asked for an increase in Italian investment in Turkey").

طلب (چیزی) کردن *talab (-e chizi) kardan* is a less commonly used verb to express the meanings of *to ask, to beg, to demand*, and in most cases the basic simple or compound verbs that is used in these meanings comes as a secondary variable form of verbs (e.g. خواستن, درخواست کردن etc.). Example:

بقایی برای بار دوم از روحانی طلب یاری کرد. [25]

For the second time, Baka'i asked the priest for help.

استعلام کردن *este'lām kardan* has means *to ask, to ask* for written information which has the meanings of asking and demanding. Example:

شورای رقابت تناژ محصولات خودروسازان را استعلام کرد. [16]

The Competition Council has asked automakers to provide information on the tonnage of their products.

خواهش کردن *xāheš kardan* basically means *to ask*, which has the meaning of begging. Example:

برای این آمده ام که از شما خواهش کنم آن را قبول کنید. [14:195]

I came to beg you to accept this.

خواهشمند بودن *xāhešmand budan* comes mainly in the third person singular and in some cases the first person singular and plural, in the form of politeness or in official correspondence (letters, notes) and appeals that in the meanings of asking, begging. Examples:

خواهشمند است رسماً اعلام بفرمائید علت لغو مجمع بدون تعیین تاریخ جدید چیست؟ («اعضای مجمع فدراسیون تکواندو خواستار برگزاری سریعتر انتخابات شدند»). [24]

Without announcing the new date of the General Assembly, we ask you to officially state the reasons for the cancellation ("Members of the General Assembly of the Taekwondo Federation demanded that the election be held sooner").

من از خوانندگان دانشمند «سخن» خواهشمندم که در این کار دشوار چاره گری کنند. [27:299]

I ask the clever readers of Sokhan (magazine) to find a way out of this difficult situation.

استدعا کردن *ested'ā kardan* is used to express to ask which has the meaning of demanding and the meaning of ask with the meaning of demand, then this at the same time with above meanings, the aspect of the meaning of the summoning semantic is also observed. Examples:

از ایشان استدعا کردم که با من شطرنج بازی فرمایند. [5:95]

I asked them to play chess with me.

از مردم استدعا دارد که آرامش خود را مثل همیشه حفظ نماید. [13:94]

He summoned the people to keep their peace as usual.

مطالبه کردن *motālebe kardan* means to demand, to demand one's rights, to be given one's rights, and only in these places with simple verb خواستن [xāstan] can form a variant. Example:

بانک ملت خسارت 820 میلیون دلاری از انگلیس مطالبه کرد. [26]

"Millat Bank" has demanded that the United Kingdom pay $ 820 million in damages.

دعا کردن *doā kardan* means *to ask God for something*, and here it is functionally equivalent to the simple verb خواستن [xāstan]. Examples:

هر یک از افراد ما در هر نمازی خدا را شکر می گویند و برای دوام این نعمت و موهبت دعا می کنند. [12:36]

Each of our people prays to God in their every prayers and asks that this blessing and blessing continue.

باید رفت، دعا کرد که بهشان خوش بگذرد. [16:101]

You have to go and ask them to have a good time.

مسئلت کردن *mas'alat kardan* usually means *to ask God* instead of asking for something, or it is only here that with the simple verb خواستن [xāstan] forms a variant. This compound verb is usually used in the last part of a congratulatory letter to express good wishes (for example, to ask or wish the congratulatory person health, success, etc.) or in the last part of a letter of condolence to the patient, etc. used in wishing blessings from God. Examples:

از خدای مهربان سلامتی شما را مسئلت می کنم.

I wish you good health (in a congratulatory letter).

از خداوند متعال برای شما صبر مسئلت می کنم.

I ask Allah to be patient with you (in a letter of condolence).

التماس کردن *eltemās kardan* means *to ask earnestly, to ask hard, to beg, mainly to beg*, beseech which has aspect of asking and it is only in these places that خواستن [xāstan] forms a variant with the simple verb. Example:

هرچه التماس می کردم، کاغذ و قلم می خواستم، به من نمی دادند. [20:10]

No matter how much I begged, no matter how much I asked for paper and pen, they wouldn't give it to me.

برگزارکنندگان اجلاس ژنو 2 نیازمند حضور ایران در این اجلاس هستند و باید برای حضور ایران در این اجلاس التماس کنند («نقدی: اجلاس ژنو 2 بدون حضور ایران نتیجه ای برای مردم سوریه نخواهد داشت»). [24]

For the organizers of the Geneva II meeting, it is necessary for Iran to participate in this meeting and they should ask Iran to participate in this meeting ("Naqdiy : The Geneva 2 meeting will not bring any results for the Syrian people without Iran's participation")

تمنا داشتن *tamannā dāštan* actually means *to beg*, and basically means *to ask*, which means to beg and only in these places is with a simple verb خواستن [xāstan] forms a functional equivalence. Example:

از شما تمنا دارم وضع ما را دقیقاً در نظر بیاورید. [15:181]

Please, I ask you to have a clear idea of our situation.

طلبیدن *talabidan* has been used relatively infrequently to express the meanings of *to ask, to beg, to demand*, and in most cases in the basic meanings of simple or compound verbs used in these as a secondary functional equivalent of verbs e.g. خواستن, درخواست کردن etc. Example

دبیر کل شورای جهانی کلیساها از جامعه جهانی کمک طلبید. [11]

The Secretary General of the World Council of Churches has asked to the international community for help.

تعارف کردن *ta'ārof kardan* has several meaning and has a only in functional equivalence with the simple verb خواستن [xāstan] the sense of asking, asking politely. Example:

ایرانی‌ها به مهمان نوازی مشهور هستند و برای همین احساس می‌کنند برای پذیرایی بهتر از مهمان، باید مدام به آنها تعارف کنند تا میوه، شیرینی یا غذای بیشتری میل کند. [17]

Iranians are known for their hospitality. For this reason, they believe that in order to make a better guest, they should ask from guests to eat fruit, sweets, or more food.

خواهنده شدن *xāhande šodan* is rarely used and comes as a secondary variable form of the basic simple or compound verbs that express the meanings of *to ask, to beg, to demand*. Example:

اگر اول شما و آخر شما ... گرد آیند و همه خواهنده گردند ... نقصان نیاید در مُلک من. [1:168-169]

The ones at the beginning and the ones at the end ... even if everyone gathers and asks (to give something) ... my property will not decrease.

طالب (چیزی) شدن *tāleb (-e chizi) šodan* is rarely used and comes as a secondary variant form of the main verbs that mean *to ask, to beg, to demand*. Example:

وی طالب مساعدت شد. - *She asked for help.*

In short, if we replace the verbs used in all the sentences given as examples of the compound verb variants of the verb خواستن [xāstan] with the simple verb خواستن [xāstan], there will be a change in the meaning of the sentence. And these compound verbs can serve as variants of the simple verb خواستن [xāstan] in expressing the meanings of asking, begging, demanding. There are noticed only methodological limitations.

As we have seen, the verbs used as a functional equivalent to the verb خواستن [xāstan] in the expression of the meanings of the simple verb *to ask, to beg, to demand* are, in turn, can be divided into the following six groups of meanings according to the aspects of meaning expressed in the medium. It should be noted that certain verbs can be divided into several groups of meanings at the same time, as they represent several aspects of meaning:

1. Verbs that are used to express both the meaning of a request with the meaning of to ask and the meaning of a demand with the meaning of ask:

خواستن [xāstan], درخواست کردن [darxāst kardan], تقاضا کردن [ta□āzā kardan], خواستار شدن [xāstār šodan], خواهان شدن [xāhan šodan], طلب کردن [talab kardan], طلبیدن [talabidan], استعلام کردن [este'lām kardan], استدعا کردن [ested'ā kardan],تعارف کردن [ta'ārof kardan], دعا کردن [doā kardan], تمنا داشتن [tamannā dāštan].

2. Verbs involved in the expression of the meaning of the request, which has the meaning of demand:

خواستن [xāstan], درخواست کردن [darxāst kardan], تقاضا کردن [taγāzā kardan],خواستار شدن [xāstār šodan], خواهان شدن [xāhan šodan], طلب کردن [talab kardan], طلبیدن [talabidan], استعلام کردن [este'lām kardan], استدعا کردن [ested'ā kardan],مطالبه کردن [motālebe kardan], خواهنده شدن [xāhande šodan], طالب شدن [tāleb šodan].

3. Verbs involved in the expression of the meaning of the demand to give:

مطالبه کردن [motālebe kardan], طلب کردن [demand kardan], درخواست کردن [darxāst kardan], خواستن [xāstan].

4. Verbs involved in the expression of the meaning of the request, asking, which has the meaning of begging:

خواهش کردن [xāheš kardan], خواهشمند بودن [xāhešmand budan], التماس کردن [eltemās kardan], تمنا داشتن [tamannā dāštan], خواستن [xāstan], درخواست کردن [darxāst kardan], خواستار شدن [xāstār šodan], خواهان شدن [xāhān šodan], طلب کردن [talab kardan].

5. Verbs that are involved in the expression of the meaning of the request, which has the meaning of begging (licking):

التماس کردن [eltemās kardan], خواهش کردن [xāheš kardan], تمنا داشتن [tamannā dāštan], خواستن [xāstan].

6. Verbs involved in expressing the meaning of asking, which have the meaning of asking from God:

دعا کردن [doā kardan], مسئلت کردن [mas'alat kardan], خواستن [xāstan].

Therefore, it can be said that these verbs, which serve as variable forms of the simple verb خواستن [xāstan] in the expression of the meanings of *to ask, to beg, to demand*, are not divided into groups of meanings without modification, خواستن [xāstan] can be replaced by a simple verb, and all of these compound verbs can be briefly or generically described by the word خواستن [xāstan]. However, the verb خواستن [xāstan] does not serve as a key word in all the groups of meanings divided according to the aspects of meaning expressed by these compound verbs. In particular, the six groups of meanings mentioned above, in the first and second groups درخواست کردن [darxāst kardan], in the third group مطالبه کردن [motālebe kardan], in the fourth group خواهش کردن [xāheš kardan], in the fifth group التماس کردن [eltemās kardan] and in the sixth group مسئلت کردن [masalat kardan], the compound verbs serve as the main word for meaning.

In conclusion, it can be said that خواستن [xāstan] is a simple verb that means *to ask, to beg, to demand*, eighteen compound verbs auxiliaries in these compound verbs (without taking into account the variable forms of the verbs) comes as a function of the variable forms of this verb.

The conjunctive verbs that serve as variable forms of the simple verb خواستن [xāstan] in expressing the meanings of *to ask, to beg, to demand* vary according to the place and degree of use, and these verbs we have listed the locations of applications in a sequential order based on their levels of use.

The division of the compound verbs, which serve as variable forms of the simple verb خواستن [xāstan], in the expression of the meanings of *to ask, to beg, to demand*, into six groups of meanings according to the aspects of meaning expressed by them detected.

In the semantic groups of compound verbs, which serve as variable forms of the simple verb خواستن [xāstan] in the expression of the meanings of *to ask, to beg, to demand*, the simple verb خواستن [xāstan] is also used with the other verbs that it has been observed that serves as the main word.

References:

1. (1372). *Abu Nasr Ahmadi Jam. Ravdat ul-moznebin va jannat ol-moshtaqiyn*. Tehran.
2. Anvarovna, N. M. (2020, November). *Mahmud Zamahshari about mafullar. In Archive of Conferences* (Vol. 9, No. 1, pp. 295-298).
3. Arifdjanov, Z. T. (2020). The structure of persian verbs and their role in word formation. *Theoretical & Applied Science*, (7), 420-423.
4. Balli, Sh. (2001). *Obshaya lingvistika i voprosi fransuzskogo yazika*. - Moskva: Editorial URRS.
5. (1357). *Bozorg Alavi. Chamedan*. Tehran, Amir kabir.
6. (1349). *Jalal Al-e Ahmad. Se tar. Tehran. Entesharat-e Ferdousi*. Chap-e dovvom.
7. Kartsevskiy, S.O. (1965). *Ob asimmetrichnom dualizme lingvisticheskogo znaka*. Istoriya

yazikoznaniya 19-20 vekov v ocherkax i izrecheniyax. - Moskva, Ch. 2.
8. Kropotova, L.V. (2009). Problema razgranicheniya sinonimii i variativnosti. Filologicheskiye nauki. *Voprosi teorii I praktiki*, № 2 (4).
9. Kuznetsova, E.V. (1989). *Leksikologiya russkogo yazika*. - Moskva: Visshaya Shkola.
10. Lutfullaeva, D. (2021). Linguistic Principles of Naming Trade Objects in Uzbek Language. *Journal of Psychology and Education*, 58 (1), 1027-1032.
11. (1391). *Mohabat nyus. Ajans-e xabari-ye masihiyan-e iran. Tarix-e entesharat-e xabar. 5 mehr 1391*: Retrieved from www.mohabatnews.com
12. (1357). *Mohammad Ali Jamalzade, Qesse-ye ma be sar resid*. Tehran, Sherkat-e moallefan va motarjeman-e iran.
13. (1361). *Mohammad Mahmud. Zamin-e suxte*. Tehran, Nashr-e nou.
14. (1360). *Mohammad Mosaddeq. Xaterat va ta'allomat-e doktor Mosaddeq*. Tehran, Elmiy.
15. (1340). *Mortaza Moshfeq Kazemi. Tehran-e maxuf*. Tehran, Ebn-e Sina.
16. (1992). *Paygah-e ettelarasani-ye asr-e xodro. Tarix-e entesharat-e xabar. 31 farvardin, 1992*. Retrieved from www.asrekhodro.com
17. (1992). *Paygah-e ettelarasani-ye ebtekar. Tarix-e entesharat-e xabar: 27 esfand, 1992*. Retrieved from www.ebtekarnews.com
18. Rustamiy, S. (2020). The place of adult science in eastern classical literature. *Scientific progress*, 1 (1).
19. (n.d.). *Ruzname-ye keyhan, moarrex-e 1392/11/8.*
20. (1341). Sadeq Hedayat, Se qatre xun. Tehran, Amir Kabir.
21. Saiidmahamadzhanovna, S. D., Imamidinona, J. D., & Sayidmahamadovna, S. N. *Methodological foundations of the typological analysis of a part of the speech of the turkic languages.*
22. (n.d.). *Sayt-e tahlili-ye asr-e iran*. Retrieved from www.asriran.com
23. (n.d.). Sayt-*e xabargozari-ye daneshjuyan-e iran* (isna). Retrieved from http://isna.ir
24. (n.d.). *Sayt-e xabargozari-ye jomhuri-ye eslami*. Retrieved from www.irna.ir
25. (n.d.). *Sayt-e xabargozari-ye solh*: Retrieved from http://solhnews.org
26. (n.d.). *Sayt-e xabargozari-ye tasnim*: Retrieved from www.tasnimnews.com
27. (1338). *Xanlari. Nemunehayi az nasr-e fasih-e farsi-ye moaser*. Tehran, Bina.

Impact Factor:

ISRA (India)	= **6.317**	**SIS** (USA)	= **0.912**	**ICV** (Poland)	= **6.630**
ISI (Dubai, UAE)	= **1.582**	**РИНЦ** (Russia)	= **0.126**	**PIF** (India)	= **1.940**
GIF (Australia)	= **0.564**	**ESJI** (KZ)	= **9.035**	**IBI** (India)	= **4.260**
JIF	= **1.500**	**SJIF** (Morocco)	= **7.184**	**OAJI** (USA)	= **0.350**

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2021 **Issue:** 06 **Volume:** 98

Published: 02.06.2021 **http://T-Science.org**

QR – Issue QR – Article

Dmitry Olegovich Bordukh
Institute of Service Sector and Entrepreneurship (branch) of DSTU
Bachelor

Artur Aleksandrovich Blagorodov
Institute of Service Sector and Entrepreneurship (branch) of DSTU
Bachelor

Danil Sergeevich Shcherbakov
Institute of Service Sector and Entrepreneurship (branch) of DSTU
Bachelor

Vladimir Timofeevich Prokhorov
Institute of Service Sector and Entrepreneurship (branch) of DSTU
Doctor of Technical Sciences, Professor
Shakhty, Russia

Galina Yurievna Volkova
LLC TsPOSN «Ortomoda»
Moscow, Russia

FEATURES OF THE FORMATION OF FLEXIBLE TECHNOLOGICAL PROCESSES FOR THE PRODUCTION OF ATTRACTIVE AND COMPETITIVE PRODUCTS

Abstract: *In the article, the authors recommend that the market revise the concept of forming it with in-demand and import-substituting goods, taking into account their attractiveness. Such a concept will fully correspond to the consumer's desire to satisfy his desire and desire to make a purchase, taking into account his social status, providing manufacturers with the sale of their products in full and guaranteeing enterprises sustainable TPE of their activities.*

Key words: *flexible production, attractiveness, demand, competitiveness, import substitution, demand, profit, financial condition, stability, sustainable TPE, assortment, assortment policy.*

Language: *English*

Citation: Bordukh, D. O., Blagorodov, A. A., Shcherbakov, D. S., Prokhorov, V. T., & Volkova, G. Y. (2021). Features of the formation of flexible technological processes for the production of attractive and competitive products. *ISJ Theoretical & Applied Science, 06 (98),* 24-54.

Soi: http://s-o-i.org/1.1/TAS-06-98-6 ***Doi***: https://dx.doi.org/10.15863/TAS.2021.06.98.6

Scopus ASCC: *2000.*

Introduction

UDC 685.34: 314.17

The attractiveness of the product can become a magnet that initiates the interest of the buyer. It was not for nothing that V.I. Dal interpreted attractiveness as attractiveness, magnetism. The economic system is formed by production relations, therefore, there will not be radical transformations of the existing system of the economy, there will be a restructuring, a reboot, which changes not the system, but the order of functioning of the system, the vector evolution of economic policy. The economic system will be optimized by realizing the costs of minimizing the costs of the assortment.

Does the consumer benefit? Apparently, yes,

provided that manufacturers and sellers do not skimp on research work on consumer demand. Here, the simplest research is not enough, it will require a deep analysis and integration of different approaches - economic (marketing), sociological, cultural, ergonomic, sanitary, focusing scientific research on regional, national characteristics. The prospect of real participation in the process of real-level students will open, accelerating their qualification formation

The transition from good to better in any field of activity is associated with an increase in implementation costs, including risk financing. In our view, the analyzed transition to a new economic policy should justify the expectations - lead to a reduction in costs, losses, environmental burden, but the result will largely be determined by the construction of scientific, technical and educational educational policy. Good intentions often end up with worse results due to poor management.

The time has come again to temporarily disconnect from the production of goods and, following the example of Karl Marx, focus on the cell of the modern economic organism - the commodity, but, unlike the author of "Capital", place the commodity not in production, but try to fit it into the subsystem of market relations. Capital without circulation is not capital. Capital is a process. The process of capital reproduction is a characteristic way of its implementation. The market ensures the reproduction of capital, creating conditions for the sale of marketable products. For production, initial capital in financial form is required, for implementation, as a condition for reproduction, demand for a commodity is required, which must be provided by the market - conditions linking the producer with the consumer. Everything, as we can see, rests not even on the characteristics of the product, but on the organization of the market. Of course and the properties of the product are important here. The doctor is able to revive the dying, but he is not able to revive the corpse. The same can be said for the market.

The transition to market-oriented production based on the structure of concretized consumption can be viewed as a way to resolve the growing contradiction between growing socio-cultural needs and natural sources. And in this sense there is sufficient reason to speak about the objective completeness of the development of reproduction. The center of concentration of activity is shifting to the territory of the market, its scientific potential is being updated. Question # 1 lean production - is the market ready to increase allocations for researching the structure of the needs of the mass buyer? It is not difficult to find individual examples. At the end of June 2019, Google conducted a survey of the culinary preferences of Russians in order to make a rating of 20 basic products and the same number of dishes. The taste of Russian consumers has encouraged marketers and terrified nutritionists. However, experts are convinced that there will be no changes in two or three years. Manufacturing, providing the grocery market received the necessary information for thinking about the directions of investment in production. Now it is important to avoid a rush of restructuring, to agree on quotas within the corresponding unions, banknotes and other associations of producers.

"Attractiveness" is transformed from an advertising category into an economic one, more precisely, into a market brand. Theoretically and even methodologically, "Attractiveness" refers to the "cross-cutting" concepts that characterize the activity and its products. There are hardly any opponents of this statement. The essence of considering “attractiveness” in the light of our problematics is not in defining “attractiveness” as such, but in its concrete historical manifestation. Activity is a way of implementing an idea; outside of practical activity, the idea will not go beyond the element of consciousness, it remains knowledge and is likely to lose its meaning after some time. The relevance, meanwhile, is not inherent in the activity itself, but in the way of implementing the plan, while the way in which the activity is carried out is regulated by space-time coordinates, revealing and limiting the relevance of the mode of action. History is made up of actual historical periods - actual stories. A historical phenomenon, regardless of its nature - material or ideal, becomes not when it happens, but only when it is included in the historical chain of events. In dialectics, social development is therefore described by a pair of categories "historical-logical", and historical phenomena can "drop out" from the logic of the historical process, which is natural. Otherwise, development would involuntarily make one think about the Divine creation of social history. when included in the historical chain of events. In dialectics, social development is therefore described by a pair of categories "historical-logical", and historical phenomena can "drop out" from the logic of the historical process, which is natural. Otherwise, development would involuntarily make one think about the Divine creation of social history. when included in the historical chain of events. In dialectics, social development is therefore described by a pair of categories "historical-logical", and historical phenomena can "drop out" from the logic of the historical process, which is natural. Otherwise, development would involuntarily make one think about the Divine creation of social history.

"Attractiveness" in a broader context has always stimulated activity. In recent history, this concept has acquired a new meaning and, accordingly, a new meaning. It found itself at the center of economic contradictions in the market. It is actively exploited in their own interests by all those for whom the market is the main source of speculation, they will go to "all the hard". Those who have retained the honor of a

professional manufacturer see it as a salvation for consumers.

The concept of "product attractiveness" is partially revealed in the concept of "product value". In special literature, "product value" is defined as "a set of quality parameters expected by the consumer for the product he needs and their values that meet the needs of the consumer." The product value unfolding is called the "customer satisfaction tree".

In order for the value of a product to cause consumer satisfaction, it is important not only to be concerned about the quality of the product, but also to remember that the consumer's consciousness is not a constant, it moves and matures. The expression "the client is ripe" characterizes the process of interaction between the producer and the consumer. The consumer in such an interaction is represented by mental activity, first of all. The sources of mental readiness to accept the manufacturer's proposal as coinciding with their own idea of the attractiveness of the product are not uniform. Usually they include:

- manufacturer's credibility;
- information from reliable sources; consumer communication, informal communication; the presence of the product in the past experience of the buyer; the relevance of this purchase to the buyer.

If the "buyer" is considered outside the socio-economic context, then the answer to the second question looks very clear. The market is waiting for a buyer with high solvency. There are also buyers in Russia, but their share does not exceed 7 percent, and they rarely go to the lucrative market for the masses, rather by chance than by necessity. The mass consumer is extremely economical and it is difficult to "shake" it for purchase. It requires a certain type of product that can charm, and the presentation of the product, "cultural packaging". It is necessary to attract the buyer, to bewitch. Like a reflection the desire to comprehend the specifics of the status of demand for a product on the market, one should consider the revival of interest in the concept of "product attractiveness". It is much more specific in its content in comparison with the close and more pseudo-scientific concept of "demand for a product by the market". It contains fewer economic statistics, formal signs that allow to measure pressure, but in full there is a "human factor" that determines market dynamics.

If psychologically the image of the product as attractive has formed, then relations from the phase of abstract possibility pass into real possibility. The next step - the transformation of a real opportunity into the reality of purchasing a product you like will depend on the ratio of producer and consumer costs. For the first, we are talking about the ratio of cost and price, for the second - the price and quality of the product.

Main part

In all modern quality management systems in the context of provisions on prestigious awards (EFUK, UOK, IAQ, TQM, etc.), such an indicator as the degree of satisfaction with consumer products stands above all others, occupying in a weight ratio from 1/5 to 1/3 cumulative points. This indicator has the least points - 180 (out of 1000) in the Regulation on the Prize of the Government of the Russian Federation in the field of quality.

We understand that customer satisfaction with a product should not be limited to the consumer appeal of a product. Product attractiveness is superimposed on satisfaction, remaining part of attractiveness. There are products that initially, perhaps, did not belong to the range of attractive ones, for example, gifts or something purchased "on the occasion", by necessity. The attractiveness was discovered later, as it was used for its intended purpose. But the comparison between satisfaction and attractiveness is quite correct and indicative. Moreover, at the junction of these concepts there is a test zone for characterizing the degree of development of production. Figure 1 shows the consumer expectation architecture.

To study the status of the concept of "Product attractiveness", a questionnaire was developed, shown in Table 1.

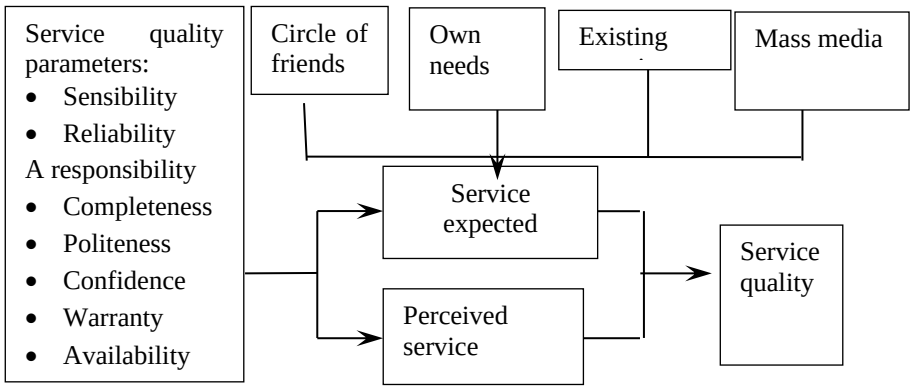

Figure 1. The architecture of customer expectations

Table 1-Analysis and study of the status of the concept "Attractiveness of goods"

No.	Indicators of "Product attractiveness"	Rank
1	Feeling the need to buy a product	7
2	Reliability of goods	2
3	Manufacturer's responsibility for the quality of the goods	1
4	Completeness of goods	3
5	Service courtesy	17
6	Trust in the seller, manufacturer	16
7	Impressive warranty period	4
8	Product availability	8
9	Communication with the seller	25
10	Mutual understanding with the seller, his interest in selling products	26
11	Service culture	27
12	Affordability	9
13	Customer satisfaction	10
14	The level of readiness of the consumer to make a purchase	11
15	The level of interest of the manufacturer in the formation of "Product attractiveness"	19
16	Consumer buying opportunity	12
17	Authority of the manufacturer	5
18	Consumer communication	24
19	The consumer's opinion about an earlier purchase of an identical product	13
20	The need for the consumer to purchase "Attractive product"	23
21	The relevance of this purchase to the buyer	14
22	Possibility of subsequent exchange of goods	20
23	Availability of several necessary functions for the product	6
24	Modern design	22
25	Payment method for purchase	15
26	Ease of operation of the product	21
27	Organization and availability of service support for purchased goods	18

An analysis of the results of a survey of respondents on the influence of the criterion "Attractiveness of goods" confirmed the importance of the rehabilitation of this criterion in marketing activities to form sustainable demand not only for light industry products, but also for all consumer goods (Table 2).

What is interesting is the fact that is due to the coincidence of the studies carried out by the authors on the formation of the architecture of customer satisfaction based on the criterion - Product attractiveness - as one of the main factors on demand and the results of a priori ranking on its impact on the sale of consumer goods, for participation in which students-commodity experts, students - experts in the field of certification and standardization, students - technologists, constructors and designers, teachers of these specialties and graduates of the same specialties, who are currently leading specialists in enterprises engaged in the production of this very product for consumers in the regions of the Southern Federal District and the North Caucasus Federal District.

Table 2 - Results of the survey of respondents on the influence of the criterion "Attractiveness of goods" on the demand for demanded and competitive products

No.	Expert opinions / Factors	All respondents	Teachers and specialists	Students	Agreed
1	Feeling the need to buy a product	2	2	2	2
2	Reliability of goods	12	12	12	12
3	Manufacturer's responsibility for the quality of the goods	1	1	1	1
4	Completeness of goods	3	3	3	3

5	Service courtesy	21	8	21	21
6	Trust in the seller, manufacturer	8	21	8	8
7	Impressive warranty period	4	4	4	4
8	Product availability	17	6	24	17
9	Communication with the seller	24	16	17	24
10	Mutual understanding with the seller, his interest in selling products	6	17	7	6
11	Service culture	16	19	13	13
12	Affordability	7	26	5	7
13	Customer satisfaction	13	24	20	5
14	The level of readiness of the consumer to make a purchase	20	7	16	16
15	The level of interest of the manufacturer in the formation of "Product attractiveness"	5	23	6	23
16	Consumer buying opportunity	23	13	23	20
17	Authority of the manufacturer	26	20	26	26
18	Consumer communication	11	5	27	14
19	The consumer's opinion about an earlier purchase of an identical product	14	11	14	11
20	The need for the consumer to purchase "Attractive product"	15	10	11	27
21	The relevance of this purchase to the buyer	27	14	15	19
22	Possibility of subsequent exchange of goods	19	15	22	15
23	Availability of several necessary functions for the product	10	18	10	10
24	Modern design	25	9	25	18
25	Payment method for purchase	22	27	18	25
26	Ease of operation of the product	18	25	19	22
27	Organization and availability of service support for purchased goods	9	22	9	9

If customer satisfaction is formed at the expense of the manufacturer's level, i.e. its test level is formed by the price availability of the product, which is offered by the assortment range, of course, by quality, and at the expense of the consumer level, i.e. its test level assumes the presence of a culture of customer service, the attractiveness of the product, customer satisfaction, and, of course, the solvency of the consumers themselves, then the respondents who took part in the survey believe that consumer satisfaction will be ensured with the reliability of the product, its affordability, and the availability of the opportunity for buyers make purchases, i.e. their solvency. Natural product quality, variety of assortment range, attractiveness by design decision, i.e. correspond to fashion, products should have a sufficiently long warranty period, and, interestingly, all respondents are unanimous that manufacturers should fight for respectful attitude of buyers towards them, win their trust and desire to make a purchase of the products of these enterprises, i.e. the brand and image are always in demand, which together solves the main task - provides consumers with domestic products within the framework of import substitution.

The criteria for assessing the competitiveness of a light industry enterprise using the software developed by the authors made it possible for the first time to formalize the role of experts - respondents on the basis of their competence to the problem under consideration. The need for such an approach is due to the desire to have an objective assessment of competence, taking into account not only the opinion of the invited party of expert respondents to participate in the survey, but also using the assessment criterion - the coefficient of concordance (W) - the value of which varies from 0 to 1. And if W = 0-0.5 - this is their lack of agreement with the opinion of those experts whose value of the coefficient of concordance (W) tends to 1, which confirms their high competence and the possibility of their further participation as expert respondents. The results of a survey of experts on assessing the competitive potential of light industry enterprises, although they received the value of the coefficient of concordance (W) in the range of 0.4-0.6, but excluding heretics, that is, those respondents whose opinion does not coincide with the opinion of most other experts, we found it is a pleasant fact that the opinion of those respondents whose authority is beyond doubt, and those whom the program classified as heretics, have an unambiguous or close opinion that the factors characterizing the influence of competitive potential on the competitiveness of an enterprise are identical, and they can be used in further research in assessing

this very competitiveness of enterprises, assuming that he is able to manufacture import-substituting products for consumers in the regions of the Southern Federal District and the North Caucasus Federal District. At the same time, manufacturers have every reason for these criteria, namely: the ratio of the quality of the product and the costs of its production and marketing; sales growth rates; costs of innovation; labor productivity; the level of partnerships with interested participants in the production of import-substituting products; costs per ruble of products sold, and the main criterion; the competitiveness of the goods weighted average for the range of products should be considered in demand.

But at the same time, all the responding experts were unanimous that the company's competitiveness will be more stable over time if the company's share in the demand market is stable. In any case, it will not decrease over time if it is guaranteed a return on investment and, of course, a stable profitability of the total assets of the light industry, engaged in the production of import-substituting products, is ensured. The opinion of all experts is justified that the competitiveness of an enterprise is also influenced by a stable trade turnover on the basis of direct contractual relations with the sellers of the products of these same enterprises.

We agree with them on the issue of the role of highly qualified personnel, which of course, although it was reflected in the questionnaire in the form of one criterion - the staff turnover rate - but did not cause the experts, with regret, concern about the liquidation of lyceums, colleges, on the basis of which they trained highly qualified workers and middle managers - foremen, technicians, mechanics, technologists, engaged in servicing not only the innovative technological process, but also innovative equipment. And it is completely sad that the training of engineering and technical personnel has practically ceased, explaining all this by the lack of their demand, although the heads of enterprises themselves are at a loss. There is also a downside to this situation, namely, that managers have withdrawn from the training of these highly qualified specialists through targeted training in colleges and universities, not wanting to bear the costs of this very training, forgetting the Russian proverb: "A miser pays twice." It is also disappointing that the majority of enterprise managers believe that everything will be resolved by itself, but if a shoemaker, a seamstress-minder, a furrier can be trained in the workplace, then it is unlikely to prepare a leading engineer - a manager and a production manager for filled technological processes with an effective innovative solution.

Once again I want to recall one more Russian proverb: "That until the thunder breaks out, the man does not cross himself." Is it really necessary to step on a rake, get a tangible blow on the forehead and shout - "Ugh, I remembered the name of this instrument, that this is a rake." the light industry, which was confirmed by the experts - the respondents, showing unanimity, on the main criteria for assessing the competitiveness of light industry enterprises. Summing up the analysis of the concept of "product attractiveness", its relationship with the closest economic concepts, it is methodologically expedient to arrange the relations of these concepts systematically. Table 2 shows the results of a survey of all respondents on the formation of the image of goods and its attractiveness. ensuring competitiveness and demand among consumers.

Unfortunately, the respondents, when filling out the questionnaires offered to them, did not pay due attention to communication with sellers, methods of payment for a purchase, the possibility of exchanging a purchase made if necessary: the level of service and other factors, and only because our consumer is not spoiled by all this list of services service, both the manufacturer and the trade still have a lot of opportunities for improvement in interaction with consumers in order to guarantee themselves a steady demand.

Thus, the criteria "Product attractiveness" has a right to life and are more significant for both the manufacturer and the buyer to ensure sustainable demand for products manufactured in the regions of the Southern Federal District and the North Caucasus Federal District, and this is the most important and dominant wish for meeting needs, which consumers of these regions would like to sell.

The 21st century has sharpened the scientific, philosophical and practical interest in competition by improving the quality of manufactured products. The scale, content, forms and significance of competition put it in a number of global problems of human development with one important clarification: it is not humanity itself that benefits from achievements in the competitive struggle, but individual subjects of human activity, starting with the personality of the performer and the head of the enterprise, and up to those states in whose interests they work. Therefore, the organization of effective participation in competition should be considered as a leading indicator of professional competence, spiritual maturity and political consciousness, bearing in mind, of course, economic policy. We all wish ourselves and our neighbors success in life, and we associate this with happiness. We explain this condition more often - by external factors: luck, luck, support. Less often - internal - personal qualities.

Judging by the interest in different types of testing, expert assessments, the question generally remains open: what determines success in life?

Often, subconsciously, we feel our inefficiency, but, not understanding the origins, we react to it in different ways: some with even more frenzy pounce on disgusting work, others, with no less zeal, begin to conflict with others, blaming them for their failures.

Success is usually associated with the fact that the more you produce, the more you do, the higher your efficiency, your success. They are very often confused (and sometimes even deliberately) with performance, forgetting or not knowing that the result will be effective if it is not measured against costs.

Production, thoughts and things with a positive interaction of man with the world obey the general law of Nature: existence is possible only under the condition: the arrival of energy must be greater than its consumption. True efficiency is a function of its two constituent elements: the achieved result (P), as well as the resources and means (PC) that allow it to be obtained: remember the fable about the peasant and the goose that lays the golden eggs. Efficiency lies in the balance of its components, ie "P / PC = MEASURE". Indeed, if you adopt a behavior that focuses only on the golden eggs and neglects the goose, then you will soon be left without the resources that produce these golden eggs. On the other hand, if you only care about the goose, forgetting about the golden eggs, then soon you will not be able to feed yourself and the goose.

So, the Efficiency of the activity lies in the proportionality of the result with the resources and means: "R / PC = MEASURE".

The resource of an enterprising person is the whole world around him, but first of all he himself.

A person's personal resources are in his mind and character, in the skills and abilities of interacting with the world.

There is a Pareto rule: 20/80. If you try to use it in our case, you get the following. In relation to an individual, this is: 20% of actions and thoughts give 80% of a positive result. It is striking the persistence with which a person, having been unsatisfied with the result for decades, repeats monotonous actions, but at the same time he never once has the thought: “I’m doing something wrong!? Or - is there something wrong!? " It is very easy for a person to get used to doing stupid, hard physical or monotonous intellectual work and it is very difficult for him to look at himself through the eyes of a researcher, through the eyes of a Master.

They say: "they change a person - situations", but only the Master in them deeply experiences what is happening, is their active participant. The situation for the Master is filled not only with novelty, but also with meaning, in it he finds differences, changes, points of growth. He sees his goal in her. The problem evokes in him a sense of rivalry, a sense of readiness and mobilizes all his forces, which, with such a mood, only multiply with each positive decision. We learn from mistakes, but he has no mistakes, there is only experience, positive experience.

It is the Masters who make up those 20% of people who account for 80% of success. And therefore, our eternal problem has the form of a dilemma: either you become a Master, or all your life you chase in the "collective" of an eighty percent crowd after the ghost of twenty percent success. And the question is justified, will we become the master of our destiny with the inner resource of the Master?

The strategies and behaviors developed can be assessed as productive or unproductive, depending on their relevance to the situation: let us recall the tale of a fool, a man and a goose that lays the golden eggs.

The technical term for thinking styles is query modes. Query modes represent a basic set of targeted worldview techniques. They are built on previously acquired preferences, learned values and views of the world - concepts of the world and the nature of reality, which are related to the map as a system of landmarks used when moving.

To achieve success in learning, you just need to start working with the material, try it without any prejudices, and consolidate its assimilation with appropriate exercises.

In any “masterful” skill or action, we can find a certain “strategy”. His Master strategy includes a series of thoughts and actions that lead relentlessly to success.

Cherished goals serve as a measure of success. Choosing and achieving goals (these include dreams, hopes, desires and specific goals) can be considered the most important components of human experience. In addition to the satisfaction of success achieved, choosing the right goal can literally change our lives. Usually the desired is achieved through personal qualities. It is personalities that turn clear goals into motivation, self-confidence, perseverance and other human qualities that steadily lead to success. One of these qualities is undoubtedly considered ambition.

The activity of imagination and the development of will, undoubtedly, is much more beneficial than overtime work.

Behavior has a purpose, because it must lead to a particular result, and we interpret our actions as aimed at a certain outcome. We ourselves attach importance to them, although sometimes we do it only afterwards, “in hindsight”.

Even in cases where we act without realizing, we still have a fundamental motivation - an unspoken goal.

Consciously and accurately formulating your own goals, that is, a "well-defined outcome", increases the chances of transforming our desires into appropriate actions on the path to success.

Let us analyze this in the context of the general movement towards perfection, namely:

1. Decide what you want (formulate and set a goal for yourself).
2. Do something.
3. See what happens.
4. If necessary, change the approach until you achieve what you want.

Setting the right goals means being able to "correctly formulate the result."

The main principles of the formation and selection of their goals are:

1. Selecting goals that deserve to be achieved.
2. Choosing a goal that you can achieve on your own.
3. State your goal in affirmative terms.
4. Express your goal accurately, in sensory terms.
5. Match your goal with the situation.
6. Soberly assess the consequences of achieving your goal.

Perhaps we began to understand that if we want to change something, then we must start the change with ourselves. And in order to change ourselves effectively, we must first of all change our perception.

The need for a flexible organization of the production system is explained by economic and organizational laws. The relationship between the producer and the consumer determines the economic law of mutual benefit. Organizational laws determine the requirements for adapting the production system to an open economy, which in turn is adjusted by the law of ensuring the adequacy of the internal structure and possible types of organization of footwear production to the conditions of the external market environment. By expanding the assortment and ensuring high quality of manufactured goods, enterprises gain new sales markets and maintain their positions in an already conquered market. The idea of working for an individual consumer allows enterprises to fulfill additional orders without changing the main production plan even in conditions of large-scale production.

Flexibility is the dominant concept in the literature on the most progressive development trends in modern industry. Therefore, it is necessary to clearly define this concept based on the analysis of modern systemic concepts. The following works are devoted to the issues of production flexibility: V.F. Gorneva, M.Kh. Bleherman, V.N. Vasilieva, I.M. Makarova, E.G. Ginzburg, B.V. Prykina, Yu.M. Solomentseva, V.N. Samochkina, Yu.A. Mezentseva, S.G. Selivanova and others.

It should be noted that the main research related to the flexible production system was carried out for the conditions of mechanical engineering, due to the widespread use of numerically controlled machines in this industry, including machining centers, industrial robots and other computer-controlled equipment, which is not typical for light industry.

A large number of publications and authors dealing with the problem of production flexibility predetermines different approaches to the content of this concept. So, V.F. Gornev understands flexibility as the possibility of a fairly quick and economical change in the structural elements of the production system, parameter arrangements, algorithms and operating programs. At the same time, the flexibility of the production system is determined by the range of changes in the technical characteristics and elements of the production system; versatility of technical solutions for main and auxiliary equipment; the time required to change the technical characteristics; improving the management system. The author compares the concept of flexibility with the concept of adaptability of production processes.

M.Kh. Bleherman refers to flexibility as the ability of a production system to adapt to changing operating conditions with minimal cost and no loss or with very little loss of productivity.

The concept of flexibility according to D.A. Nysu reflects the ability of the system to maintain certain production parameters (productivity, accuracy, economic efficiency) within specified limits under non-stationary operating conditions and compensate for various external influences by changing internal parameters according to appropriate criteria in space and time.

Yu.M. Solomentsev proposes to consider the flexibility of automated machine tool systems (ACC) as their ability to adapt to a change in the nomenclature of parts and various production situations. In this case, adaptation is understood as the transition of the ACC from an inoperative state to a working one, and by a production situation - organizational features associated, for example, with equipment and tool failures, with the launch of extraordinary parts for processing, etc.

V.N. Samochkin defines the flexibility of an enterprise as "the ability to obtain the desired result, which allows it to master, within a certain period of time, a regular number of products that can be demanded by the market and, in turn, allow it to obtain the necessary result in the future, ensuring the survival and development of the enterprise" ...

P. Blyton considers the concept of flexibility by J. Atkinson only as the flexibility of the workforce, including functional in terms of number, time and financial flexibility.

Thus, flexibility is a system characteristic reflecting the ability of any system to adapt to the dynamics of internal and external influences, maintaining the performance indicators at the required level of efficiency. The main principles, the implementation of which allows you to achieve an appropriate level of flexibility, are modularity, variance, consistency, information content.

Flexible technology - the ability to structural changes, quick adaptation of production elements in conditions of dynamism and intensification.

The concept of flexibility reflects the ability of a system to maintain certain parameters (productivity, economic efficiency) within specified limits under non-stationary operating conditions. It also compensates for various external influences by changing internal parameters according to appropriate criteria in space and time.

There are other interpretations with a significant range of understanding of flexibility from readjustment to full automation. Even a cursory analysis of the views reflected in the literature on the concept of flexibility of the production system indicates that it has not yet been finally formulated. To a greater extent, it is revealed in the definition proposed by B.V. Prykin, who considers flexibility as the ability of a system to perceive innovations and adapt to new conditions of functioning in the event of deviations from its existing state without violating its integrity. Based on the study of all available views on the problem of the flexibility of the production system, the concept of the flexibility of the production system is formulated as follows.

"The concept of flexibility is to create a production system that reflects the ability to be adaptive to changing external conditions only on the basis of changes in internal organizational and technical parameters, while maintaining the main economic indicators and performance indicators."

The integration processes taking place in the world economy are influenced by two main directions that have developed in the new technological paradigm: an orientation towards increasing productivity and competitiveness. Structural restructuring of the economy at the end of the XX century. was carried out under the influence of the spread of new information technologies, increased operational uncertainty and the development of new models of management and marketing. The ongoing processes were reflected in the new reorganizing strategies of Shore, Sabel, Harrison, Storper and were summarized by Manuel Castells in his work "The Information Age: Economy, Society and Culture." The rationale for the transition to new organizational structures is the transition from "mass production to flexible production" (Piore, Sabel) or from "Fordism to post-Fordism" (Corea).

The mass production model was based on increasing productivity through economies of scale in a conveyor mechanized process of manufacturing standardized products, subject to the control of a vast market by a specific organization - a large corporation built on the principle of vertical integration and an institutionalized social and technical division of labor. These principles were embedded in management methods called "Taylorism" and "scientific organization of labor."

When demand became unpredictable in terms of quantity and quality, world markets diversified and as a result became difficult to control, and the pace of technological change made highly specialized production equipment obsolete, the mass production system became too rigid and expensive for the new economy. The provisional response to this rigidity was a flexible manufacturing system. It was practiced and conceptualized in two different forms: as flexible specialization, as formulated by Piore and Sabel, based on the experience of the industrial regions of Northern Italy, where "production adapts to incessant changes without pretending to control them" in the structure of industrial crafts or custom production.

At the same time, the concept of flexible specialization is based on the methods of implementing the “flexible production paradigm” as the most adequate response to market changes.

However, the practice of industrial management in recent years has introduced another form of flexibility: dynamic flexibility, in Corea's formulation, or flexible manufacturing with a large volume of output, as defined by Cohen and Zisman, also adopted by Bairn, characterizing the transformation of the insurance business. Flexible, high-volume manufacturing systems, typically associated with growing demand for a given product, combine high production volumes for economies of scale, with customized, easily reprogrammed production systems that save on scale. New technologies make it possible to rebuild assembly lines typical of a large enterprise into a set of easily programmable production units,

In industrialized countries, large-scale and mass production is only 20%, and single, small-scale and batch production is 80%.

For many decades, the most efficient technological systems, in terms of flexibility, were automated lines built on the basis of an aggregate principle from standardized parts in a mass production environment. These lines are designed taking into account a specific technology, volume and cycle of production, capabilities and production areas of the customer, etc. The technical revolution in all areas of technology has led to frequent product changes. The trend towards diversification has manifested itself in the creation of various models of all types and types of shoes, adapted to the specific requirements of the consumer. The rapid renewal of the range of shoes and the decrease in serial production as a result of the appearance of modifications (individualization of consumer demand) led to the fact that that traditional rigid automated lines in many cases ceased to meet the requirements of modern technological development, and their use hinders the production of new models of footwear. In order to resolve the contradictions caused, on the one hand, by the small batch of production facilities, and on the other hand, by the large scale of production itself, methods of group technology were developed. These goals are achieved by creating technological systems for processing shoe parts and assemblies, which are complex complexes with a high flexibility and level of automation. All technical means in the complexes are controlled by computer controllers of different levels from control devices for individual elements to an automated production control system (ACS) and an automated process control system (ACS). From these positions, flexibility acquires the following definition: the ability

of a technological system to maintain the necessary performance characteristics and parameters when the goals and objectives of the production of footwear change within the specified limits, which is achieved by changing the structure, organization and program of the system. Modern equipment for small batch production offers almost unlimited flexibility, since is a universal equipment with manual control. In these systems, the main problem was and remains not the problem of flexibility, but the problem of automating all functions while maintaining the existing flexibility. Thus, in the development of modern shoe production systems for small-scale industrial production, a different technical and organizational approach is characteristic, which ensures the achievement of high flexibility.

– division of tasks in the production cycle between specialists, autonomous groups or independent firms in such a way that each unit can maximize the "economics of scale" and expertise gained from specialization in one area, and at the same time be able to vary the final product in quantity and form without losing overall efficiency ;

– rejection of Taylorism (reliance on skills, versatility, participation of workers in the struggle for product quality and the flow of ideas; reintegration of mental and physical work);

– decentralization of the decision-making mechanism (to reduce the alienation of workers, increase their responsibility and increase the speed of response to changing market signals);

– development of multipurpose technologies that are flexibly adaptable to various tasks and volumes;

– a culture of cooperation, the development of a negotiation process between firms and within firms as a key condition that maintains the necessary interdependence and flexibility.

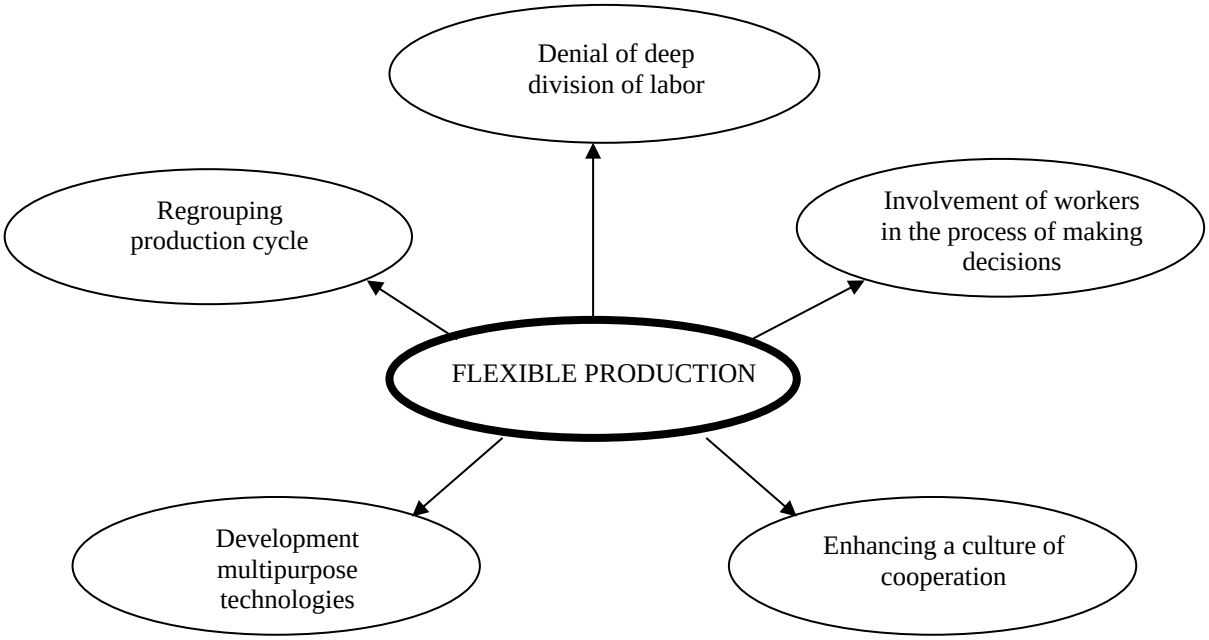

Fig. 2- Methods for ensuring production flexibility

The challenge of ensuring flexibility must be addressed not only for newly created enterprises, but mainly for existing ones. In this case, it is divided into two components: flexibility associated with the preparation of production, and flexibility associated with the functioning of the production itself, which in turn are subdivided into the flexibility of design solutions; flexibility of the technological process; flexibility of the organizational structure; information flexibility. The formation of flexible technological processes is a reaction of production to the individualization of consumer demand, and a change in production is seen as a change in the purpose of production. In turn, changing goals requires the transition of the production system to a new state.

Consider Figure 3 of regulation of a flexible system with one degree of freedom, which is equivalent to regulation of one parameter in a system with an arbitrary number of degrees of freedom, assuming complete independence of this parameter from the other. In this scheme, X (t) and Y (t) are the “production goal” variable and the “input parameter” variable with the given constraints, respectively; f (t) - external disturbance; t is time.

For example, Y (t) is the current value of the unit cost, and X (t) is the current number of model names simultaneously processed in a flexible system, each of which is characterized by a vector (labor intensity; number of workers, operating and maintenance costs; cost of basic and supporting materials). Then the

transfer function of the system for the goal Wc = dY / dX reflects the intensity of the change in the input characteristics of the system depending on the change in goals or, in other words, the dependence of the cost on the change in the components of the specified vector, which is described by a certain mathematical model. On the assumption that the process is continuous and the connections are linear or linearizable, the transfer function of an open-loop dynamic system can be used for frequency analysis of the stability of its given state.

The response of the system to external disturbances is characterized by the transfer function for external influences Wwn = dY / df. This function determines the stability or margin of stability of the system to external influences in a steady state. Thus, each steady state is characterized by indicators of dynamic quality: stability, stability margin, resistance to external influences.

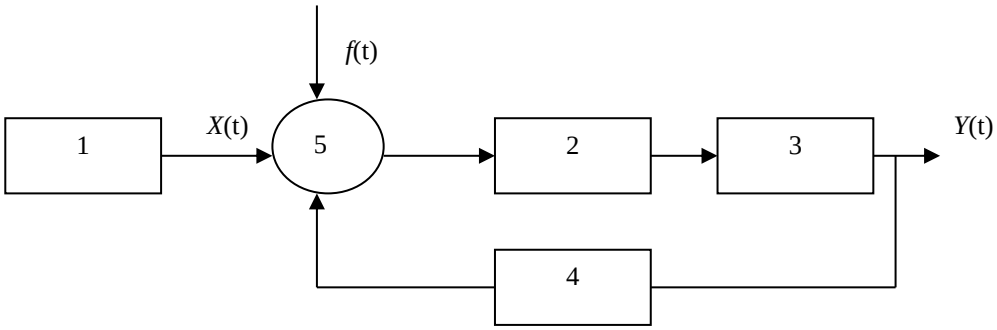

Fig. 3 - Block diagram of flexible system regulation:
1 - the formation of goals and objectives of processing; 2 - generation of options for structure, organization and action program; 3 - decision making;
4 - analysis of the accepted option; 5 - analysis of deviations

Changing the goal of production requires the system to transition to a new state. The transient process is characterized by the time, speed and accuracy of the transition. These characteristics are dynamic indicators of the flexibility of the technological system. Unlike static ones, they characterize the limiting possible changes of a particular parameter and the number of technologically distinguishable (definable, quantized) states.

In connection with the multicriteria and multiparametric nature of steady states and transient processes in the system, the transition of the system to a new state in accordance with the set goal can be considered as its exit into the range of permissible values, and not into the optimal point of the criteria space. This is due to the fact that in a real multi-criteria system, the optimal value of one of the indicators is achieved only when the other deteriorates.

Figure 4 shows a diagram of the system transition from state 1 to state 2 and the corresponding admissible areas ΔX_{one} and ΔX_2adjustable parameters. It can be seen from the diagram that the transition of their state 1 to state 2 is characterized by the transition time T, the static deviation X0, the overshoot valueδ (oscillation), as well as permissible values ΔX_{one} and ΔX_2 adjustable parameter (X2>X1). Thus, the speed of overcoming the crisis situation, which is associated with a reorientation to the production of a new range of footwear and the development of new technologies, is an indicator of the flexibility of technological and production processes.

The analysis of the dynamic transition scheme to a new state allows us to consider flexibility as a property that provides the best quality of the transition process and maintenance of the new state. From the presented dynamic model of the transition to a new state, two tasks can be formulated, the solution of which should be provided by the properties of flexibility. Firstly, this will improve the quality of the transient process (time, speed, accuracy), and secondly, ensure the maintenance of the new state. Obviously, the transition process is an adaptation to a new range of products, or, in other words, preparation of production for the transition to a new product. In turn, maintaining a new state is nothing more than adaptation to various production situations.

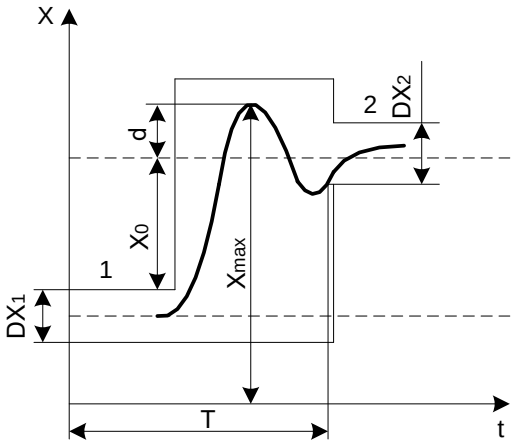

Fig. 4 - Scheme of the system transition to a new state:
***T*- transition time; X0 - static deviation; Xmax - dynamic deflection;**
δ - the amount of overshoot; ΔX_{one} and ΔX_2 - the range of admissible values of the controlled parameter in states 1 and 2; *t* - current time

Thus, flexibility allows the transition of a dynamic system of shoe production from one stable state to another in accordance with the production goal.

The greater the required deviations of the system and the higher their speed, the more complex the regulators and technical means, the higher the costs of creating and operating the system. Therefore, there is an economically rational flexibility for defining production conditions and a rational level of automation for its implementation.

In serial and large-scale production, the nomenclature of fixed models of one type of footwear is limited and the regulation system is significantly simplified; operating costs and changeover costs are split into large batches of models, resulting in an overall cost-effective production.

Consider the classification of the flexibility of the production system, taking into account the preparation and operation. YES. Nys distinguishes the following forms of flexibility: constructive, technological, parametric. (fig.4). According to this classification, the constructive form of production flexibility is realized through the configuration of the machine transport system and the control system. Technological flexibility is provided by the following components: route, operational, software types of flexibility. It is obvious that the configuration of functional systems is determined by the adopted technological process and means of technological equipment, while the concept of constructive and technological flexibility according to D.A. Nysu can be combined into a single technological flexibility.

Parametric flexibility allows you to adjust reliability, transition time to a new state, efficiency, transition accuracy, productivity. It is fundamentally nothing more than organizational flexibility. its influence on such components as reliability, transition time, productivity is determined not only by the nature of the technological process, but also to a greater extent by organizational reasons.

Yu.M. Solomentsev et al., The flexibility of a machine tool system is taken as its transition from a non-working state to a working one and adaptation to changes in various production situations, which are understood as possible equipment and tool failures, the launch of extraordinary parts for processing and other organizational features. At the same time, technological, structural and organizational flexibility stand out separately. Technological flexibility should ensure the adaptation of the system to the changing nomenclature of parts. The structural flexibility of the system should allow it to fulfill its service purpose in the event of a failure of any of the components (machine tool, CNC system, tool, etc.). In addition to reliability, structural flexibility includes the ability to transfer the functions of a failed component to another.

When analyzing the presented classifications, the general characteristics of the forms of flexibility of Yu.M. Solomentsev and D.A. Nysa Technological flexibility according to Yu.M. Solomentsev is substantively identical to those identified by D.A. Lowered constructive and technological forms, united into a single technological one. Structural and organizational form of flexibility Yu.M. Solomentseva corresponds to the parametric one according to D.A. Nysu.

M.Kh. Bleherman identifies the following types of flexibility - the flexibility of expanding the system; flexibility of the nomenclature and volume of production; system adaptability; technological flexibility. The flexibility of system expansion implies the possibility of modular expansion of the production system. The flexibility of the nomenclature and the volume of production provides for the ability to

update products and manufacture them with any launch batch. The adaptability of the system reflects the duration and cost of the transition to the manufacture of the next part name. Technological flexibility (route and operational) - the use of various options for the technological process to compensate for all kinds of deviations. All of these flexibilities are also one technological flexibility.

V.F. Gornev distinguishes between the flexibility of the basic elements of the production system; flexibility of technological equipment; structural flexibility; flexibility of the control system. The flexibility of the basic elements of the production system is ensured by the design capabilities and technical characteristics of equipment and technical controls, their full or partial interchangeability or economically effective replacement. The flexibility of technological equipment can be considered by groups of technological equipment: separately by fixtures and instrumentation. Both of these forms of flexibility are determined by the design capabilities and technical characteristics of technological equipment: equipment and technological equipment.

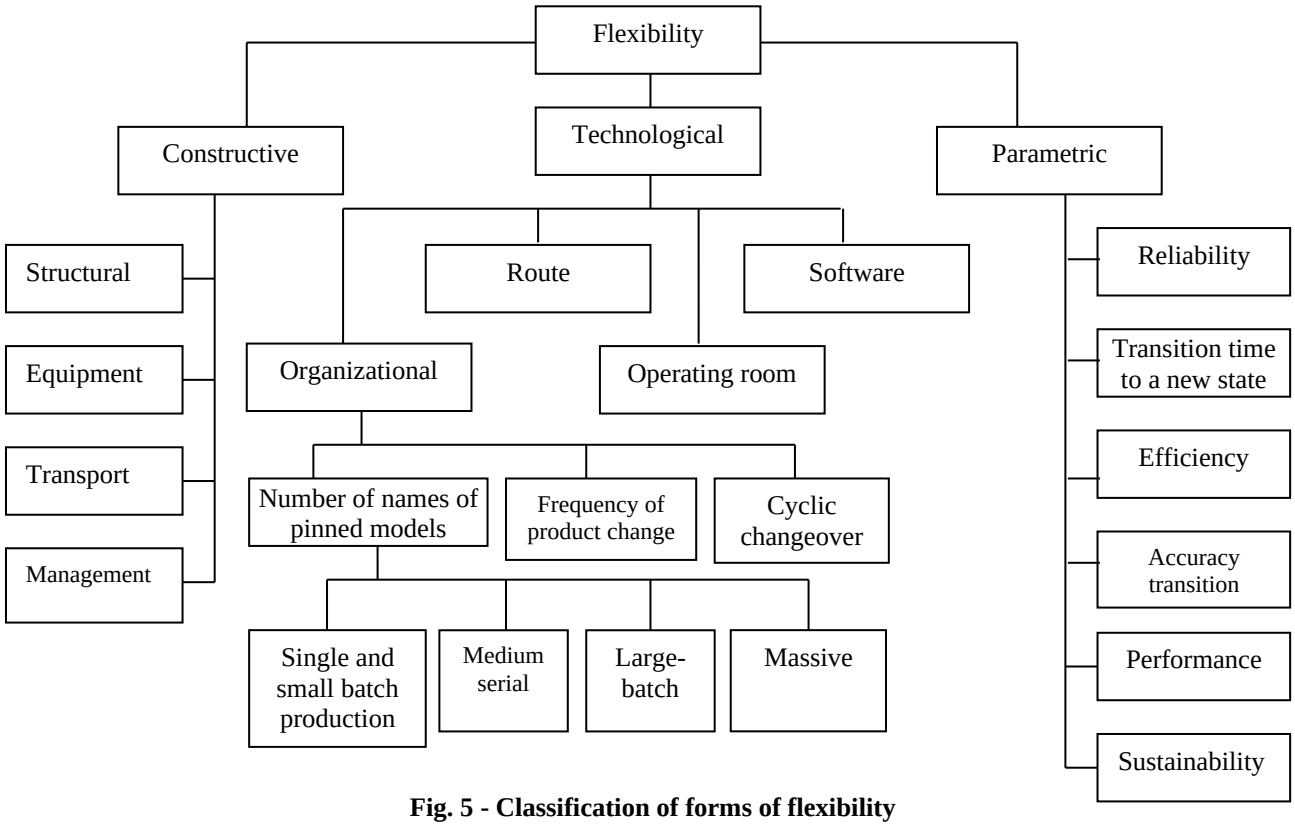

Fig. 5 - Classification of forms of flexibility

Structural flexibility is determined by the possibility of implementing different variants of technological processes within the same production system in order to optimize the process when conditions change due to the appropriate structure of the system. Flexibility of the control system, in the presence of which it is possible to jointly or separately operatively change short-term production plans relative to the projected ones, intra-module and organizational control due to the presence of unplanned technological disturbances.

Both structuring and flexibility of the management system solve organizational problems, being a generalized organizational form of flexibility.

In turn, B.V. Prykin as one of the properties of the system introduces the concept of mobility, i.e. the ability of the constituent elements of the system to move, concentrate in the necessary combinations and function rationally in specific situations, which is also a component of organizational flexibility.

On the basis of the foregoing, the structural nature of the concept of flexibility becomes obvious, it is natural that the hierarchy and content of levels in accordance with the tasks to be solved can be measured, expanded and refined. The analysis of the considered approaches makes it possible to establish that there are no fundamental differences between them.

All the proposed forms of flexibility are grouped into two main ones: technological and organizational. The diagram shown in Figure 6 reflects the influence of the reasons and tasks of adaptation of production to

the prevailing economic conditions and forms of flexibility that contribute to the implementation of these tasks on the flexibility of production as a whole.

Thus, the creation of flexible technological processes is a complex transitional process, realized through technological and organizational flexibility.

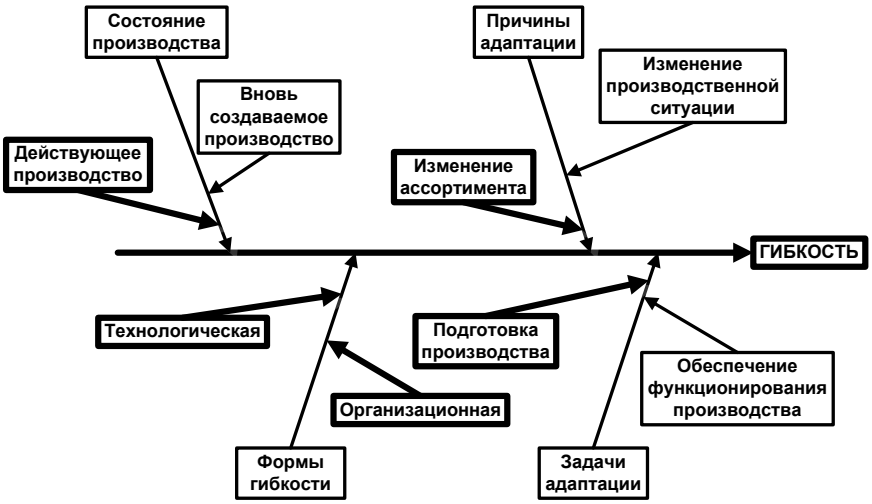

Fig. 6 -. Diagram of indicators affecting production flexibility

4.3. Process flexibility as a factor of enterprise competitiveness

It is known that the concept of competitiveness can be applied to various objects: documentation of technology, products, production, etc. from all categories of competition philosophical, social, psychological, market, economic, unconditional importance for production are market and economic, since they characterize its ability as a complex open the organizational and economic system to predict its future, to produce specific products and thereby provide a profit sufficient for the normal functioning and development.

The competitiveness of an enterprise is determined by external and internal factors. The factors of the organization's competitiveness, determined by the external environment, are elements that must be taken into account when forming the flexibility of a production system of any kind, however, in the future, only the influence of internal competitive advantages is considered.

Market and economic categories of competitiveness of enterprises and the industrial products they produce have been studied in detail in the works of M. Porter, J.-J. Lamben, W.J. Stevenson and others.

So, M. Porter singles out as innovations that allow creating a competitive advantage of production or its products, new technologies, new or changed customer requests, the emergence of a new segment of the industry, changes in government regulation, changes in the cost or availability of production components. At the same time, the changed requests of buyers, the emergence of a new segment of the industry, a change in government regulation, a change in the cost of production components are classified according to the classification of J.-J. Lamben to external factors that do not affect the costs of production itself.

Buyers' actions are manifested in completely new requests or their assessments change dramatically, which serves as an impetus for the design and release of new or modified products. The emergence of a new segment of the industry allows you to enter a new group of buyers. Changes in the cost of components, changes in government regulations, undoubtedly, are factors of external influence on production efficiency.

Then the changes in production components and new technologies identified by M. Porter should be considered as the reasons due to which internal factors of the enterprise's competitive advantage appear. Indeed, changing technology creates new opportunities for the development and production of goods. For an already operating production, replacing the entire technological process is an expensive measure, and the improvement of individual stages provides real opportunities for increasing the level of competitiveness of the enterprise. In any case, technology upgrades are almost always associated with additional costs.

W.J. Stevenson proposes to form the competitive advantages of an enterprise through price, quality, specific features of goods or services (production or service orientation), mobility (flexibility) of production, time or timing of processes (timing of certain operations). Of these factors, internal factors include price, quality, production flexibility, time and timing of processes. Product quality, production flexibility and the duration of processes are mainly

determined by the technical and organizational level of the enterprise. At the same time, there is a clear influence of flexibility on the price of products and the duration of its production cycle. Indeed, flexibility provides a quick restructuring for the release of a new range of products, which leads to a reduction in the duration and costs of its production.

R.A. Fatkhutdinovs are invited to take into account structural, resource, technical, managerial and market factors as internal factors.

Structural factors involved in the design of an organization include:

– production and organizational structure of the enterprise;

– the mission of the organization;

– specialization and concentration of production;

– accounting and regulation of production processes;

– informational and normative-methodological base of management, etc.

Resource internal factors for achieving a competitive advantage of an organization are associated with the specifics of relationships with suppliers, taking into account and analyzing all types of resources, with a functional-cost analysis of manufactured products, optimization of the efficiency of resource use, etc.

The technical factors of the organization's competitive advantages are realized through technical innovations, including: possession of patent novelty or know-how of products and technologies, an increase in the proportion of progressive technological equipment and a decrease in its average age, etc.

Administrative internal factors of the organization's competitive advantage: these are the managers themselves, the level of their qualifications, as well as the functioning of management systems, information support for decision-making, quality management in the organization, etc.

The increasingly fierce competition in the international consumer goods market poses new challenges for the shoe industry. This is the problem of the criticality of the time required for creating a product and organizing its sale, and improving the quality of design and production processes, and problems associated with competition in the maintenance market, and problems associated with direct cost reduction (direct capital; labor compensation in production and etc.).

The results of a study in the field of the state of shoe enterprises in Russia and the Southern Federal District, in particular, showed their inability to cope with the growing difficulties from the external and internal environment. Having embarked on the path of transition to market relations, shoe enterprises faced a crisis in their economic systems.

The old directions in the management of a shoe factory, emerging in the internal environment (organization of production, cost reduction, efficient use of all resources, growth in labor productivity, etc.) do not give a way out of this situation. It is necessary to develop and use new approaches in the field of economic management of the enterprise, including marketing and the development of the competitive status of the enterprise, which facilitates adaptation to the external environment.

Thus, the success of a shoe business depends on how quickly the threat to its existence is identified. This once again confirms the main conclusion based on the results of the study of the state of shoe enterprises, that their adaptation to the external environment, with the absolute importance of the internal environment, should become paramount and manifest in strategic forecasting and flexible development of the enterprise.

It is important for shoe enterprises to be able to navigate in the use of the achievements of scientific and technological progress in order to identify new trends in time, to work out the concept of developing these achievements for specific production conditions, to prepare for their implementation and ensure their implementation.

The flexibility of the enterprise is the ability of the enterprise to obtain the necessary result, which allows it, without a radical change in the basic production assets, to master within a certain period of time a regular (necessary) number of new models of footwear that can be demanded by the market and, in turn, allow in the future period to obtain the necessary result that ensures survival and enterprise development.

The structure of footwear production is quite complex and differs in a variety of assortment of raw materials and finished products. A feature of the footwear industry is the frequent change of production facilities (assortment). The design of new models of footwear provides for the development of technological processes for their manufacture. This work must be carried out in a short time and with minimal costs, and the optimal production option is selected, since at the design stage of the technological process, the intensity of the enterprise's functioning is set in advance, i.e. the possible level of technical and economic indicators of its work. At the design stage, the foundations of product quality are also laid, since its properties largely depend not only on the appearance, functionality, fashion compliance, etc., but also on the manufacturing process.

In this regard, it would be more correct to talk about the need to create a structural model of shoe production that would ensure the functioning of a flexible technological process with the obligatory implementation of the main requirement - ensuring the manufacture of shoes in an assortment that meets the needs of the market and realizes the requirements of competitiveness.

A generalized structural diagram of the flexible development of an enterprise is shown in Figure 7.

The structural model of production will be effective even if the behavior of the proposed range of products in its "life" is taken into account. all stages of the product life cycle (LLC) will be implemented:

– marketing and market research;

– design and development of technical requirements for the products being created;

– material and technical supply;

– preparation and development of technological processes;

– production;

– control, testing and inspection;

– packaging and storage;

– sale or distribution of products;

– installation, operation;

– technical assistance in maintenance (repair, etc.);

– disposal after the end of use of the product.

Fig. 7. Generalized block diagram of agile development enterprises:
G - mathematical dependence, providing a scheme for the development of flexible technological process of manufacturing a range of products;
Wob - resistance (result) to renewal in different development cycles this production;
Sob - the ability to update in different cycles of development of this production

A distinctive feature of the light industry is the short life cycle of products, since the clearly defined aspiration of people for individuality in clothing, footwear, and accessories necessitates the production of a wide range of products. This leads to frequent product model changes, reduced batch sizes, and increased launch frequency.

Organization of multi-assortment production with maximum use of the capabilities of the equipment used, labor resources and production areas and the possibility of periodic change and renewal of footwear with minimal cost and time for organizing its production are the main requirements for modern production.

In the general case, the average production time of a unit of TEP production is determined by the average time of performing operations T, the average value of the preparation for the launch of the

corresponding batch of TK, the average time of preparation for production for a given TPP model, the average number of batches of manufactured products during the life cycle B, the average batch size A. definition of TEP has the following form:

$$T_{EP} = T + TK / A + TPP / AB. (1)$$

The preparation time for the launch of a batch of technical specifications includes labor costs for the selection of materials, adjustment of equipment, planning the production of a batch of products, etc. and is calculated at a time for each batch. The production preparation time of the CCI includes: model selection, design, technological preparation, costing, pricing, production planning, which are calculated at the same time, but for the entire production program of a given model.

In the shoe industry, there is the concept of a basic model, for which the main design and technological developments are carried out, refined for working models, the so-called model features. In this regard, the concept of a conditional life cycle of the base model overlaps the life cycles of working models (Figure 8).

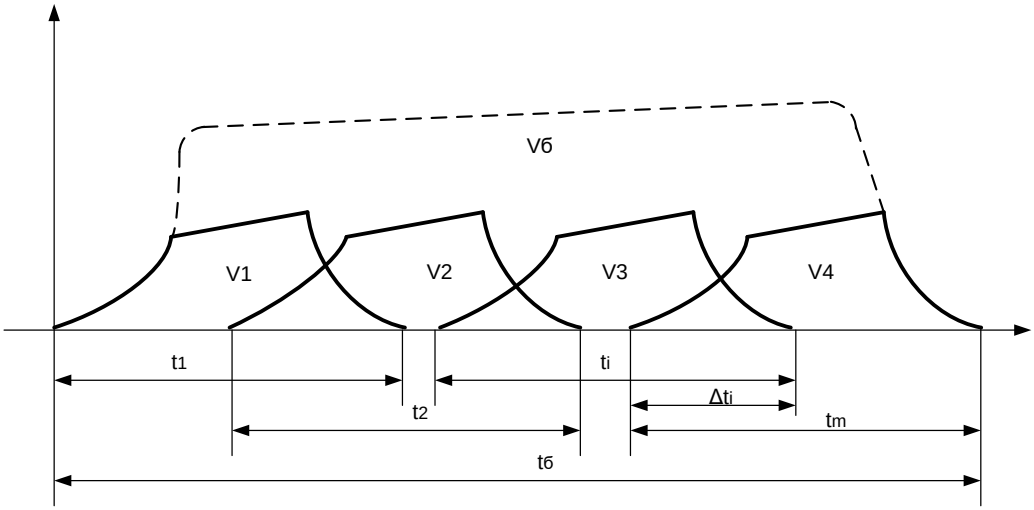

Fig. 8 - Relationship of the life cycle of the base model with life cycle of working models

It is obvious that the total volume of production of products based on the basic model V_b will be determined:

$$V_б = \sum_{i=1}^{m} V_i , \quad (2)$$

Where V_i is the production volume of the i-th working model;

m is the number of working models released on the basis of the base one.

In turn, you can write:

$$t_б = \sum_{i=1}^{m} t_i - \sum_{i=1}^{m} \Delta t_i , \quad (3)$$

Where t_b - conditional life cycle of the base model;

t_i is the life cycle of the i-th model;

Δt_i - time of alignment of life cycles of working models.

When launching n models per year based on k, the base total labor costs for the production of products will be:

$$\sum_{i=1}^{n} T_{ЕП_i} = \sum_{i=1}^{n} T_i \cdot A_i \cdot B_i + \sum_{i=1}^{n} T_{3_i} \cdot B_i + \sum_{j=1}^{k} (T_{ППб_j} + \sum_{x=1}^{l} \Delta T_{ППр_x}), (4)$$

Where $T_{ППб_j}$ - preparation time for production of the j-th basic model;

$\Delta T_{ППр_x}$ - change in the preparation time for production of the x-th worker models based on the j-th base;

l is the number of working models released based on the j-th basic.

The influence of the components of the TK and CCI on the total labor costs is determined by the level of seriality. With a small serial production, the value of total labor costs is significantly influenced by the second and third components of formula (5) for determining the average production time of a unit of TEP products. They become comparable in size to the first component, since they are one-time and are

distributed over a small number of batches and products in each batch.

In this regard, a change in the average time of the main work operations performed cannot significantly affect the total labor costs. Hence, it becomes obvious that with a small serial production level of automation and specialization of equipment, it is impossible to significantly change labor costs. This is in line with the internal structure of a small business.

In mass and large-scale production, the change of models during the year is relatively small, i.e. products are produced in large batches and for a long time. Enterprises of this type mainly produce specialized footwear with practically no product variability (for military personnel, etc.). In this case, the second and third components do not have a significant effect on the total preparation time for the launch and the production preparation time is distributed over a large number of products. The determining influence on the total labor costs is the average time of operations. Based on this, the selection of equipment and the qualification of personnel should be carried out.

The implementation of the concept of flexibility becomes possible with the rapid execution of various volumes of orders from small-scale, almost one-off, to orders with a large series, for example, with the level of medium-series production. This entails the need not so much to reduce labor costs for preparing production and preparing the launch of batches, as in reducing the time of these preparatory work. Consequently, the technological process for the production of products should be easily reconfigurable. This implies the unconditional use of quickly adjustable and sufficiently specialized and automated equipment. The qualifications of operators and maintenance personnel must be comparatively high in order to ensure high performance for everyone in different workplaces. Flexibility should be provided for restructuring not only the technological process, but also the entire staff. In this case, all three components of the average production time of a unit of production become significant and manageable.

The characteristics of the requirements for increasing the flexibility of the functioning of production in conditions of frequent changes in the assortment are shown in Figure 9.

Due to the large volume of products and the small number of manufactured models, the principles of flexibility when applied to mass and high volume production are not significant. As for small-scale and individual production, it is already flexible in terms of its internal organization. Consequently, the concept of flexibility is important for medium-scale production, in which models of a wide range are produced at sufficiently large volumes.

For the successful operation of enterprises, a high level of renewal of the range of footwear is required. The main objects of renewal are the means of labor (equipment, tools, objects of labor, basic and auxiliary materials, components), production technology, organization of production and labor, and, finally, the footwear itself. The renewal of the first three objects is directly reflected in the renewal of the shoe assortment. Socio-economic factors also play a significant role in updating the range of footwear: the level of income of the population, the degree of saturation of the market with footwear, consumer demand and fashion. Under the influence of fashion, not only the shape of the shoe, the number of parts and their arrangement changes, but also the nature and methods of processing parts and their connections, finishing, materials used, etc. Factors determining shoe renewal

The directions of renewal of the assortment of footwear are determined by various combinations of factors. So, under the influence of scientific and technical factors, the production of new shoes is possible using new technology on existing equipment using previously used or new materials, using existing technology on existing equipment using new materials, using new technology on new equipment, etc.

The production renewal is of a chain nature. So, a change in technology is usually accompanied by a complete or partial change in the design of shoes; the introduction of new equipment requires the improvement of technology, and the latter is associated with the design of the product.

The large variability of socio-economic factors of product renewal, as well as the influence of socio-economic factors, make it possible to distinguish three types of renewal of the range of products that are characteristic of shoe enterprises.

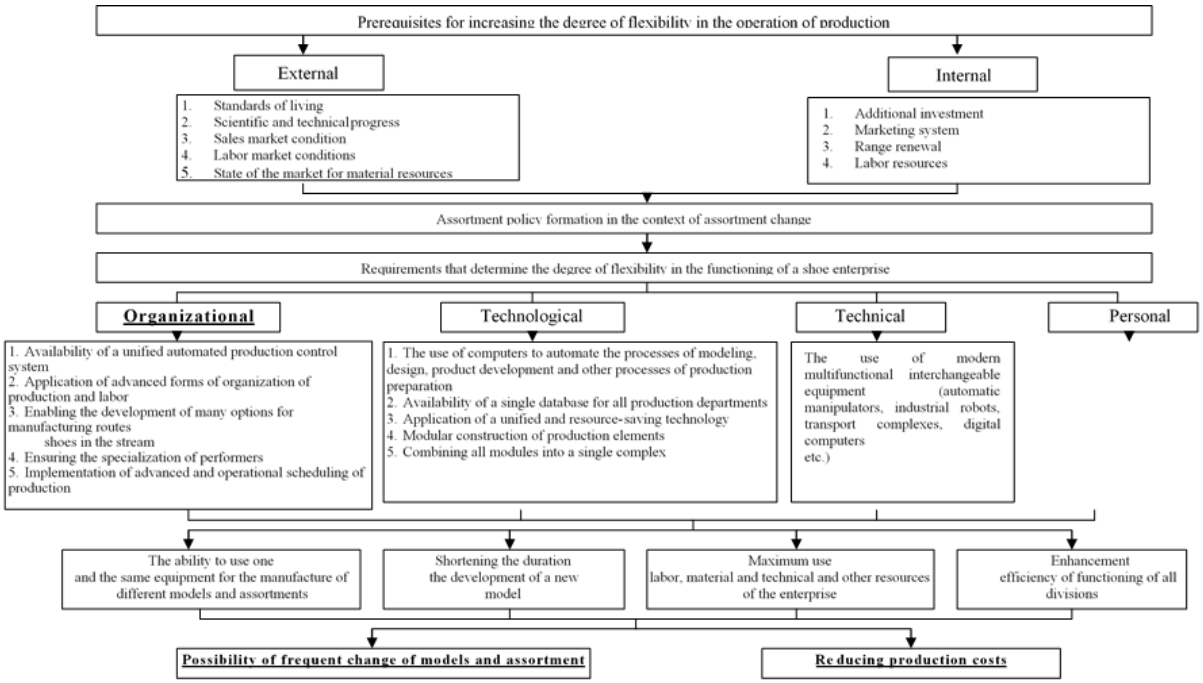

Fig. 9 - Characterization of requirements for increasing the degree of flexibility of operation production in conditions of multi-assortment production

The first type of renewal of light industry products is characterized by the introduction of products that are fundamentally new in terms of design and technology, which have not been previously produced at any enterprise and are the result of scientific research and design work. These products are distinguished by new consumer properties and technical and economic indicators, because are produced according to new technology using new materials based on nanotechnology and on new equipment using innovative technologies.

The second type of renewal of the product range is characterized by the fact that the enterprise creates modifications of previously produced products to extend the maturity phase of their life cycles.

The third type of renewal of the assortment of light industry products is characterized by the development of the production of fashionable novelties and high-quality products, fashionable structural elements, fashionable styles, new types of materials, and the release of especially elegant products in small batches. This type of renewal also includes the seasonal change of the product range. The third type of renewal of the product range is most closely related to the change in fashion, it contributes to the growth of the competitiveness of the enterprise and the formation of a positive innovative image.

Each of these types of renewal of the product range is characterized by its own complex of works, organizational features, duration of development, etc. Each type of update is also characterized by its own time intervals, within which the selected direction of the update is relevant. After a certain time, new, more progressive technological, technical and design solutions appear, therefore, the release of products based on previous solutions will lead to a decrease in the technical and aesthetic level and a deterioration in economic characteristics; such products of the enterprise will not be in demand among consumers.

To solve the problems of domestic light industry enterprises associated with updating and expanding the range of products, organizing the release of products that meet consumer requirements, research is needed in the field of managing the development process and launching a new range of products.

Product assortment management is the impact on the development processes, the formation of the composition and structure of the manufacture and sale of products in order to maximize the satisfaction of consumer demand with high technical and economic indicators of production.

The development and implementation of control actions aimed at meeting consumer demand for products must be performed within the framework of the product range management system.

If we take into account that control actions are carried out through various kinds of activities, then the subsystem of product assortment management can be understood as a set of interrelated organizational, technical and social measures for the development, formation of the composition and structure, production and sale of products in order to maximize consumer demand.

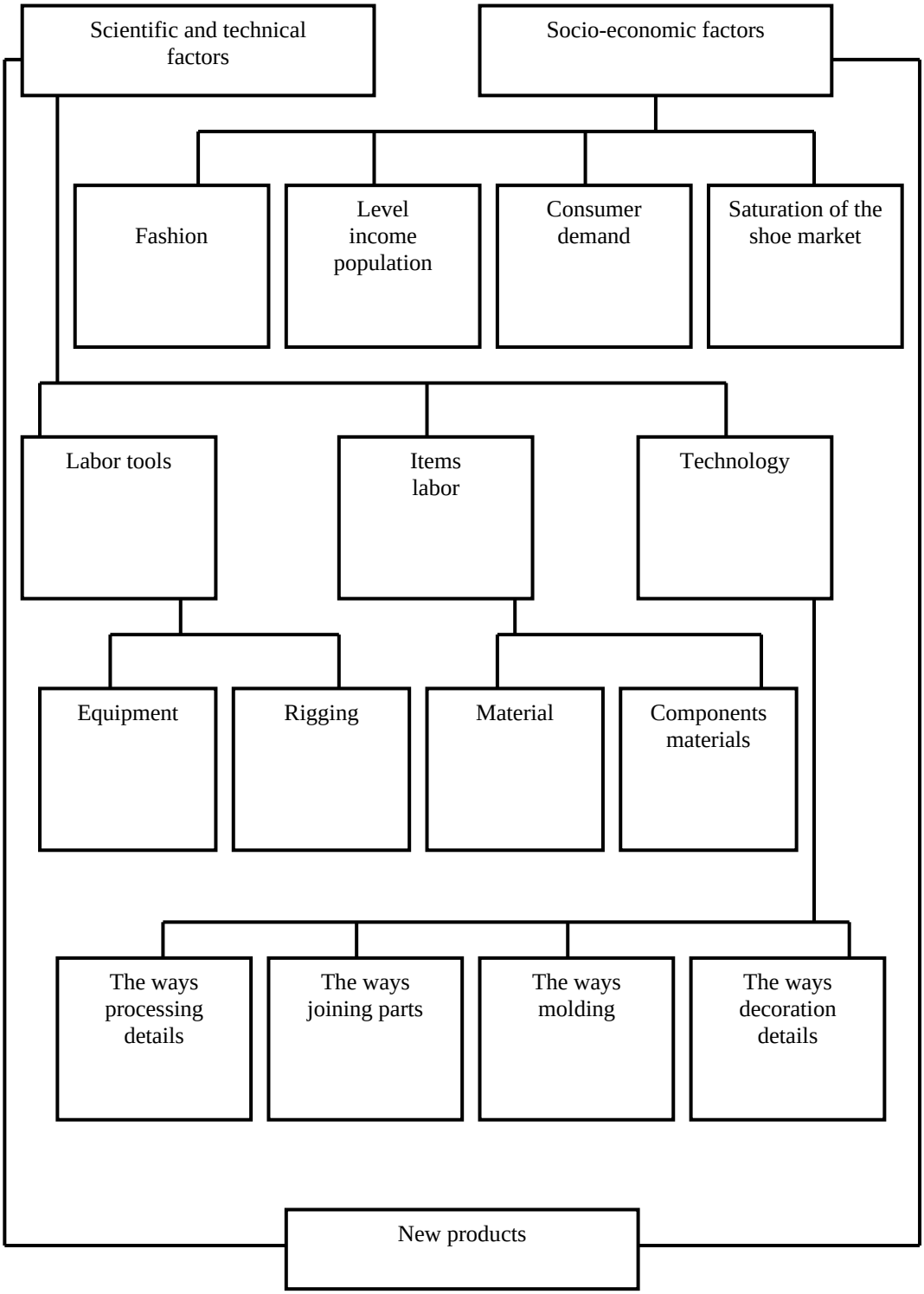

Fig. 10. Factors determining the feasibility of product renewal

Among the main functions of the product range management system are the following:

– formation of the composition and structure of products;

– organization and operational regulation of production with the aim of the fastest possible transition to new models and the development of the required production volumes;

– organization of product sales.

In addition, the system performs the functions of collecting, processing and preparing information

necessary for the implementation of basic functions. These include:

– analysis of manufactured types of products;

– analysis of the assortment policy of the main competitors;

– putting forward proposals on the feasibility of producing a new type of product and phasing out products that are not in demand;

– analysis of consumer attitudes towards new types of products.

An important criterion for the competitiveness of footwear on the market is its cost with the corresponding quality, as well as the purchasing power of the population.

The instability and dynamism of the external environment force enterprises to abandon the method of long-term planning based on the extrapolation of existing conditions, and switch to management methods based on foreseeing changes, setting objectives for the development of the enterprise.

Despite the individual nature of market research conducted by a particular shoe company, in the process of a comprehensive market study, it is necessary to perform the following independent, but interrelated and complementary research:

– filling with goods;

– market and its segmentation;

– customer behavior and consumer demand;

– analysis of the conditions of competition;

– forms of sales activities and measures to generate demand and stimulate sales.

Market research is carried out using a rich arsenal of various analytical methods, including questionnaires, various surveys, methods for analyzing patent information, methods of system dynamics, correlation-regression analysis, etc.

The main task of developing a marketing (market) strategy is to ensure sustainable commercial success of the enterprise, effective sales of products over a long period of time.

The market strategy is determined by the factors of demand, the level of competition and the general market situation and should ensure that the existing and potential benefits of the shoe company can be realized.

The availability of high-quality, competitive goods is a prerequisite for the highly efficient functioning of an enterprise. From this point of view, marketing can be viewed as a system of measures for the mutual adjustment of the product and the market in order to achieve sustainable commercial success by the enterprise.

In marketing theory, a product is a means by which a certain need can be satisfied, i.e. a set of useful properties of a thing. Thus, F. Kotler, a well-known specialist in the field of marketing, distinguishes the following components of the product, grouping them into three levels.

The first level is the fundamental characteristic of the product - its functional purpose, i.e. idea or concept of the product. A product in real performance has a number of characteristics that form the second level of product characteristics. These are such characteristics as the level of quality, specific design, brand name, packaging. And, finally, the third level is a set of additional services offered along with the product: after-sales service, a guarantee system, terms of delivery and payment for the product, accompanying documentation and the so-called "image" of the product, i.e. the image of the product and the image of the manufacturer of this product from the consumer of the product.

The solution of problems associated with the development of new products, causes, first of all, the need to clarify and clarify the economic meaning of the concept of "new products".

The art of planning a shoe assortment consists in the ability to translate existing and potential technical and material capabilities into products that bring profit to the manufacturer, have a consumer value that satisfies the buyer.

Assortment planning begins either from the moment needs are identified, or from the moment when, as a result of market research or on the basis of other information, a basic idea of the product has been formed. Regardless of the source of the idea of a new product, it is necessary to conduct market research sooner or later in order to find out whether the conceived product meets a perceived or not yet realized need.

When forming the assortment policy of footwear production, it is necessary to take into account the intra-production capabilities, which make it possible to diversify the assortment, satisfy the consumer and take into account the risk of lack of demand for the goods.

The network schedules for assortment planning, which can be developed at enterprises, allow you to determine the time from the moment the product is conceived to the beginning of its implementation in the region, with broad adherence to the sequence of stages included in the assortment planning. The duration of the entire cycle can be reduced, but subject to the attraction of additional resources and the application of additional efforts at critical stages.

Highlighting the main characteristics of a product is of fundamental importance, since it is they who determine the directions of creating the new. To make a new product, sometimes it is enough to change at least one characteristic. Here it is important to consider those characteristics of goods, the difference in which leads to differences in the marketing activities of enterprises.

The formation of an assortment policy based on product assortment planning is a continuous process that continues throughout the entire product life cycle, from the moment the idea of creating it was conceived

and ending with the withdrawal from the product program.

The creation of a new product is a complex design task associated not only with achieving the required technical level of the product, but also with giving its design such properties that ensure the maximum possible reduction in labor costs of materials and other means for its manufacture, but at the same time meet the requirements of buyers.

It should be borne in mind that all production areas are included in the work in a certain technological sequence, which depends on the technological complexity of the new product and the duration of certain operations, as a result of which a new procedure for performing operations is created. Due to the lack of production skills among workers when performing new operations, there is a decrease in labor productivity and the quality of work in the first days of production of new products, i.e. during the period of their development.

Designing a product to the proper level involves the need for criteria to evaluate its results. As such, indicators of the manufacturability of the design can act.

The development of principles and methods for performing design work, including a creative one, associated with the analysis of analogous models, the initial conditions for the formation of requirements for the product, the preparation of technical suggestions and selection of the best, assessment of the quality of the product.

Modern requirements for the organization of the process of developing new shoe models clearly show the shortcomings of methods of analysis, analysis and substantiation of decisions, inflexible and insufficiently coordinated with each other, based on the experience and intuition of the designer.

The design of footwear for various purposes is a traditional field of engineering, in which considerable development experience has been accumulated. Therefore, shoe design involves the use of previous experience, which is concentrated in recommendations for the selection of basic design solutions, descriptions of previously designed models, and typical design techniques. When analyzing analogue models, it is necessary:

– study fashion trends in the development of footwear;

– to conduct a qualitative assessment of analog models - compliance with the specific purpose of the designed model, ergonomic compliance, perfection of the compositional solution.

Obtaining high-quality designs of shoe models largely depends on the quality of the analysis of possible options for solving the design problem, establishing the feasibility of designing a new model.

Many firms are striving to improve the efficiency of their new product development mechanism, realizing that there is a complete relationship between the success of new products and the financial well-being of the enterprise.

The creation and introduction of new products into the market contains significant elements of risk. Research data show that out of 58 serious new product ideas, only four are fully developed, two are being introduced to the market, and only one is successful.

In addition, many new products fail already on the market: 40% for consumer products; 20% - for industrial goods; 18% - for various services, i.e. there is a high degree of market uncertainty.

The search for ideas about new products should be carried out systematically, and not on a case-by-case basis. The main sources of ideas for creating new products are:

1. Fundamental research (aimed at obtaining new knowledge and indirectly leading to the emergence of ideas for new products) and applied (purposefully using scientific methods to develop ideas about new products).
2. Observation of related products at exhibitions and fairs.
3. Reports and proposals of sales agents, sellers, dealers.
4. Trends in the development of new products by competing firms.
5. Supplier information.
6. Expert opinions.
7. Information in patents, catalogs, advertisements, etc.

Revealing the shortcomings of the manufactured products also allows to form new ideas for its improvement.

At the end of the development of a new product and the creation of prototypes, preparations begin for the final stage - production and sales. The most effective method by which you can assess the chances of success of a particular product is the trial (experimental) sale of small batches of a product in a controlled market in real competition. Trial sales are designed to test in practice the demand for a new product for the market and to work out the technique of its marketing. This makes it possible to reduce the risk when organizing commercial production.

The positive results of testing new products on the market are the basis for the beginning of the final stage of the process of implementing the idea into a specific new product - the stage of its production development. A detailed plan for the production of a new product is being developed: sources of supply with materials, components, equipment are being investigated, working drawings are being prepared, and products are being launched into production.

All stages of creating a new product must be carried out in a short time. Shorter development time increases competitiveness, because the cost of a new product must be recouped before it becomes obsolete and loses demand as new competing products enter the market.

Any product, regardless of the degree of its novelty and quality, goes through a certain life cycle. Knowledge of the features of the product life cycle is a prerequisite when working with an assortment.

The concept of the product life cycle can be briefly formulated as follows: any product lives - i.e. stays on the market for a limited time - maybe for many years, or maybe several months or weeks. The volume of its sales and the amount of profit made during the life cycle change, and the nature of the change for different products is similar. Over time, the indicated values first slowly increase, then they grow rapidly, then their growth slows down, their value stays at a certain level and begins to fall, at first slowly, then rapidly.

The period from the appearance of a product on the market until the end of demand for it is called the life cycle of the product. Several stages can be distinguished in it:

1 - introduction of the product to the market;

2 - growth in sales volume and profit;

3 - product maturity;

4 - decline in sales and profit.

The life cycle of a product ends with its withdrawal from production due to the lack of demand for it. The division of the life cycle curve into parts and the allocation of stages is conditional, therefore, in the special literature on marketing there are descriptions of different options, but most often these four are distinguished.

Consideration of the classical curve of the product life cycle (LCT) is quite common in domestic and foreign methodological literature. The stages of the life cycle are analyzed in detail and a forecast of the stages is proposed based on the experimental data of similar goods and their extrapolation over a short period of time. The classic life cycle curve is the relationship between the volume of sales of a product and the corresponding periods of time, reflected in the classical two-dimensional coordinate system along the x-axis, in which the current time is positively plotted, and the y-axis is the sales volume. In the standard adopted in domestic and foreign literature, the product life cycle curve is divided into a number of intervals characterizing the product (usually there are 5 of them), which are assigned the appropriate names. In most cases they are called "product origin", "market introduction".

The average life cycle of consumer goods is presented in the graph in Figure 11 and in Table 3

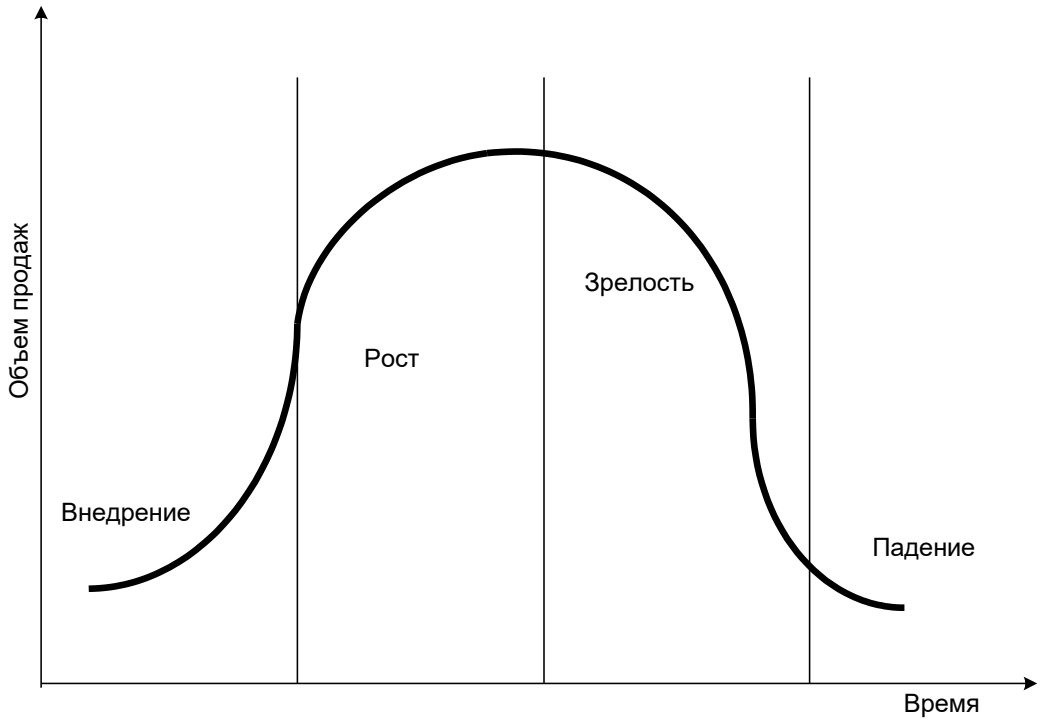

Fig. 11 - Average life cycle product range

T a b l e 3 - Average life cycle of the manufactured product range

Phase	Description of the phase from the point of view of agile development
1. Implementation	From production start to breakeven
2. Height	From the break-even point to the middle of the life cycle

3. Maturity	From the middle of the life cycle to the beginning of the development of a new product range
4. Fall	From the start of production of a new range of products to the end of production of a given range of products

The life cycle of a product in a real situation may not be expressed on the graph of the traditional classical curve, in which the periods of publication of the publication on the market, growth, maturity, saturation and decline are clearly defined. Depending on the specifics of individual goods and the characteristics of demand for them, there are various types of life cycle, differing both in duration and in the form of manifestation of individual phases.

In addition to the classical form of the product life cycle (Fig. 12), the practice of various enterprises gives examples of its specific modifications.

Effective marketing activity allows achieving high sales and profit growth even at the first stage, and in subsequent stages - maintaining a significant volume of sales (the curve called "boom"). The boom curve (Figure 13) describes a very popular product with stable sales over time. In the case of such a product life cycle curve, the firm produces the product and makes a profit for a long time.

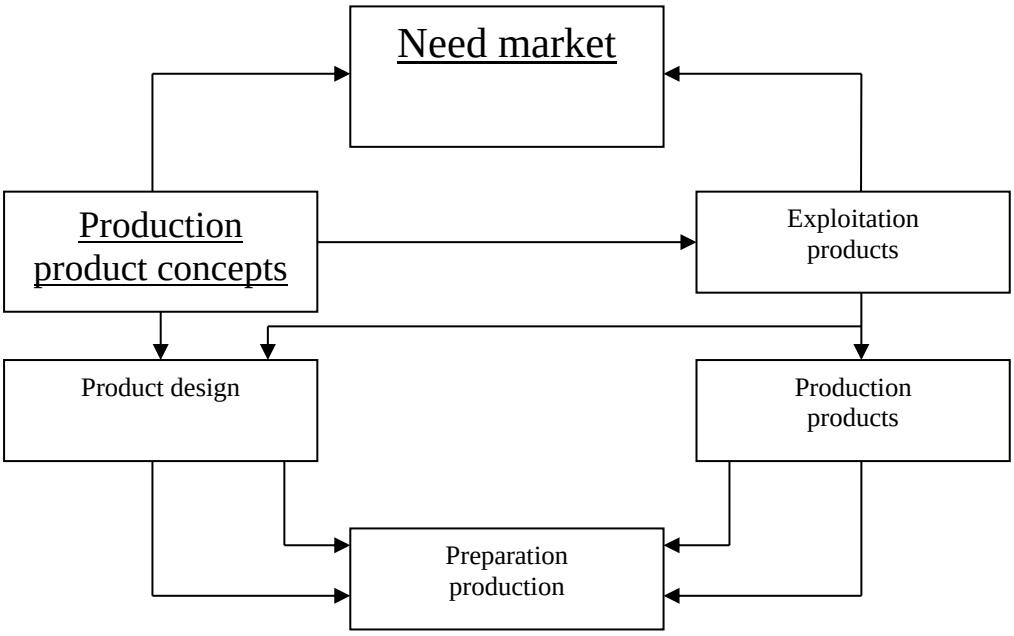

Fig. 12 - Stages in the product life cycle

The life cycle of a publication can be expressed as a “craze” curve, where sales of a publication rise sharply and then plummet.

The entrainment curve (Figure 14) describes a product with a rapid rise and fall in sales. Often a fashionable, popular product has such a curve.

“Continuous craze” implies a rapid increase in product sales, then a rapid decline, but with a residual average level of sales. The continuous entrainment curve (Fig. 15) also describes a popular product, but this product is still preferred by some consumers.

The fashion curve, or seasonal curve, refers to the life cycle of publications experiencing periodic, varying in time, repeated ups and downs in demand, etc. The curve for such a product that sells well for certain periods of time is shown in Figure 16.

The curve of a new start or nostalgia (fig. 17). The demand for this product falls, but after a while it resumes. An example would be the return to women's platform shoes that were popular in the 70s.

The dip curve (fig. 18). It characterizes a product that almost immediately ceases to be in demand from buyers.

The curve of new rises (fig. 19). Such a curve is characteristic of goods whose sales cease to grow, but after a slight improvement and the appearance of additional useful properties, the enterprise manages to increase sales again.

Unsuccessful withdrawal curve (fig. 20). Such a curve is characteristic of products that were poorly planned and carried out to be launched into the market, but with repeated attempts to introduce them, they have received great success.

In the theory of agile enterprise development, interest in the concept of the product life cycle lies in the replacement of goods in a recession phase with new ones.

Fig. 13 - Boom Curve

Fig. 14 - Entrainment curve

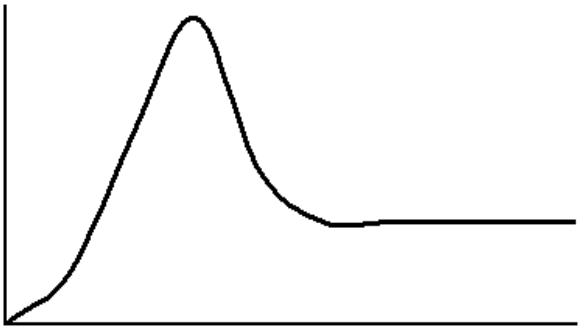

Fig. 15 - Curve long-term passion

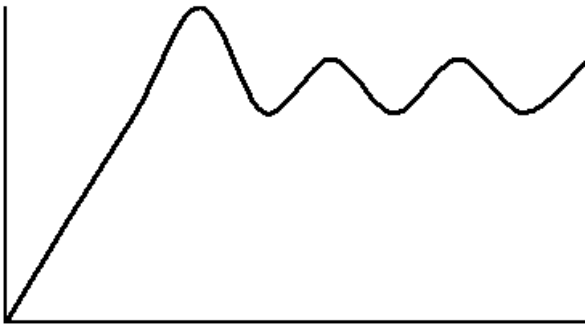

Fig. 16 - Curve seasonality

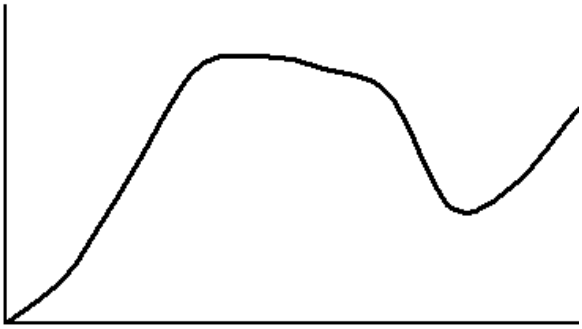

Fig. 17 - New start curve or nostalgia

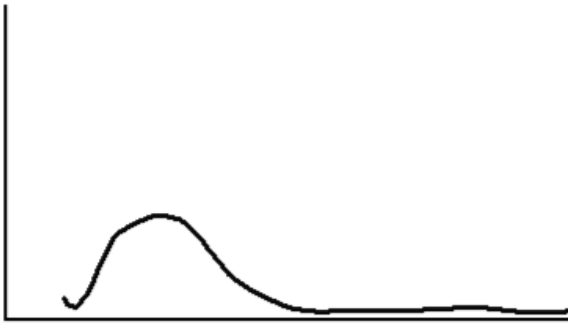

Fig. 18 - Failure Curve

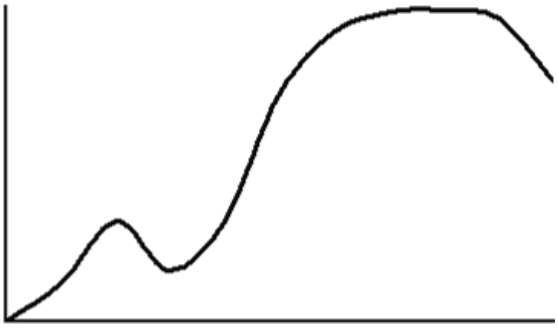

Fig. 19 - Curve of new ups

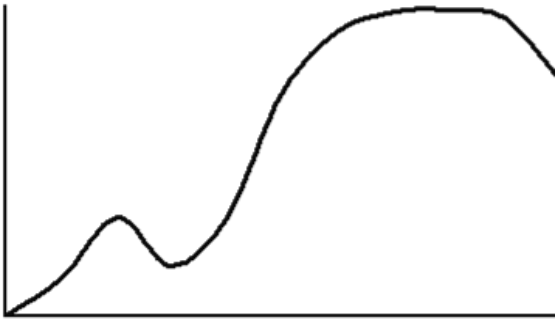

Fig. 20 - Unlucky Curve excretion

All other things being equal, a change in the production time (duration of the product life cycle) will affect the value of the optimal number of shoe models under development. At the same time, the longer the life cycle, the less the number of products needs to be developed by the enterprise and, conversely, the shorter the life cycle, the greater the number of such products.

The assessment of the phases of the life cycle allows you to plan the cyclicality of their turnover, the timeliness of replacement of products and the development of analogues, thereby reducing the degree of risk and, ultimately, allowing the flexibility of the enterprise's development.

The experience of leading foreign firms shows that the economic efficiency of their activities is largely determined by innovation activity, i.e. creation and implementation of new products that provide profit on average 28% higher than traditional ones. According to the definition given by F. Kotler, new products include products that have undergone any changes in form, content or packaging that may be important for the consumer and serve as the basis for the formation of his preferred attitude towards the products of this company. When introducing new products, firms try to find the optimal solution that meets both the market requirements and the available equipment and technology capabilities.

Thus, the study and consideration of the stages of the life cycle of products allows you to appropriately optimize the structure of the product range.

Conclusion

The quality is "written by nature" to be at all times in the epicenter of scientific and amateurish reflections. The problem of ensuring the quality of activities is not just universal, relevant, it is strategic.

The domestic light industry is going through hard times, and the consumer is offered products of dubious quality that have entered our markets by counterfeit and other illegal means, that is, they have no guarantees for buyers to exercise their rights to protect themselves from unscrupulous manufacturers and suppliers.

To reanimate the role and importance of a quality-oriented strategy, since only in this case business leaders will subjectively and objectively have to improve their production using nanotechnology, innovative processes and digital production so that competitive and import-substituting materials and products fully satisfy the needs of domestic consumers. At the same time, our statement is substantiated that the consumption of domestic materials and products is regulated by the market. In this case, market requirements should shape the role of the state and consumers in production in the formation of sustainable demand for domestic materials and products, namely:

maintain a range of goods, regulating it by federal, regional and municipal orders;

stimulate price stability; increase consumer ability and gradually improve their quality. The implementation of these tasks will create the basis for the consumer to realize the need to pay for the advantages of high-quality materials and products, and the manufacturer to realize that improving the quality of materials and products cannot be associated only with rising prices, but also due to technical innovations in digital production, aimed on the use of new technological and engineering solutions.

Today, and even more so tomorrow, it is important to implement one of the defining principles of production efficiency - the manufacturer produces exactly what is needed not only for domestic, but also for foreign consumers.

It is equally important to understand the role and significance of quality activities, that is, how much the leaders have penetrated into the essence of things, learned to manage things, change their properties (assortment), form, forcing them to serve a person without significant damage to nature, for the good and in the name of man.

Both political leaders and the government have recently begun to talk about the need for a competent industrial policy. However, if we carefully consider the normative, methodological documents on the structural restructuring of industry, then the thought arises whether we are not treading here on the same rake that all the years of reforms have come upon.

What is the essence of economic reforms and the significance of industrial policy in them, which are theoretically substantiated and practically tested by a number of developed countries?

This is the fight against inflation, strengthening the national monetary unit and financial stabilization. This is a change in the forms of ownership in various spheres of the economy through the process of privatization. This is a restructuring of the economy under the conditions of market relations.

Moreover, all these fundamental processes of economic reform must be based on structural adjustment. Both financial stabilization and privatization must be subordinate to the structural adjustment process, since it is structural restructuring that determines the final result of reforms and the effectiveness of adaptation of various forms of production to civilized market relations.

The end result should also be the basis for the restructuring of the economy. And these are products, services - their competitiveness in the domestic and world markets.

What happened in the Russian reforms? All three basic processes (financial stabilization, privatization and restructuring) went on their own, without interconnection. Therefore, the methods used by the government and the Central Bank to combat inflation

and other economic indicators often ran counter to the tasks of structural adjustment.

As for the process of restructuring, the government's position is expressed by the following statement: "the market will put everything in its place by itself." With such a position towards structural restructuring, it is not surprising that at that time there was no place for the words quality, competitiveness, import substitution in the national economic policy.

This is, unfortunately, the reality of the reforms carried out today. In this connection, I would like to refer to the well-known world experience.

A world-renowned quality specialist E. Deming, who at one time was a scientific advisor to the Japanese government and led Japan out of the economic crisis, in his book "Out of the Crisis" says: "... the management of paper money, and not a long-term digital strategy production - the way into the abyss. "

About whether the state needs to pursue industrial policy, one can quote the statement of the outstanding economist of the past, Adam Smith, who 200 years ago laid the foundations for the scientific analysis of the market economy. About the role of the state, he said: "... only it can, in the interests of the nation, limit the greed of monopolists, the adventurism of bankers and the selfishness of merchants." It's like today about us and our situation in the economy.

What are the results of economic activity today, what are the achievements in this area? Growth of gold and foreign exchange reserves, decrease in inflation, budget surplus and other financial and economic achievements. Is this the end result of public administration? And not the quantity and quality of goods and services sold in the domestic and foreign markets, and not the population's ability to pay to purchase these goods and services? And, ultimately, not the quality of life of the country's population ???

Therefore, it is quite natural that today the task is posed for all levels of the executive and legislative authorities - to improve the quality of life of Russian citizens.

Let's carry out an enlarged factor analysis of the quality of life problem. The quality of life of citizens depends on the quality of consumed goods and services in the full range - from birth to ritual services, as well as on the ability to pay of citizens, which allows them to purchase quality goods and services. These two factors (quality and solvency) depend on the state of the country's economy, which in turn depends on the efficiency of enterprises in various sectors of the economy, including light industry. The efficiency of enterprises' work depends on the state of management, on the level of application of modern management methods.

The existing world practice of widespread use of modern methods is based on standardization and certification. Standardization allows you to generalize best practices, formalize them in an accessible and understandable form and make them the property of everyone who wants to apply these best practices. Certification allows you to assess the level of implementation of the requirements of standards in practice and give an appropriate guarantee for the consumer. Currently, no more effective mechanism has been invented for the dissemination of advanced experience in solving various problems, and in the world there are corresponding international structures for standardization and certification.

An analysis of the current international standards, which are aimed at improving the level of enterprise management, shows the following areas of their action:

– quality management systems (a series of international standards ISO 9000 and industry supplements);

– environmental management systems (series of international standards ISO 14000);

– occupational safety and health systems (OHSAS 18001);

– social responsibility system (SA 8000).

The structure of the problem "quality of life" and a set of international standards aimed at solving it.

At the same time, international standards for quality management have the most significant and global character. The use of modern methods in them makes it possible to solve not only the problem of improving quality, but also the problem of economy and the problem of productivity. That is, today the concept of "quality management" is being transformed into the concept of "quality management".

Thus, solving the problem of increasing the efficiency and competitiveness of the economy, and ultimately the quality of life, is impossible without the implementation of a well-thought-out and competent industrial policy, in which innovations based on digital production and quality should become the priority areas of the state's economic policy.

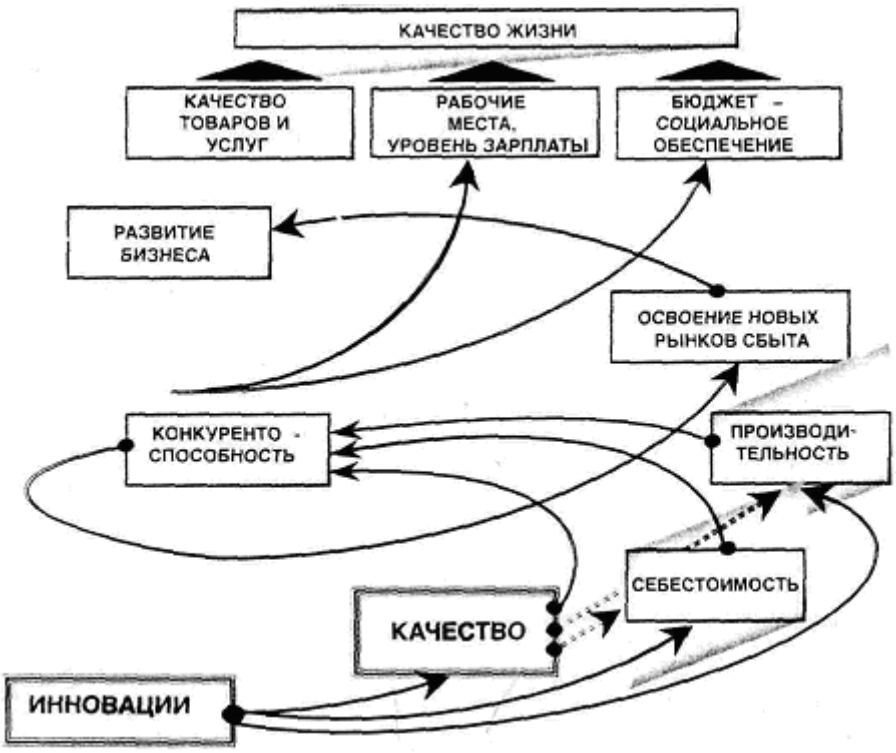

Fig. 21 - Innovation and quality - the path to high living standards

The problems of improving the quality and competitiveness of materials and products at the present stage of development of the Russian economy are becoming increasingly important. As the experience of advanced countries that at one time emerged from such crises (the United States in the 30s, Japan, Germany in the postwar period, and later South Korea and some other countries) shows, in all cases, the basis of industrial policy and recovery economy, a strategy was put in place to improve the quality and competitiveness of products, which would be able to conquer both domestic and foreign sales markets. All the other components of the reform - economic, financial, credit, administrative - were subordinated to this main goal.

The developed software for the formation of the technological process for the production of import-substituted products and the determination of specific reduced costs, which are the sum of current costs (prime cost) and capital investments, commensurate with the standard efficiency factor, taking into account the production program, makes it possible to calculate the static parameters of the technological process of production of import-substituted products when various forms of organization of production.The developed software for calculating cash flows from the operating activities of light industry enterprises based on assessing the degree of implementation and dynamics of production and sales of products, determining the influence of factors on the change in the value of these indicators, identifying on-farm reserves and developing measures for their development, which are aimed at accelerating turnover production and reduction of losses, which guarantees light industry enterprises to obtain stable TPE and prevents them from bankruptcy.

Models of product sales within a month at 100%, 80%, 50% are proposed. Calculations indicate that with 100% of the sale of shoes, compensation is provided for the costs not only for the production and sale of shoes, but also a net profit of 1,900.54 thousand rubles remains, which indicates the effective operation of the enterprise, as well as the correct marketing assortment. enterprise policy. Also, profit is obtained from the sale of 80% of men's, women's and children's shoes. If less than 50% of footwear is sold from the production volume, the enterprise will incur losses. To solve this problem, the conditions for the sale of shoes in a specified period of time and the volume of sales of at least 50% are necessary.

Based on the current situation in the economy of our country, in our opinion, no less significant problem in the development of the regional consumer market is the lack of a full-fledged regulatory framework that ensures the functioning of the mechanism of state regulation of the consumer market in the regions. Based on this, it is the state and regional intervention that should correct the situation on the market of domestic products of light industry enterprises in the regions, and thus there will be an opportunity for the development of production of competitive and import-substituting products.

The implementation of the planned measures will lead to covering the deficit for all types of

products, will ensure an increase in labor mobility in the Southern Federal District and the North Caucasus Federal District and reduce negative processes in the labor market, as well as a stable balance of interests of consumers, employers and municipal, regional and federal branches of government. For the successful implementation of all of the above measures, the interest of the regional authorities in the development of production of competitive and import-substituting products, reduction in prices for components and energy costs and benefits for the transportation of products produced by enterprises in the regions of the Southern Federal District and the North Caucasus Federal District is most necessary.

Therefore, only a stake on innovation, quality, and competitiveness of products and services should be the basis of the industrial policy pursued at all levels yesterday, today, and even more so tomorrow.

About the economic effect of work results is limiting, which consists in increasing labor productivity, the level of mechanization of production, lowering the indicators of work in progress and the cost of digital production. An accessible tool for digital production technologists is proposed to rationalize the design of technological processes, which allows an enterprise to form a competitive assortment and predict the maximum income from the production of import-substituting products.

An assortment policy has been developed for the formation of competitive products, taking into account factors affecting consumer demand: compliance with the main fashion trends, taking into account the economic, social and climatic characteristics of the regions of the Southern Federal District and the North Caucasus Federal District, the production of which using modern innovative technological processes, as well as to meet the demand of an elite consumer, with the use of manual labor create the basis for satisfying the demand for footwear for buyers in these regions.

Innovative technological processes have been developed for the production of import-substituting products using modern technological equipment with advanced nanotechnologies, which form the basis for reducing the costs of import-substituting products and ensuring their competitiveness with the products of leading foreign companies, with the possibility of a wide-range production of products not only by type, but also by sex and age. groups, which guarantees her demand in full.

The layouts of technological equipment are proposed, on the basis of which it is possible to form a technological process for the production of import-substituting products with an optimal volume of output, taking into account the production area and the form of organization of digital production.

Software has been developed for calculating cash flows from the operating activities of light industry enterprises based on assessing the degree of implementation and dynamics of production and sales of products, determining the influence of factors on the change in the value of these indicators, identifying on-farm reserves and developing measures for their development, which are aimed at accelerating turnover production and reduction of losses, which guarantees enterprises to obtain stable TEP and prevents them from bankruptcy.

Software has been developed for the formation of the technological process of digital production and the determination of the cost of production of import-substituting products. A computer simulation model has been implemented that describes the dynamics of the process of manufacturing import-substituting products. The proposed methodology and software implemented on this basis can reduce the duration of technological preparation of production and increase, due to the rationalization of the technological process, the specific consumer effect of import-substituted products.

Comprehensive indicators of the effectiveness of innovative technological processes for the manufacture of footwear, similar to other types of import-substituting products, have been calculated. Taking into account the production program, promising options for technology and equipment have been formed, the most effective has been selected; the possibilities of streamlining the flow are revealed, allowing to exclude "bottlenecks", to minimize equipment downtime, which is one of the conditions for the design of innovative technological processes. The reliability of the calculations for assessing the efficiency of technological processes by methods of target programming for various technological and organizational solutions is confirmed by calculations of indicators of economic efficiency: cost, profit and profitability and other indicators.

The proposed methodology allows to reduce the duration of technological preparation of digital production and to reduce the time of expert work while maintaining the required depth and validity of engineering conclusions. The economic effect of the research is expressed in the intellectualization of the technologist's labor with a reduction in time spent on developing the range of manufactured import-substituting products and assessing the efficiency of technological processes in comparison with a typical economic calculation of the total cost of manufacturing such products.

The analysis of the influence of the forms of organization of digital production and manufacturing technology on the cost of import-substituting products is carried out using the example of the technological process of manufacturing children's, women's and men's shoes, taking into account the shift program. Theoretical dependencies have been obtained to assess the influence of the factor "organization of production" on individual calculation items as a whole

and other technical and economic indicators in order to prevent enterprises from bankruptcy.

Thus, all this together will provide light industry enterprises in the regions of the Southern Federal District and the North Caucasus Federal District with a stable position both in the domestic and in the markets of the near and far abroad. All that is needed is the goodwill and interest of all participants in this process.

References:

1. (2021). *Methodological and socio-cultural aspects of the formation of an effective economic policy for the production of high-quality and affordable products in the domestic and international markets:* monograph / O. A. Golubev [and others]; with the participation and under the general. ed. can. philosopher. Sciences, prof. Mishina Yu.D., Dr. Sciences, prof. V.T. Prokhorov; Institute of the Service Sector and Entrepreneurship (branch) of the Don State Technical University. - Novocherkassk: Lik.
2. (2020). *Features of quality management; manufacturing of import-substituting products at enterprises in the regions of the Southern Federal District and the North Caucasus Federal District using innovative technologies based on digital production*: monograph / O. A. Golubev [and others]; with the participation and under the general. ed. Dr. tech. Sciences, prof. V.T. Prokhorov; Institute of the Service Sector and Entrepreneurship (branch) of the Don State Technical University. - Novocherkassk: Lik.
3. (2009). *Quality management of competitive and demanded materials and products*: monograph / Mishin Yu.D. and etc.; under total. ed. V.T. Prokhorov. (p.443). Mines: GOU VPO "YURGUES".
4. (2009). *How to ensure a steady demand for domestic products of the fashion industry*: monograph / V.T. Prokhorov and others; under total. ed. V.T. Prokhorov. (p.494). Mines: GOU VPO "YURGUES".
5. (2008). *Quality management of competitive and demanded materials and products*: Monograph / Yu.D. Mishin [and others]; under the general editorship of Doctor of Technical Sciences, prof. V.T. Prokhorov. (p.654). Mines: Publishing house of GOU VPO "YURGUES".
6. (2012). *Production management of competitive and demanded products*: / V.T. Prokhorov [and others]; under total. ed. Doctor of Technical Sciences, prof. V.T. Prokhorov; FSBEI HPE "YURGUES". (p.280). Novocherkassk: YURSTU (NPI).
7. (2012). *Restructuring of enterprises - as one of the most effective forms of increasing the competitiveness of enterprises in markets with unstable demand*: monograph / N.M. Balandyuk [and others]; under total. ed. Doctor of Technical Sciences, prof. V.T. Prokhorov. FSBEI VPO Yuzhno-Ros. state University of Economics and Service". (p.347). Mines: FGBOU VPO "YURGUES".
8. (2014). *Quality revolution: through advertising quality or through real quality*: monograph by V.T. Prokhorov [and others]; under total. ed. Doctor of Technical Sciences, prof. V.T. Prokhorov; ISOiP (branch) DSTU. (p.384). Novocherkassk: YRSPU (NPI).
9. (2015). *Advertising as a tool for promoting the philosophy of the quality of production of competitive products* / Kompanchenko EV, [and others]; under total. ed. Doctor of Technical Sciences, prof. V.T. Prokhorov; Institute of the Service Sector and Entrepreneurship (branch) of the Don State Technical University of Shakhty: ISO and P (branch) of the DSTU, p. 623.
10. (2015). *Assortment and assortment policy:* monograph / V.T. Prokhorov, T.M. Osina, E.V. Kompanchenko [and others]; under total. ed. Dr. tech. Sciences, prof. V.T. Prokhorov; Institute of the service sector and entrepreneurship (fil.) Feder. state budget. educated. institutions of higher. prof. education "Donskoy state. tech. un-t "in the city of Shakhty Rost. region (ISOiP (branch) DSTU). (p.503). Novocherkassk: YRSPU (NPI).
11. (2017). *The concept of import substitution of light industry products: preconditions, tasks, innovations:* monograph / VT Prokhorov [and others]; under total. ed. Doctor of Engineering Sciences, prof. V.T. Prokhorov; Institute of the Service Sector and Entrepreneurship (branch) of the Don State Technical University. (p.334). Novocherkassk: Lik.
12. (2018). *The competitiveness of the enterprise and the competitiveness of products is the key to successful import substitution of goods demanded by consumers in the regions of the Southern Federal District and the North*

Caucasus Federal District: collective monograph / VT Prokhorov [and others]; under total. ed. Dr. tech. Sciences, prof. V.T. Prokhorov; Institute of the Service Sector and Entrepreneurship (branch) of the Don State Technical University. (p.337). Novocherkassk: Lik.

13. (2018). *Management of the real quality of products and not advertising through the motivation of the behavior of the leader of the collective of a light industry enterprise*: monograph / O.A. Surovtseva [and others]; under total. ed. Dr. tech. Sciences, prof. V.T. Prokhorov; Institute of the Service Sector and Entrepreneurship (branch) of the Don State Technical University. (p.384). Novocherkassk: YRSPU (NPI).
14. (2019). *The quality management system is the basis of technical regulation for the production of import-substituting products*: monograph / A.V. Golovko [and others]; under total. ed. Dr. tech. Sciences, prof. V.T. Prokhorov; Institute of the Service Sector and Entrepreneurship (branch) of the Don State Technical University. (p.326). Novocherkassk: YRSPU (NPI).
15. (2019). *On the possibilities of regulatory documentation developed within the framework of the quality management system (QMS) for digital production of defect-free import-substituting products*: monograph / A.V. Golovko [and others]; under total. ed. Dr. tech. Sciences, prof. V.T. Prokhorov; Institute of the Service Sector and Entrepreneurship (branch) of the Don State Technical University. (p.227). Novocherkassk: Lik.

Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 9.035	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2021 **Issue:** 06 **Volume:** 98

Published: 02.06.2021 **http://T-Science.org**

QR – Issue QR – Article

Saida Ubaydullayevna Sultankhodjayeva
Tashkent State University of Oriental Studies
Lecturer
saiibo@bk.ru

Husniddin Ibrohim o'g'li Inomiddinov
Tashkent State University of Oriental Studies
Lecturer

THE SHADES OF MEANING OF PHRASEOLOGIC UNITS USED IN LITERATURE

Abstract: *This article is dedicated to the study of polysemanticism of phraseological units in Persian literature, which are expressed in variety of stylistic shades of meaning, namely – in expressivity, emotionality and associative figurativeness. Special attention is given to the analysis of usage of phraseological units in literature. Furthermore, main semantic meanings and translations of phraseological units, which serve for expressiveness of the language, were identified.*

Key words: *phraseological, stylistic, shades of meaning, expressivity, emotionality, associative, figurativeness, analysis, semantic.*

Language: *English*

Citation: Sultankhodjayeva, S. U., & Inomiddinov, H. I. (2021). The shades of meaning of phraseologic units used in literature. *ISJ Theoretical & Applied Science, 06 (98),* 55-58.

Soi: http://s-o-i.org/1.1/TAS-06-98-7 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2021.06.98.7

Scopus ASCC: *1203.*

Introduction

Phraseological units in Persian are semantically diverse. During the development of language, many phraseological units (FUs) had new - two or more semantic edges apart from their lexical meaning.

The lexical meaning of FUs means their initial lexical meaning reflected in dictionaries, while the semantic aspects of FUs are understood as the addition of lexical meanings to works of art, the formation of new meanings. According to B. Yuldashev, about one-fifth of phrases in the Uzbek language have two or more meanings, and it is incorrect to define their semantic aspects only based on dictionaries, the dictionaries do not fully reveal the polysemantic features of many FUs (18). The Persian-Russian dictionaries of Yu. Rubinchik and the Russian-Persian dictionaries of L. Voskanyan contain only the lexical meanings of words and FUs (15;17). Also, in Ali Akbar Dehhudo's " لغتنامه دهخدا " [Logatnāme-ye Dehxodā] and Muhammad Muin's "فرهنگ فارسی" [Farhang-e farsi] dictionaries published in Iran, words, and comments of FUs are given, especially in the classical period. it is possible to say that it is illustrated with examples (5; 11).

The main part.

The semantic aspects of all FUs in Persian are not reflected in the same way, while in some FUs only one semantic meaning is understood, while in others we can observe the product of specific expressive, emotional, associative-figurative semantic edges due to stylistic dyes. Because most FUs have additional colors - semantic edges, and most of them serve certain stylistic purposes, especially the expression of expressive-emotional shades (1, p.39). Expressive, emotional dyes are understood from the meaning of additional dyes loaded on FUs, are fully realized in the text, and lead to the further enrichment of the content of the text, gaining new meanings. In our article, we will focus on the expressive, emotional, associative-figurative aspects of Persian FUs used in works of art. In this case, it is assumed that the semantic aspects of

Persian phraseology are taken out of the text and the cases of its use in the text are taken into account.

1. Expressive meaning edge FUs. The semantic interpretation of phraseologies is manifested in the expression of affective, reinforcing semantics. The following examples of works of art that we are analyzing allow us to reveal several semantic aspects of FUs and to define their methodological color: Including [barγ az češm-e kasi paridan] برق از چشم کسی پریدن literally - the word "sparkle in someone's eye" means "burning eyes", "sparkling eyes". From the piece of art, you can see its expressive meaning:

... وقتی این قسمت نامه را خواند نگاهی به پدرش انداخت و دید که برقی از چشمش پرید (2).

…as he read this part of the letter, he looked at his father and saw fire in his eyes.

The meanings of FU, such as "sparkle in the eyes", that is, "sparkle in the eyes" further increase its expressiveness and effectiveness concerning the lexical meanings. FU represents a person's mental state.

Interestingly, this phraseology is also used in the sense of "fainting and fainting", "blurred vision and fainting":

نمی دانم چه توی سرم زدند. *برق از چشمم پرید*. وقتی که چشمم را واز کردم، توی کلانتری خوابیده بودم (7, p. 109)

I don't know what hit me in the head. *My eyes widened and I fainted.* I was in the police station when I opened my eyes.

According to the translation in the passage, FU reflects a person's physical condition, and for this reason, it is not translated as "fire in his eyes, sparks in his eyes" but as "his eyes were blinded by the blow and he fainted." Hence, two states can be distinguished from FUs: a) a mental state caused by an external influence and b) a state caused by a physical shock. Of course, such cases are reflected in the new meaning aspects of FU and change the translation of FU. Also, the "spark, fire" in the eye - means a "very" increase in emotion, expressiveness.

It should be noted that the expression of expressiveness in the semantic structure is also different, in some FUs the expression of excess meaning is used, in others it is used passively:

نخود همه آش [noxod-e hame āš] literally: the phraseology "pea of all soups" can be translated as "chatterbox", "pale man":

حراف، سرزباندار، پررو و نخودهمه آش بود...(7, p. 59)

It was talkative, chatterbox and arrogant.

FU's next phrase is "a man who blows his nose at everything":

چه فضولیها! کسی با تو حرف نمی زد. مثل *نخود همه آش* خودت *را قاطی هر حرفی می کنی!* (7)

What arrogance! No one is talking to you. You stick your nose in every word like a lizard!

This FU is used for very vague, all-encompassing, extremely arrogant people, with an emphasis on the ultimate person.

It also represents a negative meaning in a sentence: خودرا قاطی هر چیزی کردن [xodrā γāti-ye har čizi kardan] نخود همه آش means "pale man".

When used in conjunction with a negative FU, it results in a very negative meaning - "a squeamish person who sticks his nose in everything". That is, the negative color of the FUs increases, and a very expressive-negative meaning is formed. It seems that the higher the level of meaning expressed in FUs, the greater the expressiveness.

2. Emotionally meaningful FUs. One of the characteristics of this type of FU is related to the expression of positive and negative relationships. Human emotions - joy, sorrow, fear, surprise, joy, gladness are all based on emotional feelings.

1) دل کسی سوختن [del-e kasi suxtan] means "to burn hear" and 2) قربان و صدقه کسی رفتن [qorbān-o sadaqe-ye kasi raftan] is translated word by word, it means: "to bag, to take care of, to ask":

این قدر *قربان و صدقه ام رفت* که نگو. من هم *دلم سوخت*، بالاخره سوار ماشینم شدم (6, p.88) .

He was so kind that no one asked. I was sad too. I finally got in my car.

In the following passages, we can cite the second aspect of the above FUs - feelings of anger, love:

1.دل کسی سوختن [del-e kasi suxtan] means "to be angry", "to burn":

من می دانم *دل تو* از کجا *می سوزد*. تو می خواستی زیر پای عیال من بنشینی، من بو بردم، دیگر نگذاشتم بیاید. دل پری تو از من برای همین است (12, p.60).

I know what you're burning. You tried to get my wife out of the way. I found out, I didn't let anyone else come here. So is your wrath against me;

Hence, دل کسی سوختن FU means both "to be pity" and "to be angry", they both are negative emotional aspects.

2.قربان و صدقه کسی رفتن [qorbān-o sadaqe-ye kasi raftan] gets the meaning of "to care for", "to love so much":

دیروز... یک جوان بیست ساله... افتاده بود دنبالم... هرچه بالا و پایین رفتم یارو هم دنبالم آمد. این قدر قربان صدقه ام رفت که نگو (6, p.81.).

Yesterday ... a twenty-year-old man ... he wouldn't stay behind me ... no matter how high I went up and down, he wouldn't stay down. *He would never leave me alone.*

In addition to the positive قربان و صدقه کسی رفتن emotional meanings of "kindness" and "begging," the phraseology also serves to express strong emotional feelings, such as "not letting go (for example, of love)", "loving someone too much".

Similarly, the expressive-emotional aspects of meaning in Persian have a special place among the phraseologies of FUs, which represent the urge, i.e. modality. Depending on the situation, they reflect positive and negative emotional relationships such as praise, compliment, service, joy, rejoicing, pleasure, hatred, rebuke, sarcasm, cursing. Of course, in FUs

that represent modality, in addition to emotionality, the aspects of expressive meaning are also important:

به پای هم پیر شوید[be pā-ye ham pir šavid] "Get old together!", قدمتان رویچش[γadam-etān ru-ye češm] "Welcome!", دست راست شما زیر سر من باشد [dast-e rāst-e šomā zir-e sar-e man bāšad] "Let us walk like you", "give me your happiness", ", دور از چش [dur az češm] "go away", لایق ریشت [lāyeq-e rišat] "wrong doing-seeking", "This is your punishment" (15).

As mentioned earlier, the majority of emotionally meaningful FBs have more than one semantic edge because they represent different situations, negative, positive feelings of people. Based on this, the semantic aspects of FUs differ according to their application in works of art. At the same time, it should be noted that FUs, which represent modality, is also based on sensitivity, that is, expressive-emotional feelings.

3. Semantic aspects of FUs formed based on associative-images. Image can be a key factor for FU formation. The process of comparing an event to a situation creates a basis for FUs to acquire new meanings:

آب سردی روی کسی ریختن [āb-e sardi ruye kasi rixtan] means "to pour cold water over the head".

مثل اینکه *آب سردی روی من ریختند*... خیال کردم از این مهمانخانه بروم بانجاییکه پدرم منزل دارد (2).

It was as if cold water was pouring down my head… I wondered if I should leave this hotel and go to the place where my father was staying.

The semantic aspects of FUs formed based on an associative image are based on expressive-emotional states, i.e., "taking cold water from the head or overturning a bucket of cold water" and imagining and describing the human condition "as if falling from the roof".

Also, FU, formed based on an associative image, can not only be a figurative expression of a particular event, but also represent a state or define an emotional, expressive state:

سر خودرا زمین گذاشتن[sar-e xodrā zamin gozāštan] means "to have a rest" , "to lie down ".

ان شاالله یک وقت دیگر می آیم. حالا حال ندارم، می خواهم یک دقیقه *سرم را بگذارم زمین* (10, p.114-115) .

God forbid sooner or later ... if your husband dies, you will not depend on anyone, you will be free.

1. پس فردا خدا نکرده،... شوهرت *سرش را بگذارد زمین* دستت به هیچ جا بند نیست (4, p.14).

It is worth noting that associative-figurative FUs are to some extent related to their structural meaning. From the examples we have analyzed - "pouring cold water from the head - as if falling from the roof", *"lying down - dying"* - new aspects of the meaning of FU are understood, which are relatively related to their original meaning.

Let us consider another example analysis. In Persian, "to grieve", "to grieve"; "Thirst" is FU used in two senses:

جگر کسی آتش گرفتن[jegar-e kasi ātaš gereftan] means "to burn someone's liver".

1. بیچاره را رنگش را که دیدم *جگرم واسهاشآتش گرفت* (16, p.561).

Seeing the poor man's color, *I felt very sorry for him.*

In FU, the state of burning, grief is given on the basis of the image of "burning of the liver" (literally).

The next FU describes the image of "burning of the liver" (literally) when very thirsty:

2. جگر عروس *آتش گرفت*. گفت: خاله، مردم از عطش، آب به من برسان (9) .

The bride was very thirsty. He said he would bring water to his aunt, otherwise he would die now.

Conclusion

This means that FUs are realized more in a work of art - the semantic aspects of FU, new aspects of meaning, and expressive, emotional, associative images are manifested through the work of art. It should be noted that, according to its use in works of art and the collected examples, expressive and emotional FUs occur in more than one sense than associative figurative phraseologies. In our article, FUs were semantically explored and the following conclusions were drawn:

1. FUs are realized in the process of speech;

2. Although the lexical structure of FUs is the same, it is observed that they acquire different semantic aspects;

3. Expressive, emotional colors are understood from the meaning of additional colors loaded on FUs, are fully realized in the text, and lead to the further enrichment of the content of the text, the acquisition of new meanings;

4. Expressive, emotional meaning in FU is formed by various means - in the expression of emotions, in modal relationships, in associative images.

References:

1. Abdullaev, A. (1983). *Expression of expressiveness in Uzbek language*. Tashkent.

2. Alavi, B. (1357). *Chamedon*. Tehran.

3. Arsenteva, E.F. (1989). *Sopostavitelnyy analysis frazeologicheskix edinits*. (pp.37-39). Kazan.
4. Bahromi, M. (1358). *Shefoxoneye Oyene*. Tehran.
5. Dekhxoda, A. (1373). *Loghatnomye Dekhxoda*. Tehran.
6. Hasan, A. (13). *Daxil bar panjareye fulod*. Tehran.
7. Hedoyat, S. (1952). *Do doston matne farsi va tarjomeye faronse az Venson Monti*. Tehran.
8. (n.d.). *Iranian stories. A set of translations*. 142 p.
9. Mehdi, F. (1349). Tehran: Amir Kabir.
10. Mirsodeqi, J. (1350). *In Shekasteho*. Tehran: Zar.
11. Moin, M. (1371). *Farhange Farsi*. Tehran: Amir Kabir.
12. Najafiy, A. (1387). *Farhange forsiye amiyone*. Tehran: Nulufar.
13. Nushun, A. (1326). *Xoruse Saxar*. Tehran: Zamineye majalleye mardom.
14. Pahlavon, A. (1353). *Tashrifot*. Tehran.
15. Rubinchik, Yu.A. (1981). *Osnovy frazeologii persidskogo yazyka*. (p.276). Moscow: Nauka.
16. Shahri, J. (1357). *Shokre talx*. Tehran.
17. Voskanyan, G. (1986). *Russian-Persian dictionary*. (p.832). Moscow.
18. Yuldashev, B. (1993). *Functional-methodological features of FBs in modern Uzbek literary language*. fil.fan.dok.dissertation. (p.296). Tashkent.
19. ابولحسن نجفی، فرهنگ فارسی عامیانه ، تهران: نیلوفر، ۱۳۸۷. ص. ۱۵۶۲
20. علی اکبر دهخدا، لغت نامه ی دهخدا. مؤسسه ی انتشارات و چاپ دانشگاه تهران.- ۱۳۷۳
21. امیر حسن، دخیل بر پنجره ی فولاد، چهل تن، تهران، رواق، 1357
22. بزرگ علوی، چمدان، ناشر کتاب الکترونیک، ص.۱۰۹
23. بزرگ علوی، نامه ها، تهران، امیرکبیر، 1357
24. جعفر شهری، شکر تلخ، تهران، امیرکبیر، 1357
25. جمال میرصادقی، این شکسته ها، تهران، زر، 1350
26. صادق هدایت، زنده به گور و آب زندگی، تهران امیر کبیر، 1331. چ. 2
27. صادق هدایت، فردا، دو داستان متن فارسی و ترجمه ی فرانسه از ونسان مونتی، تهران، 1952
28. عباس پهلوان، تشریفات، تهران، امیر کبیر، 1353
29. عبدالحسین نوشین، خروس سحر، ضمیمه ی مجله ی مردم، تهران، اردیبهشت 1326
30. فضلالله مهدی (صبحی)، افسانه ها، تهران، امیر کبیر، 1349
31. محمد معین ، فرهنگ فارسی. جلد اول ، دوم. انتشارات امیر کبیر تهران.- ۱۳۷۱
32. میهن بهرامی، شقاخانه آینه، مجله ی کتاب جمعه، تهران، 18 مرداد 1358

Impact Factor:

ISRA (India)	= **6.317**	**SIS** (USA)	= **0.912**	**ICV** (Poland)	= **6.630**
ISI (Dubai, UAE)	= **1.582**	**РИНЦ** (Russia)	= **0.126**	**PIF** (India)	= **1.940**
GIF (Australia)	= **0.564**	**ESJI** (KZ)	= **9.035**	**IBI** (India)	= **4.260**
JIF	= **1.500**	**SJIF** (Morocco)	= **7.184**	**OAJI** (USA)	= **0.350**

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2021 **Issue:** 06 **Volume:** 98

Published: 03.06.2021 **http://T-Science.org**

QR – Issue QR – Article

Shohsanam Mahmudjon qizi Khudayberdiyeva
Samarkand State University
Lecturer to Department of
Theoretical and Applied Mechanics,
xudoyberdiyevz@mail.ru

Nozima Shodiqulovna Raxmatullayeva
Samarkand State Institute of Economics
and Service Academic Lyceum,
Lecturer

Aziz Berdiyarovich Gadayev
Samarkand State University
Doctoral student to Department of
Theoretical and Applied Mechanics

FREQUENCY ANALYSIS OF LONGITUDINAL-RADIAL VIBRATIONS OF A CONICAL SHELL

Abstract: *The article presents the equations of torsional vibrations of a three-layer conical shell. For this, a surface is selected at a certain distance from the middle layer of the conical shell. Shear heads on this surface are selected as searchable objects. Then, the equations of torsional vibrations of a three-layer conical shell with respect to these sought-for functions were formed.*

Key words: *Conical shell, middle layer, three-layer shell, torsional vibration, stress, deformation, displacement.*

Language: *English*

Citation: Khudayberdiyeva, S. M., Raxmatullayeva, N. S., & Gadayev, A. B. (2021). Frequency analysis of longitudinal-radial vibrations of a conical shell. *ISJ Theoretical & Applied Science, 06 (98),* 59-67.

Soi: http://s-o-i.org/1.1/TAS-06-98-8 ***Doi***: https://dx.doi.org/10.15863/TAS.2021.06.98.8

Scopus ASCC: *2200.*

Introduction

The solution of applied problems of the dynamics of layered conical shells is based on the well-known Kirchhoff-Love, Hermann-Mirsky and other refined theories of vibration [1-2]. These theories are developed for single-layer, homogeneous shells [3-4], and therefore, their application to study the dynamics of layered structural elements is accompanied with certain difficulties of a mathematical nature and ensuring the fulfillment of the contact conditions between the layers [5-6]. Therefore, in the last few decades, theories of vibrations of layered elements of structures began to be developed [7-8]. The number of works devoted to the development of new theories of vibration of structural elements, taking into account various rheological, temperature, anisotropic and other properties of materials, is large. Despite this, at present, the study of non-stationary oscillations of such elements continues on the basis of new theories and equations of oscillation [9-11].

This article is devoted to the study of the equations of torsional vibrations of layered conical elastic shells following from the general equations of vibrations of a three-layer elastic shell as limiting cases.

Formulation of the problem.

In a cylindrical coordinate system (r, θ, z), the problem of torsional vibrations of a homogeneous and isotropic conical shell made of an elastic material is

considered, the inner r_1 and outer r_2 radii of which are linear functions of the longitudinal coordinate, i.e.

$$r_1 = r_0 + kz\,;\; r_2 = r_0 + kz + d\,;$$

where $r_0 = const$, d - толщина оболочки; $k = tg\alpha$ (рис.1). When deriving the equations of oscillation, it is assumed that the conical shell, as a three-dimensional body, strictly obeys the mathematical theory of elasticity and, in its exact formulation, is described by its equations. In a cylindrical coordinate system, we consider a three-layer conical shell of an elastic material that is inhomogeneous in thickness.

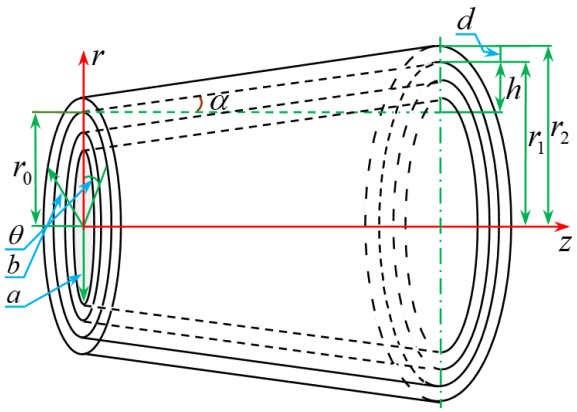

Figure 1.

We will assume that the rational design of the conical shell from the point of view of its work on the action of dynamic loads will be such when the bulk of the rigid material in the form of two layers, hereinafter called load-bearing layers [1], is spaced at some distance by means of a thin wall or a third layer. The third layer can be of the same material as the carrier layers. When the space between two rigid layers is filled with a lighter, and therefore less rigid material, it is hereinafter called a filler. The third layer or filler keeps the bearing layers at a distance equal to its thickness and carries out their joint work.

Moreover, if problems are considered that are different from the problems of transverse vibration of the shell, then it is easy to guess that the joint work of the bearing layers depends on the ability of the filler to resist their relative shear. Based on these considerations, we will assume that the contacts between the bearing layers and the filler are rigid.

We direct the Oz axis of the coordinate system along the symmetry axis of the shell and number the layers as shown in Fig. 1. Through *a* and *b* we denote the inner and outer radii of the shell, and through r_1 and r_2 the inner and outer radii of the middle layer (filler). When deriving the equations of oscillation, we will assume that both the cylindrical shell as a whole, and the bearing layers and the filler, strictly obey the mathematical theory of elasticity and in the exact setting are described by its three-dimensional equations in a linear formulation.

The components of the vectors of displacement of the points of the layers along the coordinate axes, which are considered small, will be denoted by $u_{rm}(r,\theta,z,t)$, $u_{\theta m}(r,\theta,z,t)$, $u_{zm}(r,\theta,z,t)$. Here and below, the index takes on the values $0,1,2$.

Therefore, in the future, we will not emphasize this every time, implying that this is always the case.

The dependencies between the components of stresses and strains at the points of the layers of a conical three-layer shell are considered to be given in the form [2].

$$\sigma_{ij}^{(m)}(r,\theta,z,t) = \lambda_m\left(\varepsilon^{(m)}\right) + 2\mu_m\left(\varepsilon_{ij}^{m}\right);\; (i,j = r,\theta,z), \quad (1)$$

λ_m, μ_m – Lame coefficients of the materials of the layers.

The equations of motion of points of layers, as conical three-dimensional bodies, in the absence of volumetric forces have the form [3].

$$\begin{aligned}
&\frac{\partial\sigma_{rr}^{(m)}}{\partial r} + \frac{1}{r}\frac{\partial\sigma_{r\theta}^{(m)}}{\partial\theta} + \frac{\partial\sigma_{rz}^{(m)}}{\partial z} + \frac{\sigma_{rr}^{(m)} - \sigma_{\theta\theta}^{(m)}}{r} = \rho\frac{\partial^2 u_{rm}}{\partial t^2};\\
&\frac{\partial\sigma_{r\theta}^{(m)}}{\partial r} + \frac{1}{r}\frac{\partial\sigma_{\theta\theta}^{(m)}}{\partial\theta} + \frac{\partial\sigma_{z\theta}^{(m)}}{\partial z} + \frac{2}{r}\sigma_{r\theta}^{(m)} = \rho\frac{\partial^2 u_{\theta m}}{\partial t^2}; \quad (2)\\
&\frac{\partial\sigma_{rz}^{(m)}}{\partial r} + \frac{1}{r}\frac{\partial\sigma_{\theta z}^{(m)}}{\partial\theta} + \frac{\partial\sigma_{zz}^{(m)}}{\partial z} + \frac{\sigma_{zr}^{(m)}}{r} = \rho\frac{\partial^2 u_{zm}}{\partial t^2}.
\end{aligned}$$

Further, following [4], the potentials of longitudinal $\varphi^{(m)}$ and transverse $\vec{\phi}^{(m)}$ waves are introduced by the formula

$$\vec{U}^{(m)} = grad\,\varphi_m + rot\left[\vec{e}_z\psi_m + rot\left(\vec{e}_z\chi_m\right)\right]. \quad (3)$$

Note that when the vector potentials $\vec{\phi}^{(m)}$ are represented in the form

$$\vec{\phi}_m = \vec{e}_z\psi_m + rot\left(\vec{e}_z\chi_m\right), \quad (4)$$

where $\vec{e}_z$ – 111- unit vector along the axis z, solenoid conditions for the range of vector fields $\vec{\phi}^{(m)}$, $div\vec{\phi}^{(m)} = 0$ are performed automatically [5].

Substitution of expressions (3) into the equations of motion (2) allows us to write them through the wave equations with respect to the wave potentials [6]

$$\Delta\varphi^{(m)} = \frac{\rho_m}{\lambda_m + 2\mu_m}\ddot{\varphi}_m; \quad \Delta\vec{\phi}_m = \frac{\rho_m}{\mu_m}\ddot{\vec{\phi}}_m; \qquad (5)$$

where ρ_m – density of layer materials; Δ – Laplace operator.

$$\Delta = \frac{\partial^2}{\partial r^2} + \frac{1}{r}\frac{\partial}{\partial r} + \frac{1}{r^2}\frac{\partial^2}{\partial\theta^2} + \frac{\partial^2}{\partial z^2}.$$

From expressions (3), it is easy to determine the components of the displacement vectors of the layers of the shell u_{rm}, $u_{\theta m}$, u_{zm} through the potentials of the longitudinal φ_m and transverse ψ_m, χ_m waves

$$\begin{aligned} u_{rm} &= \frac{\partial\varphi_m}{\partial z} - \frac{1}{r}\frac{\partial\chi_m}{\partial r} - \frac{\partial^2\chi_m}{\partial r^2} - \frac{1}{r}\frac{\partial^2\chi_m}{\partial\theta^2}; \\ u_{\theta m} &= \frac{1}{r}\frac{\partial\varphi_m}{\partial\theta} - \frac{\partial\psi_m}{\partial r} + \frac{1}{r}\frac{\partial^2\chi_m}{\partial z\partial\theta}; \\ u_{zm} &= \frac{\partial}{\partial r}\left[\varphi_m + \frac{\partial\chi_m}{\partial z}\right] + \frac{1}{r}\frac{\partial\psi_m}{\partial\theta}. \end{aligned} \qquad (6)$$

The last expressions for the components of the displacement vectors of the points of the shell layers make it possible to express the deformation component in terms of the wave potentials

$$\begin{aligned} \varepsilon_{rr}^{(m)} &= \frac{\partial^2\varphi_m}{\partial r^2} - \frac{1}{r^2}\frac{\partial\varphi_m}{\partial\theta} + \frac{1}{r}\frac{\partial^2\psi_m}{\partial r\partial\theta} + \frac{\partial^3\chi_m}{\partial z\partial r^2}, \\ \varepsilon_{zz}^{(m)} &= \frac{\partial^2\varphi_m}{\partial z^2} - \left(\Delta - \frac{\partial^2}{\partial z^2}\right)\frac{\partial\chi_m}{\partial z}, \\ \varepsilon_{\theta\theta}^{(m)} &= \frac{1}{r}\left(\frac{1}{r}\frac{\partial^2}{\partial\theta^2} + \frac{\partial}{\partial r}\right)\left(\varphi_m + \frac{\partial\chi_m}{\partial z}\right) + \left(\frac{1}{r} - \frac{\partial}{\partial r}\right)\frac{\partial\psi_m}{\partial\theta}, \\ \gamma_{r\theta}^{(m)} &= \frac{1}{r}\left(\frac{\partial}{\partial r} - \frac{1}{r}\right)\frac{\partial\varphi_m}{\partial\theta} + \frac{1}{r}\left(\frac{\partial}{\partial r} - \frac{1}{r}\right)\frac{\partial^2\chi_m}{\partial\theta\partial z} + \\ &\quad + \frac{1}{2r^2}\frac{\partial^2\psi_m}{\partial\theta^2} - \frac{r}{2}\frac{\partial}{\partial r}\left(r\frac{\partial\psi_m}{\partial r}\right), \\ \gamma_{\theta z}^{(m)} &= \frac{1}{2}\frac{\partial^2\varphi_m}{\partial\theta\partial z} - \frac{1}{2}\frac{\partial^2\psi_m}{\partial z\partial r} - \frac{1}{2r}\left(\Delta - 2\frac{\partial^2}{\partial z^2}\right)\frac{\partial\chi_m}{\partial\theta}, \\ \gamma_{rz}^{(m)} &= \frac{1}{2}\frac{\partial}{\partial r}\left(2\frac{\partial^2}{\partial z^2} - \Delta\right)\chi_m + \frac{\partial^2\varphi_m}{\partial r\partial z} + \frac{1}{2}\frac{\partial^2\psi_m}{\partial\theta\partial z}. \end{aligned} \qquad (7)$$

Moreover, it is easy to check by these formulas the validity of the equality

$$\varepsilon^{(m)} = \varepsilon_{rr}^{(m)} + \varepsilon_{\theta\theta}^{(m)} + \varepsilon_{zz}^{(m)} = \Delta\varphi_m$$

If problems are considered symmetric with respect to the axis, then the components of the displacement vectors of the shell layers do not depend on the angular coordinate θ and, expressions (6) take the form

$$u_{rm} = \frac{\partial\varphi_m}{\partial z} - \frac{1}{r}\frac{\partial}{\partial r}\left(r\frac{\partial\chi_m}{\partial r}\right), u_{\theta m} = -\frac{\partial\psi_m}{\partial r},$$

$$u_{zm} = \frac{\partial\varphi_m}{\partial r} + \frac{\partial^2\chi_m}{\partial r\partial z}. \qquad (8)$$

In this case, the formulas for the deformation components are also simplified, which can be written in the form

$$\begin{aligned} \varepsilon_{rr}^{(m)} &= \frac{\partial^2}{\partial r^2}\left(\varphi_m + \frac{\partial\chi_m}{\partial z}\right), \\ \varepsilon_{zz}^{(m)} &= \frac{\partial^2\varphi_m}{\partial z^2} - \frac{1}{r}\frac{\partial}{\partial r}\left(r\frac{\partial^2\chi_m}{\partial r\partial z}\right), \varepsilon_{\theta\theta}^{(m)} = \frac{1}{r}\frac{\partial}{\partial r}\left(\varphi_m + \frac{\partial\chi_m}{\partial z}\right) \\ \gamma_{r\theta}^{(m)} &= -\frac{r}{2}\frac{\partial}{\partial r}\left(\frac{1}{r}\frac{\partial\psi_m}{\partial r}\right), \gamma_{\theta z}^{(m)} = -\frac{1}{2}\frac{\partial^2\psi_m}{\partial z\partial r} \\ \gamma_{rz}^{(m)} &= \frac{\partial^2\varphi_m}{\partial r\partial z} + \frac{1}{2}\frac{\partial}{\partial r}\left[\frac{\partial^2}{\partial z^2} - \frac{1}{r}\frac{\partial}{\partial r}\left(r\frac{\partial}{\partial r}\right)\right]\chi_m \end{aligned} \qquad (9)$$

It is assumed that at $t < 0$ the conical shell is at rest, and at the moment $t = 0$, stresses are applied to its boundary surfaces, causing its torsional vibrations, i.e. it is believed that the boundary conditions have the form

$$\begin{aligned} &\text{at } r = a,\ \sigma_{r\theta}^{(1)}(a,z,t) = f_{r\theta}^{(1)}(z,t) \\ &\text{at } r = b,\ \sigma_{r\theta}^{(2)}(b,z,t) = f_{r\theta}^{(2)}(z,t) \end{aligned} \qquad (10)$$

In addition, according to the conditions of rigid contact on the boundary surfaces between the layers, the conditions of equality of mixing and stresses must be fulfilled, i.e.

$$\begin{aligned} &\text{at } r = r_1, \\ &\quad u_{\theta 0}(r_1,z,t) = u_{\theta 1}(r_1,z,t); \\ &\quad \sigma_{r\theta}^{(0)}(r_1,z,t) = \sigma_{r\theta}^{(1)}(r_1,z,t). \end{aligned} \qquad (11)$$

$$\begin{aligned} &\text{at } r = r_2 \\ &\quad u_{\theta 0}(r_2,z,t) = u_{\theta 2}(r_2,z,t); \\ &\quad \sigma_{r\theta}^{(0)}(r_2,z,t) = \sigma_{r\theta}^{(2)}(r_2,z,t). \end{aligned} \qquad (12)$$

The initial conditions of the problem are assumed to be zero.

The torsional vibrations of the conical shell are axisymmetric, and therefore the displacements and deformations of the points of the layers, and, consequently, the stresses, do not depend on the angular coordinate. Only displacements $u_{\theta m}$, stresses $\sigma_{r\theta}^{(m)}$, $\sigma_{\theta z}^{(m)}$ and deformations $\varepsilon_{r\theta}^{(m)}$, $\varepsilon_{\theta z}^{(m)}$ will be nonzero, [7]. In this case, displacements and deformations are determined by formulas (8) and (9), from which it follows that they depend only on the potentials ψ_m,

In this case, the equations of motion (2) take the form

$$\frac{\partial\sigma_{r\theta}^{(m)}}{\partial r} + \frac{\partial\sigma_{z\theta}^{(m)}}{\partial z} + \frac{2}{r}\sigma_{r\theta}^{(m)} = \rho\frac{\partial^2 u_{\theta m}}{\partial t^2} \qquad (13)$$

Which, after applying (5), go over to wave equations with respect to potentials ψ_m, i.e., the

equations of motion of a conical elastic three-layer shell, with its torsion will be

$$\Delta\psi_m = \frac{\rho_m}{\mu_m}\frac{\partial^2\psi_m}{\partial t^2}; \qquad (14)$$

where

$m=1$ at $a \le r \le r_1$, $m=0$ at $r_1 \le r \le r_2$ and $m=2$ at $r_2 \le r \le b$.

Thus, the problem of torsional vibrations of a three-layer conical shell is reduced to the integration of equations (14) at boundary - (10), contact - (11), (12), and also zero at $t=0$

$$\psi_m = \frac{\partial\psi_m}{\partial t} = 0; \qquad (15)$$

initial conditions.

The solution of the problem.

To solve this problem, the functions of external influences can be represented in the form

$$f_{r\theta}^{(i)}(z,t) = \int_0^\infty \begin{matrix}\sin kz \\ -\cos kz\end{matrix}\Big\} dk \int_{(l)} \tilde{f}_{r\theta}^{(i)}(k,p)e^{pt}dp,\ (i=1,2). \qquad (16)$$

In accordance with the accepted representations for the external action function - (16), the solution of problem (5) (14), (11), (12) and (15) will be sought in the form

$$\begin{aligned}[\varphi_m,\psi_m] &= \int_0^\infty \begin{matrix}\sin kz \\ -\cos kz\end{matrix}\Big\} dk \int_{(l)} [\tilde{\varphi}_m,\tilde{\psi}_m]e^{pt}dp; \\ \chi_m &= \int_0^\infty \begin{matrix}\cos kz \\ \sin kz\end{matrix}\Big\} dk \int_{(l)} \tilde{\chi}_m e^{pt}dp.\end{aligned} \qquad (17)$$

Substituting transformations (14) for potential functions ψ_m into the wave equations, we will have

$$\left(\frac{d^2}{dr^2}+\frac{1}{r}\frac{d}{dr}-\beta_m^2\right)\tilde{\psi}_m = 0, \qquad (18)$$

where

$$\beta_m^2 = k^2 + \rho_m/\mu_m^{-1}; \qquad (18^*)$$

General solutions of equations (18) have the form

$$\tilde{\psi}_m(r) = C_m^{(1)}I_0(\beta_m r) + C_m^{(2)}K_0(\beta_m r); \qquad (19)$$

where $I_0(r)$, $K_0(r)$, - modified Bessel functions [1].

The further task is to express the components of the displacement vectors and stress tensors at the points of all three layers through the obtained solutions (19). For this purpose, we will first do this for the movements. Therefore, the displacements $u_{\theta m}$ can also be represented as

$$u_{\theta m}(r,z,t) = \int_0^\infty \begin{matrix}\sin kz \\ \cos kz\end{matrix}\Big\} dk \int_{(l)} \tilde{u}_{\theta m}(r,k,p)e^{pt}dp. \qquad (20)$$

Substituting (17) and (20) into (8) for the transformed values of displacements $\tilde{u}_{\theta m}(k,p)$, we obtain

$$\tilde{u}_{\theta m}(r,k,p) = -\frac{d}{dr}\tilde{\psi}_m; \qquad (21)$$

Let us represent voltages $\sigma_{r\theta}$ as well as (16)

$$\sigma_{r\theta}^{(m)}(r,z,t) = \int_0^\infty \begin{matrix}\sin kz \\ -\cos kz\end{matrix}\Big\} dk \int_l \tilde{\sigma}_{r\theta}^{(m)}(r,k,p)e^{pt}; \qquad (22)$$

and substitute representations (16) and (22) into boundary conditions (10). We get

$$\begin{aligned}&\int_0^\infty \begin{matrix}\sin kz \\ -\cos kz\end{matrix}\Big\} dk \int_{(l)} \tilde{\sigma}_{r\theta}^{(i)}(r,k,p)e^{pt}dp = \\ &= \int_0^\infty \begin{matrix}\sin kz \\ -\cos kz\end{matrix}\Big\} dk \int_{(l)} f_{r\theta}^{(i)}(k,p)e^{pt}dp\end{aligned} \qquad (23)$$

From here

$$\begin{aligned}\tilde{\sigma}_{r\theta}^{(1)}(a,k,p) &= \tilde{f}_{r\theta}^{(1)}(k,p), \\ \tilde{\sigma}_{r\theta}^{(2)}(b,k,p) &= \tilde{f}_{r\theta}^{(2)}(k,p).\end{aligned} \qquad (24)$$

On the other hand, based on the fundamentals, we have

$$\tilde{\sigma}_{r\theta}^{(m)}(r) = \tilde{\mu}_m\left(\frac{1}{r}-\frac{d}{dr}\right)\frac{d\tilde{\psi}_m}{dr}. \qquad (25)$$

Substituting (25) into (24), we obtain

$$\begin{aligned}\left(\frac{1}{r}-\frac{d}{dr}\right)\frac{d\tilde{\psi}_1}{dr}\Big|_{r=a} &= \tilde{\mu}_1^{-1}[\tilde{f}_{r\theta}^{(1)}]; \\ \left(\frac{1}{r}-\frac{d}{dr}\right)\frac{d\tilde{\psi}_2}{dr}\Big|_{r=b} &= \tilde{\mu}_2^{-1}[\tilde{f}_{r\theta}^{(2)}].\end{aligned} \qquad (26)$$

Similarly transformed contact conditions (11) and (12), based on expressions (20), (21) and (25), will have the following forms:

at $r=r_1$

$$\frac{d}{dr}\tilde{\psi}_1 = \frac{d}{dr}\tilde{\psi}_0, \qquad (27)$$

$$\left(\frac{1}{r}-\frac{d}{dr}\right)\frac{d\psi_0}{dr} = \mu_0^{-1}\mu_1\left(\frac{1}{r}-\frac{d}{dr}\right)\frac{d\psi_1}{dr}, \qquad (28)$$

and at $r=r_2$

$$\frac{d}{dr}\tilde{\psi}_0 = \frac{d}{dr}\tilde{\psi}_2, \qquad (29)$$

$$\left(\frac{1}{r}-\frac{d}{dr}\right)\frac{d\tilde{\psi}_0}{dr} = \mu_0^{-1}\mu_2\left(\frac{1}{r}-\frac{d}{dr}\right)\frac{d\psi_2}{dr}. \qquad (30)$$

General solutions (19) for all three layers have the same structure, taking into account the boundedness of solutions at $r\to 0$ and $r\to\infty$ simultaneously. In this case, the boundaries of the first layer are equal to a and r_1, $a \le r \le r_1$. It is bounded from below (from the inside) by surface $r=a$, which in the limit can tend to zero, i.e. $a\to 0$ but cannot exceed r_1 in any way, i.e. cannot strive for infinity.

Therefore, when writing a general solution to the potential function of the first layer- $\varphi_1(r)$, one can restrict oneself to taking into account its limitations

only at $r \to 0$. Based on this, we take the general solution (19) for the first layer in the form

$$\tilde{\psi}_1(r) = C_1^{(1)} I_0(\beta_1 r);\ (a \le r \le r_1), \qquad (31)$$

where $C_1^{(1)}$ - constant of integration.

Similarly, the boundaries of the second, outer layer are cylindrical surfaces $r = r_2$ and $r = b$; $r_2 \le r \le b$.

It is bounded from above (from the outside) by surface $r = b$, the radius of which can tend to infinity, i.e. $b \to \infty$. On the other hand, the inner surface of this layer cannot be pulled to a straight line, b.c. this would lead to a homogeneous round bar with a radius $r = b$.

Therefore, in the general solution for the potential function of the second layer- $\varphi_2(r)$, one can restrict oneself to taking into account its limitations only at $r \to \infty$.

Based on this, we take the general solution (19) for the second layer in the form

$$\tilde{\psi}_2(r) = C_2^{(2)} K_0(\beta_2 r);\ (r_2 \le r \le b) \qquad (32)$$

For the middle layer, we will accept the general solution (19), taking into account that our solution, in the absence of two outer layers, should transform into the known solution for a homogeneous cylindrical layer, limited at $r \to 0$ and $r \to \infty$, i.e.

$$\tilde{\psi}_0(r) = C_0^{(1)} I_0(\beta_0 r) + C_0^{(2)} K_0(\beta_0 r),\ r_2 \le r \le b. \qquad (33)$$

Thus, the number of integration constants to be determined from the contact conditions is reduced to two, $C_1^{(1)}$ and $C_2^{(2)}$. Therefore, there is no need for four contact conditions (11) and (12). Taking this circumstance into account, we restrict ourselves to only two contact conditions, leaving in (11) - (12) only the conditions of equality of displacements,

at $r = r_1$

$$u_{\theta 1}(z,t) = u_{\theta 0}(z,t) \qquad (34)$$

and at $r = r_2$

$$u_{\theta 2}(z,t) = u_{\theta 0}(z,t) \qquad (35)$$

Conditions (34) and (35) are equivalent to conditions (27) and (29), respectively. Substituting solutions (31), (32), and (33) into transformed boundary conditions (26) and contact conditions (27) and (29), we obtain

$$\left[\frac{2\beta_1}{a} I_1(\beta_1 a) - \beta_1^2 I_0(\beta_1 a)\right] C_1^{(1)} = \tilde{\mu}_1^{-1}[\tilde{f}_{r\theta}^{(1)}(k,p)], \qquad (36)$$

$$-\left[\frac{2\beta_2}{b} K_1(\beta_2 b) + \beta_2^2 K_0(\beta_2 b)\right] C_2^{(2)} = \tilde{\mu}_2^{-1}[\tilde{f}_{r\theta}^{(2)}(k,p)], \qquad (37)$$

$$\beta_1 I_1(\beta_1 r_1) C_1^{(1)} = \beta_0 I_1(\beta_0 r_1) C_0^{(1)} - \beta_0 K_1(\beta_0 r_1) C_0^{(2)},$$

$$-\beta_2 K_1(\beta_2 r_2) C_2^{(2)} = \beta_0 I_1(\beta_0 r_2) C_0^{(1)} - \beta_0 K_1(\beta_0 r_2) C_0^{(2)}.$$

From the last two equations we find

$$C_1^{(1)} = \frac{\beta_0 I_1(\beta_0 r_1) C_0^{(1)} - \beta_0 K_1(\beta_0 r_1) C_0^{(2)}}{\beta_1 I_1(\beta_1 r_1)}; \qquad (38)$$

$$C_2^{(2)} = -\frac{\beta_0 I_1(\beta_0 r_2) C_0^{(1)} - \beta_0 K_1(\beta_0 r_2) C_0^{(2)}}{\beta_2 K_1(\beta_2 r_2)}. \qquad (39)$$

Substituting (38) and (39) into boundary conditions (36), (37) and obtain the following system of equations

$$\frac{\frac{2}{a} I_1(\beta_1 a) - \beta_1 I_0(\beta_1 a)}{I_1(\beta_1 r_1)} \left[\beta_0 I_1(\beta_0 r_1) C_0^{(1)} - \right. \qquad (42)$$

$$\left. - \beta_0 K_1(\beta_0 r_1) C_0^{(2)}\right] = \tilde{\mu}_1^{-1}[\tilde{f}_{r\theta}^{(1)}(k,p)],$$

$$\frac{\frac{2}{b} K_1(\beta_2 b) + \beta_2 K_0(\beta_2 b)}{K_1(\beta_2 r_2)} \left[\beta_0 I_1(\beta_0 r_2) C_0^{(1)} - \right. \qquad (43)$$

$$\left. - \beta_0 K_1(\beta_0 r_2) C_0^{(2)}\right] = \tilde{\mu}_2^{-1}[\tilde{f}_{r\theta}^{(2)}(k,p)],$$

Let us express the transformed displacements of layers $\tilde{u}_{\theta m}$ in terms of solutions (31), (32) and (33). To do this, it is enough to recall formulas (20) for $\tilde{u}_{\theta m}(r,k,p)$ i.e.

$$\tilde{u}_{\theta m}(r,k,p) = -\frac{\partial \psi_m}{\partial r}, \qquad (44)$$

Substituting (31), (32), and (33) into (44) at $m = 0; m = 1;$ and $m = 2$, we obtain, respectively

$$\begin{cases} \tilde{u}_{\theta 0}(r,k,p) = -\beta_0 I_1(\beta_0 r) C_0^{(1)} + \beta_0 K_1(\beta_0 r) C_0^{(2)}; \\ \tilde{u}_{\theta 1}(r,k,p) = -\beta_1 I_1(\beta_1 r) C_1^{(1)}; \\ \tilde{u}_{\theta 2}(r,k,p) = \beta_2 K_1(\beta_2 r) C_2^{(2)}. \end{cases} \qquad (44^*)$$

In the expression for the torsional displacement $\tilde{u}_{\theta 0}(r,k,p)$ of the middle layer, we expand the Bessel functions $I_1(\beta_0 r)$ and $K_1(\beta_0 r)$ in power series in the argument $(\beta_0 r)$, or, to put it another way, we use the standard expansions in power series of Bessel functions $I_1(\beta_0 r)$ and $K_1(\beta_0 r)$ in powers $(\beta_0 r)$. We get

$$\tilde{u}_{\theta 0}(r,k,p) = -\beta_0 C_0^{(1)} \sum_{n=0}^{\infty} \beta_0^{2n+1} \frac{(r/2)^{2n+1}}{n!(n+1)!} + \frac{1}{2} C_0^{(2)} +$$

$$+ \beta_0 C_0^{(2)} \sum_{n=0}^{\infty} \left\{\ln \frac{\beta_0 r}{2} - \frac{1}{2}[\gamma(n+1) + \gamma(n+2)]\right\} \beta^{2n+1} \frac{(r/2)^{2n+1}}{n!(n+1)}$$

Combining the amounts here, we get finally

$$\tilde{u}_{\theta 0}(r,k,p) = \frac{1}{r} C_0^{(2)} + \sum_{n=0}^{\infty} \left\{ - C_0^{(1)} + C_0^{(2)} \left[\ln \frac{\beta_0 r}{2} - \right.\right. \qquad (45)$$

$$\left.\left. - \frac{1}{2}(\gamma(n+1) + \gamma(n+2))\right]\right\} \bullet \beta_0^{2n+2} \frac{(r/2)^{2n+1}}{n!(n+1)!}$$

Here $\gamma(n) -$ is the logarithmic derivative of the Gamma function

$$\gamma(z) = \frac{\Gamma'(z)}{\Gamma(z)}.$$

Following the work [23] for the unknown values for the values of displacement and stress, calculated at the points of a certain "intermediate" surface of the middle layer. The radius of this surface is defined in

the interval $\xi \in [r_1, r_2]$. At $\xi = r_1$ and $\xi = r_2$, this "intermediate" surface turns into contact surfaces between the layers, and at. It passes into the median surface of the filler. At $r_1 = r_2$, the radius of the intermediate surface passes into the radius of the contact surface between the bearing layers.

We put $r = \xi$ in the expression of the transformed displacement (2.1.31) and select its main parts, assuming that they are determined as the first terms of a converging power series, we obtain

$$\tilde{u}_{\theta 0}(\xi) = \frac{1}{\xi} C_0^{(2)} + \left\{ -C_0^{(1)} + C_0^{(2)} \left[\ln \frac{\beta_0 \xi}{2} - \gamma(1) - \frac{1}{2} \right] \right\} \beta_0^2 (\frac{\xi}{2});$$

We introduce the following notation [23]

$$\begin{cases} \tilde{u}_{\theta 0}^{(1)} = \dfrac{1}{\xi} C_0^{(2)}; \\ \tilde{u}_{\theta 0}^{(0)} = \left\{ C_0^{(1)} - C_0^{(2)} [\ln \dfrac{\beta_0 \xi}{2} - \gamma(1) - \dfrac{1}{2}] \right\} \beta_0^2 (\dfrac{\xi}{2}). \end{cases} \quad (46)$$

where

$$C_0^{(2)} = \xi \tilde{u}_{\theta 0}^{(1)};$$

$$C_0^{(1)} = \tilde{u}_{\theta 0}^{(1)} \xi \left[\ln \frac{\beta_0 \xi}{2} - \frac{1}{2} - \gamma(1) \right] - \frac{2}{\beta_0^2} \tilde{u}_{\theta 0}^{(0)};$$

In order to express the transformed displacement $\tilde{u}_{\theta 0}(r,k,p)$ through the introduced new functions $\tilde{u}_{\theta 0}^{(0)}$ and $\tilde{u}_{\theta 0}^{(1)}$ transform (47) as follows

$$\tilde{u}_{\theta 0}(r,k,p) = \frac{1}{r} C_0^{(2)} + \sum_{n=0}^{\infty} \{ 2\beta_0^{2n} (-\frac{1}{2} \beta_0^2) \cdot [C_0^{(1)} -$$

$$- C_0^{(2)} (\ln \frac{\beta_0 \xi}{2} - \gamma(1) - \frac{1}{2})] \} \frac{(r/2)^{2n+1}}{n!(n+1)!} + \sum_{n=0}^{\infty} \beta_0^{2n+2} \cdot \quad (47)$$

$$\cdot C_0^2 \left[\ln \frac{r}{\xi} - \frac{1}{2} \gamma(n+1) - \frac{1}{2} \gamma(n+2) + \frac{1}{2} \gamma(1) + \frac{1}{2} \right] \frac{(r/2)^{2n+1}}{n!(n+1)!}$$

In the last expression, we introduce the notation

$$\eta_1(n,r) = \ln \frac{r}{\xi} - \frac{1}{2} \gamma(n+1) - \frac{1}{2} \lambda(n+2) + \lambda(1) + \frac{1}{2}$$

or

$$\eta_1(n,r) = \ln \frac{r}{\xi} + \frac{n}{2(n+1)} - \sum_{k=1}^{n} \frac{1}{k} \quad (48)$$

Taking into account (48) and (46), expression (2.1.31) takes the form.

$$\tilde{u}_{\theta 0}(r,k,p) = \frac{\xi}{r} \tilde{u}_{\theta 0}^{(1)} + 2 \sum_{n=0}^{\infty} \beta_0^{2n} \tilde{u}_{\theta 0}^{(0)} \frac{(r/2)^{2n+1}}{n!(n+1)!} +$$

$$+ \xi \sum_{n=0}^{\infty} \beta_0^{2n+2} \cdot \tilde{u}_{\theta 0}^{(1)} \eta_1(n,r) \frac{(r/2)^{2n+1}}{n!(n+1)!} \quad (49)$$

Note that if the middle layer is thin (for example, a thin layer of epoxy glue, usually applied between the layers), then we can assume that $r = \xi$. Then

$$\eta_1(n) = \frac{n}{2(n+1)n} - \sum_{k=1}^{n} \frac{1}{k} \quad (50)$$

which is a number, for example, for

$$n = 0 \quad \eta_1(0) = 0 \text{ а при } \quad n = 1 \quad \eta_1(1) = -\frac{3}{4}$$

In order to express the boundary conditions (42) (43) in terms of the main parts of the transformed displacement $\tilde{u}_{\theta 0}$ introduced by formulas (46), consider the following formula

$$\beta_0 [I_1(\beta_0 r_i) B_1 - K_1(\beta_0 r_i) B_2] = -\tilde{u}_{\theta 0} \quad (51)$$

Then, based on (49) for $\beta_0 [I_1(\beta_0 r_i) B_1 -$ $- K_1(\beta_0 r_i) B_2]$ will have (51)

$$\beta_0 [I_1(\beta_0 r_i) B_1 - K_1(\beta_0 r_i) B_2] = \frac{\xi}{r_i} \tilde{u}_{\theta 0}^{(1)} +$$

$$+ \sum_{n=0}^{\infty} [2\tilde{u}_{\theta 0}^{(0)} + \xi \cdot \eta(n, r_i) \beta_0^2 \tilde{u}_{\theta 0}^{(1)}] \cdot \beta_0^{2n} \frac{(r_i/2)^{2n+1}}{n!(n+1)!}$$

Taking into account (51), equations (42) and (43) can be written in the form

$$\frac{\frac{2}{a} I_1(\beta_1 a) - \beta_1 I_0(\beta_1 a)}{I_1(\beta_1 r_1)} \cdot \left\{ \sum_{n=0}^{\infty} \beta_0^{2n} \left[2\tilde{u}_{\theta 0}^{(0)} + \xi \eta_1(n, r_1) \cdot \right. \right. \quad (53)$$

$$\left. \left. \cdot \beta_0^2 \tilde{u}_{\theta 0}^{(1)} \right] \frac{(r_1/2)^{2n+1}}{n!(n+1)!} + \frac{\xi}{r_1} \tilde{u}_{\theta 0}^{(1)} \right\} = \tilde{\mu}_1^{-1} [\tilde{f}_{r\theta}^{(1)}(k,p);$$

$$\frac{\frac{2}{b} K_1(\beta_2 b) + \beta_2 K_0(\beta_2 b)}{K_1(\beta_2 r_2)} \cdot \left\{ \sum_{n=0}^{\infty} \beta_0^{2n} \left[2\tilde{u}_{\theta 0}^{(0)} + \xi \eta_1(n, r_2) \cdot \right. \right. \quad (54)$$

$$\left. \left. \cdot \beta_0^2 \tilde{u}_{\theta 0}^{(1)} \right] \frac{(r_2/2)^{2n+1}}{n!(n+1)!} + \frac{\xi}{r_2} \tilde{u}_{\theta 0}^{(1)} \right\} = \tilde{\mu}_2^{-1} [\tilde{f}_{r\theta}^{(2)}(k,p);$$

For combinations of Bessel functions, limiting ourselves in their expansions to zero and first approximations, we obtain

at $m = 0$

$$\frac{2}{b} K_1(\beta_2 b) + \beta_2 K_0(\beta_2 b) = \frac{2}{b} \left[\left(\ln \frac{\beta_2 b}{2} + c - \frac{1}{2} \right) \frac{\beta_2 b}{2} + \frac{2}{\beta_2} \right] +$$

$$+ \beta_2 \left[-\left(\ln \frac{\beta_2 b}{2} + c \right) \right] = -\frac{1}{2} \beta_2 + \frac{4}{\beta_2 b^2} = -\frac{1}{2\beta_2} \left(\frac{8}{b^2} - \beta_2^2 \right);$$

$$K_1(\beta_2 r_2) = \frac{1}{2\beta_2} \left[\frac{4}{r_2} + \frac{r_2}{2} \left(\ln \frac{\beta_2 r_2}{2} + c - \frac{1}{2} \right) \right] \approx$$

$$\approx \frac{1}{2\beta_2} \left[\frac{4}{r_2} + \frac{r_2}{2} \left(c - \frac{1}{2} \right) \beta_2^2 \right],$$

at $m = 1$

$$\frac{2}{a} I_1(\beta_1 a) - \beta_0 I_0(\beta_1 a) = \frac{2}{a} \cdot (\frac{\beta_1 a}{4} + \frac{(\beta_1 a)^3}{16}) -$$

$$- \beta_1 (1 + \frac{\beta_1^2 a^2}{4}) = \frac{\beta_1}{2} + \frac{\beta_1^3 a^2}{8} - \beta_1 - \frac{\beta_1^3 a^2}{4} =$$

$$= -\frac{1}{2} \beta_1 - \frac{\beta_1^3 a^2}{8} = -\frac{1}{2} \beta_1 (1 + \frac{a^2}{4} \beta_1^2);$$

$$I_1(\beta_1 r_1) = \frac{\beta_1 r_1}{4} (1 + \frac{r_1^2}{4} \beta_1^2).$$

Hence

$$\frac{\frac{2}{a}I_1(\beta_1 a)-\beta_1 I_0(\beta_1 a)}{I_1(\beta_1 r_1)}=-\frac{2}{r_1}\cdot\frac{1+\frac{a^2}{4}\beta_1^2}{1+\frac{r_1^2}{4}\beta_1^2}; \quad (55)$$

$$\frac{\frac{2}{b}K_1(\beta_2 b)+\beta_2 K_0(\beta_2 b)}{K_1(\beta_2 r_2)}=-\frac{2}{r_2}\cdot\frac{\frac{8}{b^2}-\beta_2^2}{\frac{8}{r_2^2}+(c-\frac{1}{2})\beta_2^2}, \quad (56)$$

where $c=\ldots$ is the number

Substituting (55) and (56) into equations (54), we have

$$-\frac{2}{r_1}\left(1+\frac{a^2}{4}\beta_1^2\right)\left\{\sum_{n=0}^{\infty}\beta_0^{2n}\left[2\tilde{u}_{\theta 0}^{(0)}+\xi\eta_1(n,r_1)\beta_0^2\tilde{u}_{\theta 0}^{(1)}\right]\cdot\right.$$
$$\left.\cdot\frac{(r_1/2)^{2n+1}}{n!(n+1)!}+\frac{\xi}{r_1}\tilde{u}_{\theta 0}^{(1)}\right\}=\tilde{\mu}_1^{-1}\left[\left(1+\frac{r_1^2}{4}\beta_1^2\right)\tilde{f}_{r\theta}^{(1)}(k,p)\right]; \quad (57)$$

$$-\frac{2}{r_2}\left(\frac{8}{r_2^{*2}}-\beta_2^2\right)\left\{\sum_{n=0}^{\infty}\beta_0^{2n}\left[\left[2\tilde{u}_{\theta 0}^{(0)}+\xi\eta_1(n,r_2)\beta_0^2\tilde{u}_{\theta 0}^{(1)}\right]\cdot\right.\right.$$
$$\left.\left.\cdot\frac{(r_2/2)^{2n+1}}{n!(n+1)!}+\frac{\xi}{r_2}\tilde{u}_{\theta 0}^{(1)}\right\}=\tilde{\mu}_2^{-1}\left[\left(\frac{8}{r_2^2}+\left(c-\frac{1}{2}\right)\beta_2^2\right)\tilde{f}_{r\theta}^{(2)}(k,p)\right]\right.$$

Let us rewrite (57) equation in a more convenient form for subsequent use

$$\left(1+\frac{a^2}{2}\beta_1^2\right)\left\{\sum_{n=0}^{\infty}\beta_0^{2n}\left[2\tilde{u}_{\theta 0}^{(0)}+\xi\eta_1(n,r_1)\beta_0^2\tilde{u}_{\theta 0}^{(1)}\right]\cdot\right.$$
$$\left.\cdot\frac{(r_1/2)^{2n+1}}{n!(n+1)!}+\frac{\xi}{r_1}\tilde{u}_{\theta 0}^{(1)}\right\}=-\frac{r_1}{2}\tilde{\mu}_1^{-1}\left[\left(1+\frac{r_1^2}{4}\beta_1^2\right)\tilde{f}_{r\theta}^{(1)}(k,p)\right],$$
$$\left(1-\frac{b^2}{8}\beta_2^2\right)\left\{\sum_{n=0}^{\infty}\beta_0^{2n}\left[2\tilde{u}_{\theta 0}^{(0)}+\xi\eta_1(n,r_2)\beta_0^2\tilde{u}_{\theta 0}^{(1)}\right]\frac{(r_2/2)^{2n+1}}{n!(n+1)!}+\right.$$
$$\left.+\frac{\xi}{r_2}\tilde{u}_{\theta 0}^{(1)}\right\}=-\frac{b^2}{2r_2}\tilde{\mu}_2^{-1}\left\{\left[\left(1+\left(c-\frac{1}{2}\right)\frac{r_2^{*2}}{8}\beta_2^2\right)\tilde{f}_{r\theta}^{(2)}(k,p)\right]\right.$$

Let us introduce functions $u_{\theta 0}^{(0)}$, $u_{\theta 0}^{(1)}$ and operators λ_m^n by the formulas

$$\left[u_{\theta 0}^{(1)},u_{\theta 0}^{(1)}\right]=\int_0^{\infty}\left\{\begin{matrix}\sin kz\\-\cos kz\end{matrix}\right\}dk\int_{(\ell)}\left(\tilde{u}_{\theta 0}^{(0)},\tilde{u}_{\theta 0}^{(1)}\right)e^{pt}dp;$$
$$\chi_m^n(\zeta)=\int_0^{\infty}\left\{\begin{matrix}\sin kz\\-\cos kz\end{matrix}\right\}dk\int_{(\ell)}\beta_m^{2n}(\zeta)e^{pt}dp, \quad (58)$$

Inverting conditions (58) over p and k, taking into account (57), we obtain

$$\sum_{n=0}^{\infty}\lambda_0^n\left(1+\frac{a^2}{2}\lambda_1\right)\left[2u_{\theta 0}^{(0)}+\xi\eta_1(n,r_1)\lambda_0 u_{\theta 0}^{(1)}\right]\frac{(r_1/2)^{2n+1}}{n!(n+1)!}+$$
$$+\frac{\xi}{r_1}\left(1+\frac{a^2}{2}\lambda_1\right)u_{\theta 0}^{(1)}=-\frac{r_1}{2}\mu_1^{-1}\left[\left(1+\frac{r_1^2}{4}\lambda_1\right)f_{r\theta}^{(1)}(z,t)\right]; \quad (59)$$
$$\sum_{n=0}^{\infty}\lambda_0^n\left(1-\frac{b^2}{8}\lambda_2\right)\left[2u_{\theta 0}^{(0)}+\xi\eta_1(n,r_2)\lambda_0 u_{\theta 0}^{(1)}\right]\frac{(r_2/2)^{2n+1}}{n!(n+1)!}+$$
$$+\frac{\xi}{r_2}\left(1+\frac{a^2}{2}\lambda_2\right)u_{\theta 0}^{(1)}=-\frac{b^2}{2r_2}\mu_2^{-1}\left[\left(1+(c-\frac{1}{2})\frac{r_2^2}{8}\lambda_2\right)f_{r\theta}^{(2)}(z,t)\right] \quad (60)$$

Let us introduce the following notation $[.....]$

$$A_{1i}=2\sum_{n=0}^{\infty}\lambda_0^n\frac{(r_i/2)^{2n+1}}{n!(n+1)!};$$
$$A_{2i}=\frac{1}{r_i}+\sum_{n=0}^{\infty}\eta_1(n,r_i)\lambda_0^{n+1}\frac{(r_i/2)^{2n+1}}{n!(n+1)!}; \quad (61)$$

Taking into account (61), Eqs. (60) can be rewritten in a more convenient form for what follows:

$$\left(1+\frac{a^2}{2}\lambda_1\right)\left[A_{11}u_{\theta 0}^{(0)}+\xi A_{12}u_{\theta 0}^{(1)}\right]=$$
$$=-\frac{r_1}{2}\mu_1^{-1}\left[\left(1+\frac{r_1^2}{4}\lambda_1\right)f_{r\theta}^{(1)}(z,t)\right];$$
$$\left(1-\frac{b^2}{8}\lambda_2\right)\left[A_{12}u_{\theta 0}^{(0)}+\xi A_{22}u_{\theta 0}^{(1)}\right]=$$
$$=-\frac{b^2}{2r_2}\mu_2^{*2}\left\{\left[1+\left(c-\frac{1}{2}\right)\frac{r_2^2}{8}\lambda_2\right]f_{r\theta}^{(2)}(z,t)\right\} \quad (62)$$

Based on the expressions for β_m (44)*, it is easy to obtain that the operators λ_m^n, introduced by formulas (58), with the reverse transition according to Fourier and Laplace, in variables z,t have the following forms

$$\lambda_m^n(\zeta)=\left[\rho_m\mu_m^{-1}\left(\frac{\partial^2\zeta}{\partial t^2}\right)-\left(\frac{\partial^2\zeta}{\partial z^2}\right)\right]^n, \quad (63)$$

where μ_m – elastic operators of layer materials.

Equations (62) in accordance with formulas (63) for operators λ_m^n are integro-differential equations of unbounded order. These equations contain the main parts $u_{\theta 0}^{(0)}$ and $u_{\theta 0}^{(1)}$ of the torsional displacement of $u_{\theta 0}$ points of a certain “intermediate” surface of the middle layer of a three-layer conical shell. The specified "intermediate" surface has a radius, the values of which are included in the interval $r_1\le\xi\le r_2$. In accordance with the numerical value of the radius ξ, this “intermediate” surface can pass into the middle one at $\xi=\frac{r_1+r_2}{2}$ and the contact between the layers of the shell surface at $\xi=r_1$ and $\xi=r_2$. Consequently, equations (62), depending on the values of the radius ξ, can be the equations of oscillation of a three-layer cylindrical shell relative to the main parts of the torsional displacement of the points of the middle or contact surfaces of the middle layer.

The obtained equation in particular cases transforms into the equations of vibration of a two-layer elastic conical shell, into the equations of

vibration of a single-layer elastic conical shell, and others.

Results and Discussions

Let's consider the problem of longitudinal-radial vibrations of a shield clamped in the longitudinal direction, at $z=0$ and $z=l$, where l- length conical shell in the direction of the axis Oz. As vibration equations, we take the system (62). The boundary conditions of the problem have the form

$$u_{\theta 0}^{(0)}=0;\ \frac{\partial^2 u_{\theta 0}^{(0)}}{\partial z^2}=0;\ \frac{\partial u_{\theta 0}^{(1)}}{\partial z}=0;\ \frac{\partial^3 u_{\theta 0}^{(1)}}{\partial z^3}=0\cdot$$

The initial conditions are assumed to be zero.

The solution of the system of equations (62), which includs the conditions for fixing the ends, and also the functions of external actions, is represented in the form.

$$u_{\theta 0}^{(0)}=\sum_{m=1}^{\infty}\tilde{u}_{\theta 0}^{(0)}(t)\sin\frac{m\pi z}{l};\ u_{\theta 0}^{(1)}=\sum_{m=1}^{\infty}\tilde{u}_{\theta 0}^{(1)}(t)\cos\frac{m\pi x}{l};$$

$$f_{r\theta}=\sum_{m=1}^{\infty}f_{r\theta m}(t)\sin\frac{m\pi z}{l};\qquad (64)$$

The substitution of (64) into (62) leads to a system of two fourth-order differential equations with respect to the functions $\tilde{u}_{\theta 0}^{(0)}(t)$ and $\tilde{u}_{\theta 0}^{(1)}(t)$. The problem was solved numerically at the following values of the physico-mechanical and geometric parameters of the three-layer conical shell:

$\xi=0.9h_0$; $l=0.4m$; $r_0=0.04m$; $d=0.005m$; $r_2=0.08m$; $\rho_0=30kg/m^3$; $\rho_1=2700kg/m^3$; $\rho_2=2700kg/m^3$; $E_0=0.165\cdot10^9\ Pa$; $E_1=69\cdot10^9\ Pa$; $E_2=69\cdot10^9\ Pa$; $\nu_0=0.03125$; $\nu_1=0.33$; $\nu_2=0.33$; $f_{zm}(t)=3t^2$. The results are shown in Fig. 2-5 in the form of graphs of the longitudinal and transverse displacements of the points of the middle layer and normal stresses in its various sections.

Conclusion

From the presented graphs in Fig. 2-3 it follows that the longitudinal displacement of the points of different sections reach their maximum at values between 0.6 and 0.8 of the dimensionless time. Negative values of longitudinal displacement indicate that the shield for weight the period of action of the external load undergoes compression.

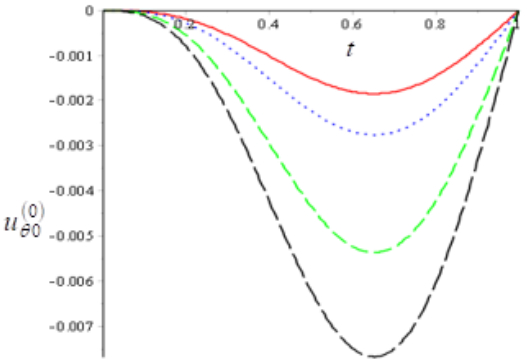

Fig. 2. Dependence of displacement $u_{\theta 0}^{(0)}$ on time at $z=0.2$ (——); 0.3 (·····); 0.4(– –); 0.6(—·).

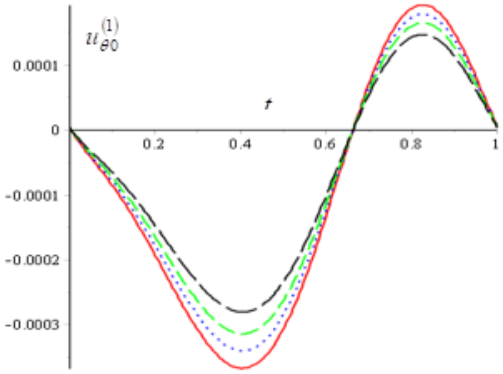

Fig. 3. Dependence of displacement $u_{\theta 0}^{(1)}$ on time at $z=0.2$ (——); 0.3 (·····); 0.4 (– –); 0.6(—·).

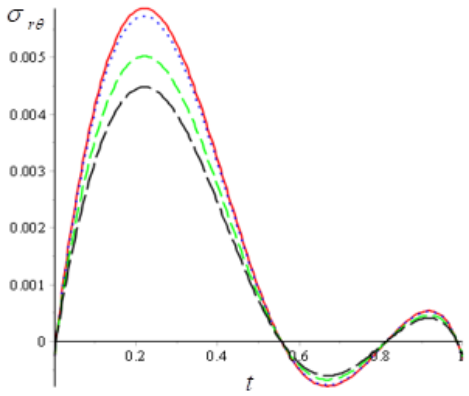

Fig. 4. Dependence of displacement $\sigma_{r\theta}$ on time $z=0.2$ (——); 0.3 (·····); 0.4 (– –); 0.6(—·).

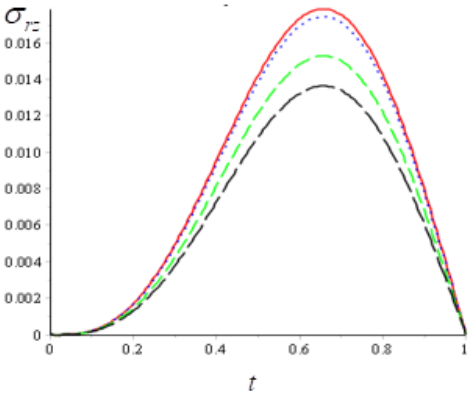

Fig. 5. Dependence of displacement σ_{rz} on time at $z=0.2$ (——); 0.3 (·····); 0.4 (– –); 0.6(—·).

The transverse displacement of the point of the cross sections has a sinusoidal character as a function of time. At the same time, it reaches its maximum at a value of the dimensionless time close to 0.4. The maximum value of the longitudinal displacement corresponds to the zero value of the lateral displacement. In addition, at the beginning of the process and further to the time value of 0.63-0.66, the transverse displacement is negative, and at 0.65 <t <0.7. Further, it remains positive with a relative maximum at 0.82.

Following graphs (Figs. 4-5) are in good agreement with the dependencies of displacements, having relative maxima at the points where the displacements are minimal. At the points of maximum displacement values, it should be noted that corresponding stresses are minimal.

References:

1. Hudojnazarov, H.H. (2003). *Nestacionarnoe vzaimodejstvie krugovyh cilindricheskih uprugih i vjazkouprugih obolochek i sterzhnej s deformiruemoj sredoj*. (p.325). Tashkent: izd-vo imeni Abu Ali ibn Sina.
2. Filippov, I.G., & Filippov, S.I. (2007). *Kolebatel`nye i volnovye processy v sploshnyh szhimaemyh sredah*. (p.430). Moscow: Izd-vo MGSU.
3. Markus, S. (1988). *The mechanics of cylindrical shells*. (p.195). Amsterdam: Elsevier".
4. Netrebko, A.V., & Pshenichnov, S.G. (2015). Nekotorye zadachi dinamiki linejno- vjazkoup-rugih cilindricheskih obolochek konechnoj dliny. *Problemy prochnosti i plastichnosti*, t.77, №1, pp.14-22.
5. Francesco, P. (2007). Vibrations of circular cylindrical shells: Theory and experiments. *Journal of Sound and Vibration*, 303, 154-170.
6. Khalmuradov, R.I., & Khudoynazarov, Kh.Kh. (2002). *Theory of axisymmetrical vibrations of circular cylindrical shells.* The 7th Conference "Shell Structures, Theory and Applications", Gdansk-Jurata (Poland), October 9-11, 2002. (pp.131-132). Gdansk: Gdansk University of Technology.
7. Hudojnazarov, H.H., Skripnjak, V.A., & Jahshiboev, Sh. (2018). Nestacionarnye poperechnye kolebanija trehslojnoj vjazkouprugoj plastinki. *Uzbekskij zhurnal Problemy Mehaniki*, №2, pp.27-32.
8. Jalgashev, B.F., & Berdiev, Sh.D. (2020). Uravnenija krutil`nyh kolebanij trehslojnoj krugovoj cilindricheskoj uprugoj obolochki. *Problemy arhitektury i stroitel`stva*, №2, pp.120-125.
9. Filippov, I. G., & Kudainazarov, K. (1990). Refinement of equations describing longitudinal-radial vibrations of a circular cylindrical viscoelastic shell. *Soviet Applied Mechanics*, 26(2), 161-168. doi:10.1007/bf00887110.
10. Hudojnazarov, H.H., & Burkutboev, Sh.M. (2017). Matematicheskaja model` krutil`nyh kolebanij cilindricheskogo sloja s uchetom protekaushhej zhidkosti i vrashhenija. *Matematicheskoe modelirovanie i chislennye metody*, № 4, pp.31-56. DOI: Retrieved from https://doi.org/10.18698/2309-3684-2017-4-3147
11. Hudojnazarov, H.H., & Jalgashev, B.Ja. (2017). *Vzaimodejstvie cilindricheskih sloev i obolochek s vjazkoj zhidkost`u*, (p.138). LAMBERT Academic Publishing.

Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 9.035	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS
International Scientific Journal
Theoretical & Applied Science
p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)
Year: 2021 **Issue:** 06 **Volume:** 98
Published: 03.06.2021 **http://T-Science.org**

QR – Issue QR – Article

Nuriddin Abdullayevich Rasulov
Namangan State University
Senior Lecturer, Uzbekistan

PUBLIC-PRIVATE PARTNERSHIP – AS AN EFFECTIVE MECHANISM OF FINANCING OF INNOVATION PROCESS

Abstract: *The article is based on the fact that the development on the innovative basis and the rational use of achievements between science and industry is an important factor in national economic growth. Also, the proposals have been developed to create opportunities for public-private partnerships to finance innovative projects and strategic programs as one of the effective mechanisms for financing of innovation processes in the development, liberalization and improvement of the economy.*

Key words: *economics, science, education, production, public-private partnership, innovation projects, strategic programs, financing of innovation processes.*
Language: *English*
Citation: Rasulov, N. A. (2021). Public-private partnership – as an effective mechanism of financing of innovation process. *ISJ Theoretical & Applied Science, 06 (98),* 68-71.
Soi: http://s-o-i.org/1.1/TAS-06-98-9 ***Doi***: https://dx.doi.org/10.15863/TAS.2021.06.98.9
Scopus ASCC: *2000.*

Introduction

Today, one of the main tasks is developing the socio-economic potential of the country on an innovative basis in the modernization of all sectors of the economy and the effective management of scientific and technological innovations. At the same time, the rational use of the achievements between science and industry requires the implementation of innovative processes in various sectors of the economy. This is one of the important factors of national economic growth.

It should be noted that in order to create any consumer-friendly innovation and reach consumers faster, it must first be provided with financial resources. There, first of all, it is expedient to make extensive use of the experience of foreign countries with innovative and investment development.

Public-private partnerships (PPP) play an important role in the consistent development, liberalization and innovative improvement of the economy sectors. Their purposeful cooperation is one of the effective mechanisms for financing innovation processes, which allows to manage and finance innovative projects based on the interests of both parties, long-term strategic programs.

Urgency

The Action Strategy for the five priority areas of development of the Republic of Uzbekistan for 2017-2021 that "one of the important tasks is to reduce the role of the state in the socio-economic development of the country, democratic reforms in government, expanding public-private partnership".

The mechanism of financing innovations created in the republic and its regions is considered as a necessary tool in the modern market economy for the rational use of innovative technologies at the international level, its path of innovative development and competitive environment. The development of the country's economy in an innovative way is aimed at the implementation of innovative projects and ideas. The establishment of PPP as a modern tool for financing innovation processes, using the experience of developed countries in achieving this goal, will serve as one of the important tools for achieving concrete results in the future. The participation of the private sector in the financing of innovative projects will reduce the high level of risk, as well as increase its efficiency. The somewhat successful and unsuccessful experiences of the last 10-12 years show that the state has required the private sector to

cooperate in the innovative development of economic sectors.

Theoretical approches

In the analysis of the PPP mechanism, it is appropriate to highlight the theoretical aspects of this term.

According to S.Yu.Sivakova, PPP is an agreement on the production and provision of infrastructure services by mutual agreement, which involves the attraction of additional investment and the implementation of cooperation agreements as a means of increasing the efficiency of state budget financing [1].

According to the guide developed by the United Nations, "PPPs are established for the purpose of financing, planning and ensuring the operation of public sector facilities, facilities, and services. Its main features are: a) long-term organization and delivery of services; b) reducing risk and supporting private sector participation; c) diversity of contracts concluded by legal entities with government agencies, etc [2].

D.E.Morokin is interested in implementing business projects and maximizing profits from it in further enhancing PPP. The reason is the implementation of innovative projects, the private sector seeks to achieve economic freedom and increase labor productivity. It is in the interest of the state that the republican and regional budgets, additional revenues from rent and concession payments, etc. [3].

Analytical part

The use of PPP mechanisms is currently observed in almost all sectors of the economy. This cooperation mechanism is one of the promising forms of involving the business sector in solving major project programs at the national and regional levels. However, the use of this mechanism in the financing of innovative projects for the purpose of innovative development is not widespread.

PPP seems to be a traditional concept, in this rapidly evolving period, the term is being interpreted in a modern way. PPP, contractual cooperation between local governments and the private sector, increase funding for innovative projects, diversify risks, increase the interest of entities in the implementation and the likelihood of achieving the expected result.

According to the experience of foreign countries, PPP is widely used in the implementation of long-term strategic programs of innovation projects. Effective use of PPP has begun in other countries, such as the United Kingdom, the United States, France, Canada.

The UK can be described as one of the most widely developed countries in terms of PPP. In the United Kingdom, the Private Financial Initiative program, based on a concession agreement, was launched in 1992. According to the program, the development of the regions will increase to a certain extent, and the private sector will be engaged in the implementation of targeted business projects on the terms provided by the state, construction, financing, operation of facilities [4].

PPP have also developed in the United States, emerging in the following key areas:

- research network and intersectoral production;
- attracting the country's scientific potential to solve national problems at the state level and the technologies created by federal funds for the development of industry in other countries [5].

On the other hand, PPP is a set of organizational and legal relations and efforts aimed at achieving the goals of innovative development at the micro and macroeconomic levels through the implementation of projects and programs in the field of innovation [6]. Science has a special place in this cooperation. In this case, each fulfills its function, that is, the main task of science – innovation and development, the main task of the state - to create opportunities, conditions, the main task of the private sector - to buy and sell created innovations (Figure 1).

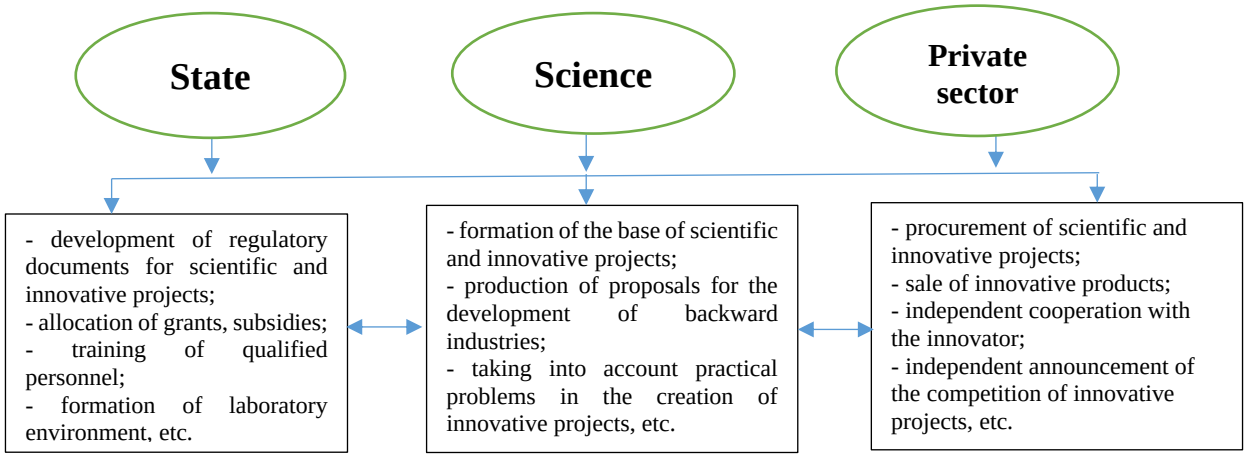

Figure 1. Innovation support mechanism

The use of the PPP mechanism has significantly expanded in practice. In using this mechanism, if the state is unable to finance projects in the production process, it can direct it directly to the private sector and leave it to its control. Such legal relations create conditions for the gradual implementation of large-scale projects, research and innovation. At the same time, the flexibility of the financial system and its individual elements allows us to take into account the dynamically changing conditions of market conditions. The methods of financing innovative processes used in the country today do not meet internationally accepted principles. Therefore, the efficiency level is low. Based on the specifics of this cooperation, it creates the necessary conditions for the activation of the innovative environment of production entities. As a result, innovation activity is a growth in PPP, carried out at all stages of the innovation process. In particular, science, education, research and so on.

In any case, the solution of problems of development of the country's economy on an innovation basis, PPP in support of innovation processes, is recognized as a mechanism for financing innovation.

By involving the private sector in the implementation of innovative projects by the state, it helps to save budget funds, diversify the risk of implementing innovative developments, reduce the cost of the pilot process, improve quality in the market of socially important services, and develop competition. The private sector, in turn, will be able to effectively place long-term investments under state guarantees in the introduction of innovative developments into production, as well as expand the market of services and increase its profitability.

Financing of innovative projects is formed through a system of organizing the investment process, in which the initiator or investor borrows financial and other resources from a third party, which does not significantly affect the quality of its balance sheet, creditworthiness and level of risk. In this case, the source of income and the return of loans, the inflow of funds for the implementation of innovative projects, the assets are recorded as collateral for lending [7].

PPP are initially projected to produce future projects. Necessary information about the innovative project will be collected and a program for its implementation will be formed. According to him, the process of collecting information about the innovative project includes:

1. Defining the main tasks in the field of PPP;
2. Description of the main data of the funded project;
3. Effective methods of PPP;
4. Distribution of rights and obligations of cooperation.

In this case, the financing of innovative projects brings the following advantages:

- If the bulk of funding is provided by the state, the private sector is the producer of the project. On the contrary, the state controls its creation only on the basis of normative legal acts;
- If there is a possibility of using credit funds, in this case it is expedient for the private sector to assume this obligation;
- Liabilities of the enterprise (private sector) creating the innovative project are not reflected in the balance of the state and its shareholders;
- Development of the optimal version of the norms of state participation in the management of innovative projects and further increase of capital turnover in foreign trade, in this process accurately assess the level of development of regional industries and regional potential, encourage investment in service priorities;
- Enhancing the innovative potential of regional enterprises, the use of foreign best practices, cooperation with foreign enterprises not only in the cooperative management of production activities, but also in the development of optimal options for management activities and systems, improving the management system;
- Paying special attention to the proportional distribution of state budget funds in the financing of innovative projects based on the economic potential of the regions;
- In-depth state expertise in the financing of regional innovative projects at the expense of the state budget or the private sector, pay special attention to its selection and focus on the viability of the funded projects and the export orientation of the project.

Conclusion

Direct investments by the state for innovation processes are aimed at coordination, taking into account the needs of the private sector. The formation of the Coordination Council can also be done on the basis of equal rights of the public and private sectors. The advantage of this mechanism is that both parties can benefit from the implementation of innovative projects of social significance. Its disadvantage is that the implementation of the innovation process can lead to politicization and changes in cash flow, as well as the active formation of a corrupt environment in the political sphere.

It is expedient to ensure long-term, intensive innovative development of the economy by improving the mechanism of financing of innovation processes in Uzbekistan, to choose effective ways to widely introduce innovative projects using local resources. Innovation requires a modern economy. In a traditional economy, however, the pace of innovation development may be at a low rate. Therefore, the use of modern mechanisms in

financing innovative processes and their constant improvement is required.

In conclusion, the above proposals include the existence of an alternative financing base, a number of mechanisms for its improvement, including the development of a regulatory framework for the formation of innovative infrastructure in line with the current economic environment, the use of incentive mechanisms for financing innovative projects.

References:

1. Varnavskij, V.G., et al. (2010). *Gosudarstvenno-chastnoe partnerstvo: teorija i praktika*. Gosudarstvennyj universitet - Vysshaja shkola jekonomiki. (p.287). Moscow: Izd. dom Gosudarstvennogo universiteta - Vysshej shkoly jekonomiki.
2. (2008). *Prakticheskoe rukovodstvo po voprosam jeffektivnogo upravlenija v sfere gosudarstvenno-chastnogo partnerstva*. Per. s angl. Zheneva: Organizacija Ob#edinennyh Nacij.
3. Morkovkin, D.E. (2015). Innovvacionnoe razvitie jekonomiki na osnove ispol`zovanija mehanizmov gosudarstvenno-chastnogo partnerstva. *Vestnik RGGU*. Serija Jekonomika.Upravlenie.Pravo. (1): 27-35.
4. Semenchishin, A. N. (2017). Stanovlenie i razvitie instituta gosudarstvenno-chastnogo partnerstva v zarubezhnyh stranah. *Molodoj uchenyj*, №52, pp.168-169.
5. Jasheva, G. A. (2013). Formirovanie mehanizmov gosudarstvenno-chastnogo partnerstva v innovacionnoj sfere. Evrazijskogo jekonomicheskogo souza. *Evrazijskaja integracija: jekonomika, pravo, politika*, №13, p.80.
6. Blinov, A.O., & Jasheva, G.A. (n.d.). *Mehanizmy finansirovanija innovacionnyh proektov*. Retrieved from https://docplayer.ru/33068586-Mehanizmy-finansirovaniya-innovacionnyh-proektov.html
7. Man`kova, A.O. (2016). Mezhdunarodnyj opyt realizacii proektov gosudarstvenno-chastnogo partnerstva. *Problemy jekonomiki i menedzhmenta*, № 10 (62), pp.10-14.
8. Mingaljova, Zh.A., & Gershanok, G.A. (2012). Ustojchivoe razvitie regiona: innovacii jekonomicheskaja bezopasnost`, konkurentosposobnost`. *Jekonomika regiona*, № 3, pp. 68-77.
9. Lihachev, N.A. (2011). Zarubezhnyj opyt chastno-gosudarstvennogo partnerstva i problemy ego adaptacii v RF. *Social`no-jekonomicheskie javlenija i processy*, № 5-6, pp. 138-145.
10. P`jankova, K.V., & Kosvincev, N.N. (2012). Gosudarstvenno-chastnoe partnerstvo: preimushhestva i nedostatki dlja gosudarstva i biznesa. *Vestnik Permskogo universiteta*, № 4, pp. 12-19.

Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 9.035	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2021 **Issue:** 06 **Volume:** 98

Published: 04.06.2021 **http://T-Science.org**

QR – Issue QR – Article

Jumiati Sasmita
University of Riau
Jl. Binawidya Km 12.5, 28291,
Pekanbaru Riau, Indonesia
Faculty of Economics and Business

CULINARY BUSINESS STRATEGIES DURING COVID-19 IN THE TURAP SIAK SRI INDRAPURA'S VOCATIONAL SCHOOL OF CULINARY TOURISM

Abstract: *This study is entitled Culinary Business Strategies during the Covid-19 in the Siak Sri Indrapura Culinary Tourism Area. This study aims to determine a strategy that can be applied by the culinary business to be able to adapt to the crisis during the Covid-19 period. A descriptive method using a qualitative approach was employed in this study with the help of the EFE Matrix (External Factor Evaluation) and IFE (Internal Factor Evaluation). The EFE Matrix helped the decision-making to summarize and evaluate external environmental information. Meanwhile, the Internal-External (IE) Matrix was used to map the total score of the IFE and EFE matrices. SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats) had also a role major in developing profitable business strategies. Based on the results of data analysis and discussion, it can be concluded that the adaptation strategy that can be carried out during a pandemic is a strategy of product and service diversification, by implementing health protocols as strictly as possible to prevent a prolonged pandemic, cleaning turap culinary locations with disinfectants to win consumer trust, providing take away and delivery order services, carrying out online sales, processing and packaging product hygienically according to customer desires, innovating food menu that can increase body immunity, trying to maintain regular customers, and establishing good relationships with new customers to win the competition with other culinary businesses.*

Key words: *Business strategies, Covid-19, SWOT Analysis.*

Language: *English*

Citation: Sasmita, J. (2021). Culinary business strategies during COVID-19 in the turap siak sri indrapura's vocational school of culinary tourism. *ISJ Theoretical & Applied Science, 06 (98)*, 72-82.

Soi: http://s-o-i.org/1.1/TAS-06-98-10 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2021.06.98.10

Scopus ASCC: *2000.*

Introduction

Background of the Study

The Coronavirus pandemic that is currently happening in Indonesia as well as in other countries has a major impact on the economy of various sectors, especially Micro, Small, and Medium Enterprises (MSMEs). Among the MSMEs, the type of business that is most affected is the culinary business. This is the result of a survey conducted by Paper.id in collaboration with SMESCO and OK OCE in conducting a survey entitled "The Impact of the Covid-19 Pandemic on MSMEs." This survey was conducted online and submitted. Based on existing data findings, 78 percent of respondents admitted to experiencing a decrease in turnover. The largest category was in the decline of more than 20 percent (67.50 percent) and occurred in almost all business sectors. The survey data showed that there are three types of businesses that experience the greatest impact, namely culinary (43.09 percent), services (26.02 percent), and fashion (13.01 percent). One of the sectors of the economy that has been seriously affected is the culinary industry. Many culinary businesses in the world have been forced to close their businesses for a while or even go bankrupt. Burhan (2020) argued that the culinary sector experienced a decrease in daily income reaching 37%, the fashion retail sector decreased to 35%, while the beauty services decreased to 43%.

Cooperatives, Small and Medium Enterprise, and Trade Office of Riau noted that during the Covid-19 pandemic that occurred in Riau, there were hundreds of thousands of Small and Medium Enterprises (SMEs) and Small and Medium Industries (SMIs) that is affected during a pandemic, these SMEs and SMIs cannot run their business. Head of the Riau Cooperatives, Small and Medium Enterprise, and Trade Office, Asrizal, stated that there were around 10 thousand IKMs and 263 thousand SMEs that have been recorded as being affected with Covid-19.

The impact of the Covid-19 pandemic on the tourism business in Riau was felt for those involved in it. Thus, substantial losses cannot be avoided. The Riau Province Tourism Office calculated that the losses due to Covid-19 are around IDR 7 billion. The Covid-19 pandemic has made the regional income of Siak Regency, especially from the tourism sector, drop dramatically in 2020.

The tourism objects of the Siak Palace and Netherlands Barrack recorded only getting IDR 533,975,000 from ticket sales throughout 2020. This amount of revenue is very far from the figure targeted by the Siak Regency Government of IDR 2 billion. Compared to 2019, Siak Regency's revenue from the tourism sector reached IDR 1.5 billion.

Since the pandemic period began to worry in early April 2020, the Regent of Siak, Alfedri, took a policy to close all tourist attractions. In June, the tourism sector was opened to the public with the application of health protocols, but it only lasted for a few days until it was closed again in early November 2020. Siak Palace was closed since March 2020 leading the people's economy around the tourist area was very sluggish or even died during the pandemic even though the Siak Palace has been an icon of regional tourism.

RIAU24.COM wrote that the coronavirus or Covid-19 in Siak has claimed many victims. The appeal for a ban on leaving the house has a bad impact on culinary tourism traders in Turap, Siak Subdistrict, Siak Regency. Furthermore, they claimed to have decreased sales turnover by up to 80 percent. Some of them even admit that there is no buying and selling at their place of sale.

The coronavirus pandemic that has occurred in various regions has hit the economy of the community. Sales turnover has even dropped dramatically by 50 to 80 percent due to this virus outbreak. Sales turnover fell due to people reducing their activities outside the home. They confine themselves in their homes and only go out when they need important things. Moreover, in recent weeks, there has been an appeal from the government for the buyers to only buy take-away food.

Meanwhile, based on field observations several places selling various foods and drinks at Turap Siak tourism place are still open as usual. However, due to the Coronavirus pandemic, this place which is usually busy is currently quiet. Moreover, along the banks of the Siak River, no people are sitting and resting and only a few traders are cleaning their stalls.

Turap is a place that is located along the banks of the Siak river which is the center of culinary tourism in the Siak, the City of the Palace, where along the Siak river are lined up with traders selling various culinary delights. Therefore, it is normally one of the tourist destinations both from inside and outside Siak City. The objective of this study is to find a strategy that the culinary industry can use to improve its ability to respond to the crisis during the Covid-19 period.

Literature Review

Definition of Culinary Business

The food (culinary) business or industry is one of the industries that is currently booming and has a lot of room for expansion. Culinary refers to activities including food preparation. Culinary arts, namely the art of preparing, cooking, and serving food, are among the activities covered by the term culinary.

The culinary business is a type of business that is profitable and will always be in demand all the time. Foof is a basic human requirement that cannot be separated from our life for this reason. There are numerous areas in this culinary sector, ranging from snacks to drinks to stable foods. Depending on how the seller distributes the products, all categories in this culinary business (snacks, drinks, and essentials) have a lot of potential.

Griffin and Ebert (in Sancoko, 2015) define business as all activities and institutions producing goods and services in everyday life, while the specific definition of business is an organization that provides goods and services that aim to make a profit. Thus, business is all activities producing goods and services that aim to make a profit. Hence, it can be said that the culinary business is the activity of producing dishes, whether in the form of side dishes, snacks, or drinks to make a profit.Culinary business can also be said as a type of business carried out by someone engaged in the food sector.

According towartawirausaha.com (2013), there are 7 basic concepts of culinary business concepts that have to be considered for business continuity: 1) Taste. The taste of the food has to be adjusted to the target market. Thus, a market survey of consumer preference in the area of business has to be conducted. Furthermore, being objective in the taste of the product to be sold has to be avoided. A seller should not pay attention to his or her tastes and desires only.2)Lifestyle. Currently, food is not only a means to satisfy hunger, but also a part of a lifestyle. 3) Purchasing power. A seller has to pay attention to the source of raw ingredients, production flow, production process, equipment, product advantages, and product packaging. Thus, a seller is not only selling the products if raw ingredients are difficult to

obtain, but it might also disrupt the production process. 4) Marketing plan. Before deciding which company to execute, it is better to analyze the market and marketing style. Giving a discount when the company opens for the first time as a promotion is preferable.5) Location. Location determines the level of competition. Culinary business sites that are located in strategic places, such as education and offices will make many people see and access. Not only in the room but the parking space is required to be taken into account. Naturally, interfering with access to public roads and chaotic settings is forbidden. 6)Hygiene. The place where the food is served has to be clean. Every guest goes to the chair as soon as it is cleaned. The food presentation also pays attention to cleanliness. However, a comfortable atmosphere of the place will increase customer's appetite. 7) Suggestion Box. A suggestion box or SMS center for customer feedback should be provided. Discounts or promotions to customers who are willing to make a positive contribution to the business should be given. Interaction with customers can also be done through social media. A special account to interact while promoting its culinary activities should also be provided.

According to Kanya Anindita (2020),there are 5 ways for restaurant businesses to optimize business opportunities during the Covid-19 pandemic. Even though the Covid-19 pandemic has made many types of businesses lose a lot of turnovers, that does not mean restaurant businesses have to experience the same thing. The restaurant business can optimize business opportunities in times of crisis because many people rely on restaurants for their daily food needs. The following are five ways that restaurant business owners can optimize their business opportunities amid the Coronavirus outbreak. 1) Improving takeaway and delivery quality is the time for restaurant owners to focus on takeaway and delivery services. First, the food presentation needs to be improved, because this will give a good impression to customers. The owner can also take advantage of this good food presentation for photo competitions on Instagram. Second, concern for customers needs to be shown by giving greeting cards or writing on the packaging of their orders. A thank you to customers for their loyalty to the restaurant they chose in this difficult situation or a note reminding them to wash their hands before enjoying the food ordered will give the customer a special memory. Third, the serving time of restaurant orders can be increased to be able to fulfill more customer orders each day. This can be done if a restaurant has a kitchen display system (KDS). KDS makes it easy for cooks to accept incoming orders, set priorities for serving orders, determine estimated serving times, and much more. Fourth, customers can order menus at restaurants easily. If the restaurant does not have its website, it should at least be easy to find on social media like Instagram. Customers are allowed to order via WhatsApp and telephone. A restaurant can also be registered in a delivery order app such as GoFood or GrabFood. 2) Adding healthy menu variants. To show the restaurant's concern for health, adding a new, healthier menu variant should be considered.During the Covid-19 pandemic, public concern for healthy food is increasing. Therefore, this situation can be taken advantage of. It can also help increase business opportunities by bringing in new customers (for example, those who enjoy a healthy lifestyle or are on a diet. 3) Managing employee shifts effectively. 4) Optimizing the food supplie. The most critical aspect of running a restaurant is keeping food on hand. Culinary entrepreneurs do not want to miss out on business chances because restaurant outlets run out of food ingredients. On the other hand, they do not want to experience waste due to storing too much stock. 5) Focusing on digital marketing. In the current physical distancing situation, it is the right moment to take advantage of digital marketing. People spend more time at home relying on the internet. Thus, posting ads on social media and sending marketing emails is a great way to optimize a restaurant business opportunity. Creating interesting content regularly on Instagram can also be done. Culinary entrepreneurs can post free and paid advertisements, but paying for ad posts will certainly get them more exposure. Culinary entrepreneurs can also consider filling the website with content that is useful to readers and sending that content to subscribers by email regularly.

Tips for culinary business to survive during the Corona pandemic is also shared by Muhayati Faridatun (2020). This pandemic has a major impact on all sectors of life, including in the field of Macro, Small, and Medium Enterprises (MSMEs). Many business sectors have gone out of business, including entrepreneurs.Even though his business experienced a major decline, Christoper did not immediately give up. The culinary entrepreneur who owns three brands immediately developed a new strategy, which can help his business survive during a pandemic. A strategy is a must. Even with a strategy, it is still difficult due to the current conditions (pandemic).Christoper shared tips applied by budding businessmen in the culinary field as follows: 1) pushing in the online industry, such as in a delivery or marketplace application, 2) giving maximum discounts and promos online, and 3) launching frozen food products to enable food to last for a few days.

Strategy

Definition of Strategy

Rangkuti (2014) states that strategy is a tool to achieve goals. Daft (2010) defines strategy as an action plan that explains the allocation of resources and various activities to face the environment, gain competitive advantage, and achieve company goals. Meanwhile, Sedarmayanti (2014) argues that strategy is a plan to increase influence on the market, both in

the short and long term, which is based on market research, appraisal, product planning, promotion and sales planning, and distribution. Furthermore, Pearce andRobinson (in Sancoko, 2015) define strategy as a plan on a large scale and future-oriented to interact with a competitive environment to achieve company objectives.Furthermore, according to Johnson and Scholes (2016), strategy is the direction and scope of an organization in the long term that achieves benefits for the organization through the configuration of resources in a challenging environment. Moreover, according to David & Wheelen (20011), strategy is a way to achieve long-term goals. Furthermore, according to Anthony and Govindarajan (2011), strategy is a systematic management process that is defined as a process in making decisions on programs to be implemented by the organization and an estimate of the resources that will be allocated in each program over the next few years.

- Business Strategy

Business strategy is the ability of entrepreneurs/companies in analyzing the external and internal environment of the company, formulating strategies, executing (implementing) plans designed to achieve company goals, as well as evaluating to get feedback in formulating future strategies.This variable is measured by three dimensions, namely, differentiation, low cost, and focus strategy(Mahmud and Anomsari,2011). Business strategy can take the form of geographic expansion, diversification, acquisition, product development, market penetration, employee rationalization, divestment, liquidation, and joint ventures.

Business strategy refers to the actions and decisions a company takes to achieve its business goals and be competitive in its industry(Sugi Priharto 2020). There are several reasons why business strategy is important for the organization for its functions like planning, assessing strengths and weakness, efficiency, and controlling competitive advantage. Meanwhile, components in business strategy are vision and business goals, core value, SWOT analysis, tactics, resource allocation plan, and measurement.

There are 10 tricks to succeed in a culinary business during the pandemic from brand and culinary experts. They are 1) listing of potentials, 2) paying attention to health protocols, 3) maximizing online platforms, 4) getting direct, 5) understanding the process from start to finish, 6) having distinctive features, 7) its capital only contributes 10%, 8) taking advantage of the pre-order technique, 9) understanding self-potential, and 10) managing food waste.

Changes that occur in the business environment have resulted in existing companies trying to adapt their strategies to these changes. A good strategy is a strategy that can adapt to various changes in the business environment that occur to gain a competitive advantage. Competitive advantage can only be achieved through continuous efforts of brainstorming designs and strategies in order to realize sustainable competitive advantages. That way, the company can dominate the old and new markets.

Meanwhile, strategic management according to David & Wheelen (in Juwono, 2011) is a series of managerial decisions and actions that determine the company's long-term performance. Whereas, according to David (in Juwono, 2011) strategic management can be defined as the science of formulating, implementing, and evaluating cross-functional decisions that enable an organization to achieve its goals.

Many business actors have made profits from this culinary business. However, many culinary business actors have gone bankrupt, because the strategies used are not quite right and the quality of service is not optimal. This indicates that the success of a culinary business in winning the competition is determined by the application of the right strategy and the good relationship it has with consumers.

According to Juwono (2011), business strategy is to review the strengths, weaknesses, opportunities, and threats of existing business; always updating the strategies formulated to suit developments and responding to the external environment which is always changing; will change and will continue to change; innovating products to be always with consumer tastes and striving to always have product development; implementing and evaluate the chosen strategy effectively and efficiently; as well as evaluating performance, reviewing the situation and making various adjustments and corrections if there are deviations in the implementation of the strategy. Meanwhile, the benefits of strategic management according to Juwono (2011) are that it can solve problems faced by the company faster and more precisely; become more sensitive in responding to threats that come from outside the company; make the best decisions because group interaction brings together a larger variety of strategies; cooperation within the employee team in the formulation of strategies will be able to improve their understanding of productivity rewards in every strategic plan and thus increase their work motivation; and that organizations that use strategic management concepts will be more profitable and more successful.Hitt, et al., (in Juwono, 2011) explained that the strategic management process is to determine the direction and mission of the organization, understand the internal and external environment and then formulate a strategy.

- SWOT Analysis

According to Rangkuti (2014), a SWOT analysisis the methodological identification of many aspects in order to build a firm strategy. The reasoning behind this study is to optimize strengths and possibilities. However, it minimizes weaknesses and

threats at the same time. The strategic decision-making process is always related to the development of the company's mission, objectives, strategies, and policies. Thus, strategic planning must analyze the company's strategic factors (weaknesses, strengths, opportunities, and threats) and current conditions. This is called a situation analysis. The most popular model for this is the SWOT analysis.

- Covid-19

Coronavirus Disease (Covid -19) is an infectious disease caused by the newly discovered coronavirus known as acute or severe respiratory syndrome coronavirus 2 (SARS -CoV-2). Lina Sayekti (2020)stated that besides having a serious impact on health, the Covid-19 pandemic also weakens the national and international economy. Various industrial sectors, including the culinary business, experienced disruption. The coronavirus pandemic that is currently happening in Indonesia as well as in other countries has had a major impact on the economy of various sectors, especially in the culinary business sector. Business activities are required to adapt to the new behavior of people who apply for work from home and social distancing.Currently, consumers cannot dine in and various restaurants only focus on take-away and delivery orders. Business operators are obliged to rack their brains to think of new strategies to survive the pandemic.Furthermore, Gloria Fransisca Katharina Lawiin 2020 (Bisnis.com) suggests that about 3 months of Large-Scale Social Restrictions in almost all regions of Indonesia have had a major downturn impact on the culinary business, causing profit to be reduced by up to 90%.According to Soraya Novika (2020), the food and beverage industry in Indonesia might face serious challenges from the impact of the spread of the Coronavirus (Covid-19). Due to Covid-19, household consumption growth has fallen once, usually 5%, and in the first quarter of 2020, it was only 2.84%. moreover, household consumption that is contributed by food and beverage and health care is very significant 44%.

Furthermore, according to Angga Bratadharma (2021), the Covid-19 pandemic that has hit since 2020 has had a huge impact on human life. Not only affects health problems, however, the pandemic has also rocked various industrial and business sectors with one of the biggest impacts being the culinary business or Food and Beverage (F&B).In a pandemic that has not yet ended, business actors continue to strive to rise from adversity. To face all kinds of challenges, they are required to be more creative by maximizing their marketing strategies, both online and offline sales. Moreover, business actors are required to be clever at looking at the opportunities that exist in the market and the current capacities of society. This is important to make business actors in the culinary field survive amid uncertainty and fierce competition.

Research Methods

This study employed the followings:

- Descriptive method using a qualitative approach is research conducted by providing a more detailed description of a symptom or phenomenon by looking at the object in the form of the current condition that is taking place.According to Bogdan and Taylor (in Moleong, 2014), qualitative research is a research procedure that produces descriptive data in the form of written or spoken words from people and observable behavior. Meanwhile, Sugiyono (2011) argues that a qualitative approach tends to direct research towards descriptive types of research. Descriptive research can describe and provide an understanding of reality. The research data were analyzed using descriptive statistics, with the interpretation of the average score.
- EFE (External Factor Evaluation) and IFE (Internal Factor Evaluation). The EFE matrix helps decision-making to summarize and evaluate external environmental information, namely economic, social, cultural, demographic, environmental, political, government, technology, and so on. The IFE matrix is used to summarize and evaluate the main strengths and weaknesses faced by the company (Hendri-yani, 2010).
- Internal-External (IE). IE matrix is used to map the total score of the IFE and EFE matrices generated from the company's external and internal audits. The IE matrix consists of two dimensions, namely the total score of the IFE matrix and the total score of the EFE matrix. The total score of the IFE matrix is mapped on the X-axis with a score of 1.0 to 1.99 which states that the internal position is weak, 2.0 to 2.99 for the average position, and 3.0 to 4.0 for a strong position.
- SWOT analysis (Strengths, Weakness, Opportunities, and Threats) is a simple analysis method but has a big role in developing a profitable business strategy. According to Rangkuti (2013), almost every company and business observer in their approach use a lot of SWOT analysis. This analysis systematically identifies various factors to formulate a corporate strategy. This analysis is based on logic to maximize strengths and opportunities, but at the same time minimizes weaknesses and threats.

Research Results And Discussion

Internal and External Factors of Siak Sri Indrapura Plaster Culinary Business during the Pandemic Period are presented in this section. Internal factors for the strength possessed by the culinary business in Siak Sri Indrapura during this pandemic are the *turap* culinary business area located in the open on the banks of the Siak river with a layout which is already at a distance from one table to another and has implemented health protocols by always using masks and providing handwashing stations to protect employees and consumers, cleaning sales locations

with disinfectants, some culinary businesses are already selling online, and providing discounts and promos online maximally via online. The company has implemented sales by implementing a take-away and delivery orders system, improved product processing and packaging to be more hygienic, already had loyal customers, innovated in the form of new healthy menus at low prices and optimized the management of foodstuff stocks, implemented competitive price, and had an attractive and unique view.

Meanwhile, internal factors that become weaknesses are providing additional costs for implementing health protocols, experiencing the impact of a significant decrease in sales, depending on business continuity on sales by delivery, and thinking more about survival than pursuing profit. The performance of the culinary business is disrupted because it is forced to reduce the number of employees, difficulties in obtaining raw ingredients, and difficulties in retaining competent employees, difficulties in paying employee salaries.

Then, the external factors for the opportunities owned by Siak Sri Indrapura's culinary business during this pandemic, namely consumers have started to pay attention to health, including in terms of choosing food. Customers prefer food that in the takeaway and delivery orders services. Consumers have begun to switch to purchasing WhatsApp and Instagram, the government's seriousness in driving the economy while overcoming the pandemic, opened new market segments in the form of hygienic packaged food and frozen food and culinary business entrepreneurs are still able to establish a good relationship with customers.

- Internal Factor Analysis Summary (IFAS)

Based on the Internal Factor Analysis Summary (IFAS), it shows that the strength with the highest value is to innovate in the form of new healthy menus at low prices. This is understandable, considering that during the pandemic the purchasing power of the community was low. Thus, there is a need for new menu innovations that arevery affordable to consumers during the pandemic while still paying attention to hygiene. Meanwhile, the main drawback is experiencing the impact of a significant decrease in sales. This is due to the decline in consumer demand during this pandemic, which has resulted in a decrease in the income of *turap* culinary entrepreneurs. Almost all *turap* culinary companies in Siak Sri Indrapura experienced a decline in incoming during this pandemic. Thus, making innovative innovations for products that are sold to survive is a better choice.

The results of the IFAS matrix show that the culinary business value score during the pandemic was 3,400, which was above the average value of 3,314 from all internal factors. Meanwhile, the results of the value of strengths were greater than weaknesses, with a score of 1,767, greater than 1,713. the two values are not far apart, this shows the optimism of culinary business entrepreneurs in difficult times like today.

- External Factor Analysis Summary (EFAS)

The highest score for opportunity is the government's attention and seriousness in driving the economy while overcoming the pandemic. This shows that the culinary business is very dependent on government policies in overcoming the pandemic. Meanwhile, the biggest threat lies in three things, namely the application of social distancing which causes a decrease in the number of customers coming, a decrease in public consumption and purchasing power, and the need for government attention to maintain the performance of the culinary business during this pandemic. These three factors have the same points and have a close relationship, where the application of social distancing causes a decrease in the number of customers who come. Then, the decrease in the number of customers is not only due to social distancing and stay-at-home policy factors, but also caused by a decrease in consumption and purchasing power of the people due to community caution in shopping during the pandemic, which is estimated to be still long. Therefore, the government's concern for maintaining the performance of the culinary business during this pandemic is very necessary to keep the economy running.

The results of the EFAS matrix show that the culinary business value score during this pandemic was 3,375 above the average value of 3,342 from all external factors. The results of the opportunities value of 1,345 show a smaller number than the threats, which is 2,128. this shows that the threats faced by the culinary business during this pandemic are greater than the existing opportunities. That is why many businesses have been forced to close, including the culinary business in Turap Siak Sri Indrapura, which has also closed.

- SWOT Analysis

A SWOT analysis was conducted to find the right strategy for the culinary business to deal with a pandemic. This SWOT analysis was translated into a SWOT matrix that describes the conditions faced by the culinary business during this pandemic. This matrix was used to help determine the right strategy.

Table 1. Turap Siak Culinary Business SWOT Analysis Matrix 2021

IFAS EFAS	STRENGTHS (S) 1. The business has a very beautiful and attractive culinary location. 2. It has a unique regional cuisine. 3. It has implemented sales by implementing takeaway and delivery order services. 4. It has health protocols to protect employees and customers. 5. The culinary area is cleaned using a disinfectant. 6. Product processing and packaging are improved to be more hygienic. 7. The business has loyal customers 8. It carries out online sales	WEAKNESSES (W) 1. The business experienced a significant drop in sales, 2. It incurs additional costs to implement health protocols, 3. It focuses more on survival than on the pursuit of profit, 4. Most of the employees just relax because no customers are coming in, 5. The performance of the culinary business is disrupted because it is forced to reduce the number of employees. 6. There is difficulty in buying/getting raw ingredients. 7. Many raw ingredients are rotten, due to lack of sales.
OPPORTUNITIES (O) 1. consumers nowadays pay more attention to health, including gin choosing hygienic foods. 2. Customers prefer food using take away and delivery order services. 3. Customers are starting to switch to purchasing via WhatsApp. 4. The government's attention and seriousness in driving the economy while overcoming the pandemic. 5. The opening of a new market segment that wants hygienic packaged food and frozen food. 6. The ability to establish good relationships with customers. 7. Siak has a tourist attraction that automatically increases culinary tourism.	S-O STRATEGY 1. Adopting health protocols as strictly as possible to generate consumer trust. 2. Increasing consumer confidence by frequently cleaning culinary locations with disinfectants. 3. Implementing sales by using takeaway and delivery order services. 4. Doing online sales. 5. Processing and packaging products hygienically. 6. Maintaining loyal customers and building good relationships with new customers.	W-O STRATEGY 1. Prioritizing take away and delivery order systems to reduce the cost of implementing health protocols. 2. Maintaining business continuity, by switching to foods that are healthy, hygienically packaged, and frozen food. 3. Reducing the impact of the decline in sales, establishing good relationships with customers, and doing online marketing. 4. Establishing good cooperation with raw ingredients suppliers and ordering them online. 5. Taking advantage of the government's attention, such as the existence of various stimuli and assistance to drive the economy.
THREATS (T) 1. There is a government policy to close tourist attractions during the pandemic. 2. The pandemic is expected to last a long time. 3. The application of the concept of social distancing and stay at home has resulted in a decrease in the number of customers who come. 4. Customers might be more interested in the culinary business by processing and packaging food that is more hygienic.	S-T STRATEGY 1. Adopting health protocols as strictly as possible to prevent a long-running pandemic, generating consumer confidence, and winning the competition with similar businesses. 2. Cleaning the culinary area with disinfectant to reassure consumers. 3. Limiting the number of arriving customers by implementing takeaway and delivery orders. 4. Processing and packaging products hygienically to meet consumer demands	W-T STRATEGY 1. Prioritizing take away and delivery order systems to reduce the cost of implementing health protocols. 2. Maintaining business continuity by switching to foods that can increase body immunity, as well as hygienically processed and packaged. 3. Taking advantage of government assistance to maintain the performance of culinary business entrepreneurs during this pandemic.

5. Customers prefer healthy foods to increase their immunity. 6. A limited supply of raw ingredients. 7. There is a decrease in consumption and purchasing power. 8. There is competition with similar businesses.	5. Switching to a diet that can increase body immunity. 6. Maintaining regular customers and building good relationships with new customers to win the competition with similar businesses.	

Furthermore, Figure 1 below visualizes the value scores for each strategy obtained. It can be seen that the biggest strategy value was in the Strengths-Threats (ST) Strategy, with a score of 3.783, followed by the Weaknesses-Threats (WT) Strategy of 3.766, the Strengths-Opportunities (SO) strategy of 3.154, and the Weaknesses-Opportunities (WO) strategy of 3.766-2.859 at last.

IFAS / EFAS	STRENGHT (S)	WEAKNESSES (W
OPPORTUNITIES (O)	TRATEGI S-O : = 1,686 + 1,468 = 3,154	STRATEGI W-O : = 1,603 + 1,256 = 2,859
THREATS (T)	TRATEGI S-T : = 1,695 + 2,088 = 3,783	STRATEGI W-T : = 1,607 + 2,159 = 3,766

Figure 1 - Matrix Strategy Combination Formulation

Formulation of SWOT Matrix Strategy Combination

Figure 1 presents that the position of the culinary business during this pandemic was in quadrant II, in the diversification strategy quadrant where even though this business faces various threats, it still has strength from an internal perspective. The strategy that could be applied is to use strength to take advantage of long-term opportunities utilizing a diversification strategy (product/market). This strategy is made based on the strengths that the company has to anticipate existing threats. The use of the Strengths-Threats (ST) strategy indicates that the culinary business in Siak Sri Indrapura is obliged to use the strengths of the culinary business to overcome the threat of a pandemic impact. ST strategy uses the company's internal strength to avoid or reduce the impact of external threats.

Analysis of Internal-External (IE) Matrix

Internal analysis shows that the total internal factor value was 3,400. external analysis shows the total external factor of 3,273. furthermore, the Internal-External Matrixwas used to find out how the position of the culinary business in this pandemic. The matching stage is the second stage of the culinary business strategy formulation process in order to adapt to the recovery period, by combining the various strengths and weaknesses of the culinary business from the internal environment with the various opportunities and threats it faces from the external environment.

IFAS / EFAS	Strength 4,000 –3,000	Medium 2,999 – 2,000	Weakness 1,999 –1,000
High 4,000 – 3,00	Internal = 3,400 Eksternal = 3,273	II	III
Medium 2,999 – 2,000	IV	V	VI
Low 1,999 – 1,000	VI	VII	VIII

Figure 2 - Internal-External (IE) Matrix

Internal-External (IE) Matrix

The IFAS matrix value of 3,400 indicates that the culinary business during the pandemic has relatively high internal factors in terms of utilizing its strengths to cover existing internal weaknesses. The EFAS matrix value of 3,273 shows that the culinary business during the pandemic has a relatively high ability in terms of taking advantage of the opportunities they have to overcome existing threats.

Discussion

The results show that internally, the culinary business in Siak Sri Indrapura during the pandemic has several strengths which, if arranged from the highest to the lowest order, are as follows: having a culinary location that is very beautiful and attractive, having a unique regional cuisine, having implemented sales by takeaway and delivery order services, having implemented health protocols to protect employees and customers, cleaning the culinary area with disinfectants, being a culinary tourism area, improving product processing and packaging to be more hygienic, and having regular customers.

Meanwhile, the weaknesses of the culinary business during this pandemic, according to the order, are experiencing the impact of a significant decrease in sales, incurring additional costs for implementing health protocols, focusing more on survival rather than pursuing profit, relaxed employees due to no customers, disrupted culinary business performance because it is forced to reduce the number of employees, and the difficulty to obtain or buy raw ingredients as well as many ingredients are rotten due to lack of sales.

From the external side, the culinary business during this pandemic has several opportunities which, if sorted, are as follows: nowadays, consumers pay more attention to health, including in choosing hygienic food. Customers prefer restaurants that provide takeaway or delivery order services. Customers are starting to switch to purchasing via WhatsApp. Moreover, the attention and seriousness of the government in driving the economy while overcoming the pandemic open up new market segments that want hygienic and frozen food packing. A good relationship with customers will also be established. Moreover, Siak has a tourist attraction that automatically impacts increasing culinary tourism. Whereas, the threats faced according to the sequence are the existence of government policies to close tourist attractions during the pandemic. The pandemic will most likely last for a long time. Furthermore, the employment of social distancing and stay-at-home notions reduces the number of customers that come in. The customer might be more interested in the culinary business, which involves more sanitary preparation and packaging of food. Customers prefer healthy food to increase immunity. Hampered supply of ingredients, decreasing consumption, and purchasing power of the community are also threats. Moreover, there is competition with similar businesses.

SWOT Analysis Results

This shows that the position of the culinary business in Siak Sri Indrapura during the pandemic is in quadrant II. In that position, the best strategy to do is diversification (product/service). The culinary business in Siak is required to gain consumer confidence that the food produced is safe and hygienic, apply strict health protocols, take advantage of new open market segments in the form of takeaway and delivery order services, carry out online sales, carry out market development by online sale and promotions, innovate products in the form of healthy food and frozen food, and improve the quality and taste of dishes to win the competition.

Overall, the analysis of the culinary business strategy indicates that several business adaptation strategies can be formulated during the pandemic. For example, the culinary business in Siak Sri Indrapura is required to implement strict health protocols to prevent this pandemic from taking a long time. Furthermore, this might also lead to customer confidence in the culinary products produced. Implementing online sales, providing takeaway and delivery order services, can also be done to overcome the decline in the number of customers who come. Food served to consumers must be hygienically processed and packaged. Furthermore, product diversification can be done by innovating a food menu that can increase the body's immunity that is needed by consumers during the pandemic. Moreover, the next strategy that can be done is to always try to retain customers by establishing good relationships with customers, giving discounts to repeat customers. If all these adaptation strategies have been carried out, it is expected that the culinary business can survive in the midst of a pandemic that is not yet clear when it will end.

Conclusion And Suggestions

Conclusion

Based on the results of data analysis and discussion, it can be concluded that the adaptation strategy that can be carried out during a pandemic is a product and service diversification strategy, by implementing health protocols as strictly as possible to prevent a long-lasting pandemic, cleaning the culinary place with disinfectants to win customer trust, providing take away a delivery order services, carrying out online sales, processing and packaging products hygienically according to customer desires, innovating food menu that can increase body immunity, and trying to maintain regular customers as well as establishing a good relationship with new customers to win the competition with other culinary businesses.

Suggestions

Based on the description above, the following can be suggested: The culinary business should try to make innovations or breakthrough menus and adjust to the circumstances to increase sales such as creating menus that can be sold online.The culinary business should also increase employee creativity, by providing activities that can make use of employee time by making food that can last a long time and can be sold online such as fish chips, billsBengkalis fish chips. To overcome difficulties in obtaining ingredients, several raw materials can be grown or should be planted such as ginger, turmeric, lemongrass, kale, bean sprouts, and others. Thus, ingredients can be produced by themselves. Furthermore, the purchase of foodstuffs is reduced during the pandemic, resulting in savings.

References:

1. Anthony, N. R., & Govindarajan (2011). *Sistem Pengendalian Manajemen*. Tanggerang: Karisma Publishing Group.
2. Angga, B. (2021). *Pelaku Bisnis Kuliner Terus Berjuang di Tengah Pandemi Covid-19*. Retrieved March, 24, 2021 from https://www.medcom.id/ekonomi/bisnis/ybJWgrWk-pelaku-bisnis-kuliner-terus-berjuang-di-tengah-pandemi-covid-19
3. Bogdan and Taylor (inMoleong, 2014). *Metodologi Penelitian Kualitatif*. Bandung: PT. Remaja Rosdakarya.
4. Burhan, F. A. (2020). *Bisnis Anjlok akibat Pandemi Corona, UMKM Bisa Ubah Strategi Usaha.* Retrieved July, 11, 2020 from https://katadata.co.id/berita/2020/04/15/bisnis-anjlok-akibat-pandemi-corona-umkm-bisa-ubah-strategi-usaha
5. David & Wheelen (inJuwono, 2011). *Juwono, Onny. 2011. Analisis Manajemen Strategik Perusahaan Waralaba* (Franchise) (Studi Kasus di RestoranCepatSaji McDonald'sPeriodeOktober - Desember 2011).
6. Daft, R. L. (2010). *Era Baru Manajemen*. Salemba Empat, Jakarta.
7. Griffin and Ebert (inSancoko, 2015). Sancoko, Aldo Hardi. 2015. Strategi Pengembangan Bisnis Usaha Makanan dan Minuman pada Depot Time to Eat Surabaya. *AGORA*, Vol. 3, No. 1, (2015).
8. Gloria Fransisca Katharina Lawi (2020). *in (Bisnis.com) Bisnis.comdengan judul "Tertatih-tatihnya Bisnis Kuliner Akibat Covid-19", Klik selengkapnya di sini:* (n.d.). Retrieved from https://traveling.bisnis.com/read/20200602/223/1247486/tertatih-tatihnya-bisnis-kuliner-akibat-covid-19
9. Hendri-yani (2016). Strategi Pengembangan Bisnis Restoran Makassar Berbahan Baku Hasil Ternak dalam Mendukung Penyediaan Makanan Sehat (Studi Kasus di Restoran Marannu dan Karebosi Kelapa Gading) *Manajemen IKM*. Vol. 11 No. 1 http://journal.ipb.ac.id/index.php/jurnalmpi/
10. Juwono, O. (2011). *Analisis Manajemen Strategik Perusahaan Waralaba* (Franchise) (Studi Kasus di RestoranCepatSaji McDonald's PeriodeOktober - Desember 2011).
11. Johnson, G., & Scholes, K. (2016). *Exploring Corporate Strategy*. 8 Edition. Boston: Prentice Hall.
12. (2020). *Kanalinfo.web.id. Pengertian Kuliner*. Retrieved July, 17, 2020 from https://www.kanalinfo.web.id/pengertian-kuliner#:~:text=Kuliner%20juga%20dapat%20dimaknai%20sebagai,%2Dpauk%2C%20panganan%20maupun%20minuman.&text=Kata%20kuliner%20merupakan%20unsur%20serapan,kuliner%20disebut%20koki%20atau%20chef
13. (2020). *Kanya Anindita*. Retrieved from https://www.hashmicro.com/id/blog/mengoptimalkan-peluang-usaha-restoran-saat-pandemi-covid19/
14. Mahmud, A.A. (2011). *Jurnal Analisis Pengaruh Orientasi Kewirausahaan, Kemampuan Manajemen, dan Strategi B isnis Dalam Peningkatan Kinerja Perusahaan* (Studi Pada Usaha Kecil Menengah Di Kawasan Usaha Barito Semarang) ISBN 979 -26-0255-0.
15. Muhayati, F. (2020). *10 TrikSuksesBerbisnisKuliner Di Masa Pandemi Dari Pakar Brand dan Kuliner*. Retrieved August, 28, 2020 from https://www.dbs.com/spark/index/id_id/site/articles/livesmarter/2020-10-trik-sukses-berbisnis-kuliner-di-masa-pandemi-dari-pakar-brand-dan-kuliner.html
16. Muhayati, F. (2020). *Tips BisnisKulinerBertahan di Masa Pandemi Corona*. Retrieved November, 16, 2020 from https://www.haibunda.com/moms-life/20201116134328-76-173892/tips-bisnis-

kuliner-bertahan-di-masa-pandemi-corona-bunda-perlu-tahu

17. Priharto, S. (2020). *Penge rtian Industri Kreatif dan Contoh Industri Kreatif di Indonesia*. Diakses pada tanggal 25 November 2020 dari. Retrieved from https://accurate.id/bisnis - ukm/.pngertian - industri - kreatif/
18. Rangkuti, F. (2014). *Analisis SWOT: Teknik Membedah Kasus Bisnis*. Jakarta: PT Gramedia Pustaka Utama Coronavirus Disease (Covid -19)
19. Rangkuti, F. (2013). *Teknik Membedah Kasus Bisnis Analisis SWOT Cara Perhitungan Bobot, Rating, dan OCAI*. Penerbit PT. Gramedia Pustaka Utama. Jakarta.
20. (n.d.). RIAU24.COM SIAK- DampakNyata Virus Corona, PedagangWisataKulinerTurapSiakKeluhkanOmzetAnjlok, Retrieved April, 6, 2020 from https://www.riau24.com/berita/baca/1586168729-dampak-nyata-virus-corona-pedagang-wisata-kuliner-turap-siak-keluhkan-omzet-anjlok
21. Sancoko, A. H. (2015). Strategi Pengembangan Bisnis Usaha Makanan dan Minuman pada Depot Time to Eat Surabaya. *AGORA*,Vol. 3, No. 1.
22. Sayekti, L. (2020). *Dalam Menghadapi Pandemi: Memastikan Keselamatan dan Kesehatan di Tempat kerja*, (ILO, 2020), pp. 7.
23. Sugiyono (2017). *Metode Penelitian Kuantitatif, Kualitatif dan R &D*. Bandung:Afabeta.
24. Sedarmayanti (2014). *Manajemen Strategi*. Bandung: PT Refika Aditama.
25. Tagar.id. (2020). *Arti Pandemi, Epidemi, dan Wabah Soal Corona*. Retrieved July, 23, 2020 from https://www.tagar.id/arti-pandemi-epidemi-dan-wabah-soal-corona
26. Taufik dan Ayuningtyas, E. A. (2020). *Dampak Pandemi Covid-19 terhadap Bisnis dan Eksistensi Platform Online.* Jurnal.
27. (2013). *Wartawirausaha.com, 2013. Konsep dasar Bisnis Kuliner*. Retrieved from http://wartawirausaha.com/2013/02/konsep-dasar-bisnis-kuliner/#axzz6vJlHBCCL

Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 9.035	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2021 **Issue:** 06 **Volume:** 98

Published: 05.06.2021 **http://T-Science.org**

QR – Issue QR – Article

Yelena Akhunova
Tashkent Institute of Finance
Senior lecturer
Department of Finance

COMPOSITION AND STRUCTURE OF HOUSEHOLD INCOMES AND EXPENDITURES IN THE REPUBLIC OF UZBEKISTAN

Abstract: *This article examines the concept and socio-economic essence of households, describes the main types of income and expenses of households, analyzes the dynamics of the structure of income and expenses of households in the Republic of Uzbekistan.*

Key words: *population, households, finance, financial relations, household incomes, household expenditures.*

Language: *Russian*

Citation: Akhunova, E. (2021). Composition and structure of household incomes and expenditures in the Republic of Uzbekistan. *ISJ Theoretical & Applied Science, 06 (98)*, 83-87.

Soi: http://s-o-i.org/1.1/TAS-06-98-11 ***Doi***: https://dx.doi.org/10.15863/TAS.2021.06.98.11

Scopus ASCC: *2003.*

СОСТАВ И СТРУКТУРА ДОХОДОВ И РАСХОДОВ ДОМАШНИХ ХОЗЯЙСТВ В РЕСПУБЛИКЕ УЗБЕКИСТАН

Аннотация: *В данной статье рассмотрены понятие и социально-экономическая сущность домашних хозяйств, описаны основные виды доходов и расходов домашних хозяйств, проанализирована динамика структуры доходов и расходов домашних хозяйств в Республике Узбекистан.*

Ключевые слова: *население, домашние хозяйства, финансы, финансовые отношения, доходы домашнего хозяйства, расходы домашнего хозяйства.*

Введение

Развитие экономики и социальной сферы, разработка и реализация государственной финансовой политики и различных программ развития имеют конечной целью повышение уровня жизни населения, обеспечение реализации его трудового, предпринимательского и инвестиционного потенциала, улучшение финансового благополучия и повышение роли домашних хозяйств в финансовой системе государства [1-2].

Домашнее хозяйство можно определить, как одно физическое лицо или группу лиц, проживающих вместе в одном помещении и принимающих самостоятельно различные экономические и финансовые решения. Домашние хозяйства являются одним из важных экономических субъектов, поскольку являются конечным потребителем многих производимых товаров, работ и услуг, представляют предприятиям и организациям различные факторы производства, уплачивают налоги и другие обязательные платежи, сберегают часть полученных доходов, а также осуществляют инвестиции в реальные и финансовые активы [3-4].

Домашние хозяйства как часть финансовой системы государства формируют разнообразные финансовые отношения с другими звеньями, например, участники домашнего хозяйства получают заработную плату от работодателей, пенсию по возрасту или некоторые виды пособий из внебюджетного Пенсионного фонда при Министерстве финансов республики Узбекистан, финансовую помощь от других физических лиц и благотворительных организаций, проценты и дивиденды от инвестиций в различные финансовые инструменты, предлагаемые

финансовым или реальным сектором экономики [5-6].

Функционирование финансов домашних хозяйств связано с функционированием семейного бюджета и других фондов денежных средств, формированием финансовых ресурсов и принятием различных экономических и финансовых решений, например, решений о расходовании или сбережении полученных доходов, оплате расходов, инвестировании временно свободных денежных средств, другими словами с получением различного вида доходов и финансировании разнообразных расходов населения [7-9].

Рассмотрим экономическую сущность и основные показатели доходов и расходов домашних хозяйств. Доходы домашнего хозяйства представляют собой совокупность денежных средств, поступающих в распоряжение домохозяйства в определенный период времени. В Республике Узбекистан для анализа доходов домашних хозяйств в соответствии с Методикой расчета совокупных доходов населения [10] применяются следующие показатели:

– общим показателем, объединяющим доходы населения, полученные из разных источников, является совокупный или общий доход населения, который включает денежные доходы и доходы в натуральной форме и состоит из преимущественно регулярных поступлений. При расчете совокупного дохода населения учитываются поступления домашних хозяйств, получение которых является ожидаемым, осуществляется в основном на регулярной основе с определенной периодичностью. Они должны вносить вклад в текущий уровень экономического благополучия домашнего хозяйства и не должны являться поступлением от выбытия капитала домашнего хозяйства (например, продажа дома, акций и другого имущества);

– в состав совокупных доходов не включаются выигрыши в лотерею, призы, полученные в играх, выплаты по страховым требованиям в возмещение имущественного ущерба, полученные наследства, единовременно выплачиваемые суммы при выходе на пенсию (в отставку), страховые выплаты по страхованию жизни (кроме пожизненной страховой ренты), внезапные (непредвиденные) прибыли, выплаты по искам о нарушении законных прав или о возмещении вреда (кроме выплат в компенсацию упущенных прибылей) и суммы в погашение долга;

– совокупные доходы включают две большие группы доходов – первичные доходы и доходы от трансфертов. Первичные доходы включают доходы, получение которых основано на осуществлении домашними хозяйствами каких-либо видов трудовой, предпринимательской или инвестиционной деятельности, а доходы от трансфертов представляют собой денежные средства, полученные населением в виде пенсий, пособий, стипендий и других подобных платежей;

– первичные доходы населения охватывают доходы от производства и доходы от собственности;

– доходы от производства включают в себя доход от трудовой деятельности и доход от собственного производства услуг для собственного потребления. Доход наемных работников – это доходы в виде оплаты труда в денежной и натуральной (в виде товаров или услуг) форме. Доходом от самостоятельной занятости является доход, полученный вследствие вовлеченности членов домохозяйства в трудовой процесс, организуемый самостоятельно. Доходом от самостоятельной занятости является доход, полученный вследствие вовлеченности членов домохозяйства в трудовой процесс, организуемый самостоятельно. Доходы от собственного производства услуг для собственного потребления включают условно исчисленные услуги жилья, занимаемого самим собственником и не предназначенные для рынка.

– доходы от собственности или имущественные доходы определяются как поступления домохозяйствам, связанные с правом собственности на финансовые и нефинансовые активы, передаваемые для использования другим лицам. Указанные доходы включают поступления в виде процентов, дивидендов, рентных платежей за использование не произведенных активов, а также авторские гонорары за использование интеллектуальной собственности.

– трансферты представляют собой поступления домохозяйству товаров, услуг и активов без получения от него возмещения в виде товара, услуги или актива. Трансферты могут состоять из наличных сумм (денежные трансферты) и из товаров или услуг (трансферты в натуральной форме), поступать от других домохозяйств, государства, благотворительных учреждений и из-за пределов границ государства. Текущие трансферты подразделяются на социальные (пенсии, пособия и стипендии) и прочие (выплаты от организаций и других домохозяйств, например, алименты, поддержка от детей или родителей, выплаты на регулярной основе от благотворительных некоммерческих организаций, профсоюзов). К прочим текущим трансфертам также можно отнести денежные переводы из-за границы, в том числе полученные физическими лицами от трудовой и предпринимательской деятельности.

Далее проанализируем динамику структуры доходов домашних хозяйств в Республике Узбекистан в 2017-2019 годах на основании данных Государственного комитета Республики

Узбекистан по статистике (таблица 1).

Таблица 1. Структура совокупных доходов населения в Республике Узбекистан
(в процентах)

№, п/п	Наименование доходов	2017 г.	2018 г.	2019 г.
1.	Совокупные доходы, всего	100,0	100,0	100,0
	в том числе:			
2.	первичные доходы	79,1	76,1	74,6
2.1.	доход от производства	75,7	73,0	71,7
2.1.1.	доход от трудовой деятельности	73,7	71,0	69,6
2.1.1.1.	доход наемных работников	27,6	26,4	27,3
2.1.1.2.	доход от самостоятельной занятости	46,1	44,6	42,3
2.1.2.	доход от собственного производства услуг для собственного потребления	2,0	2,0	2,1
2.2.	доход от собственности	3,4	3,1	2,9
3.	доход от трансфертов	20,9	23,9	25,4
4.	Из общего объема совокупных доходов доходы от малого предпринимательства	63,3	61,9	59,3

**Источник: данные Государственного комитета Республики Узбекистан по статистике*

На основании анализа данных динамики структуры совокупных доходов населения Республики Узбекистан в 2017-2019 годах можно сделать следующие выводы:

– доля первичных доходов, получаемых населением, уменьшается с 79,1% до 74,6%, тогда как удельный вес различных трансфертов в совокупном доходе домашних хозяйств увеличивается с 20,9% до 25,4%, что может свидетельствовать как об увеличении объемов инструментов социальной защиты населения, так и о положительной динамике сумм, поступающих за счет денежных перевод из других стран;

– доля доходов от трудовой деятельности уменьшается с 73,7% до 69,6%, при этом удельный вес дохода наемных работников практически остается на одном уровне и варьируется в интервале 26,4-27,6%, тогда как удельный вес дохода от самостоятельной занятости уменьшается с 46,1% до 42,3%;

– удельный вес дохода от собственного производства услуг для собственного потребления остается неизменным около 2,0-2,1%;

– доля доходов от собственности в структуре совокупного дохода также уменьшается с 3,4% до 2,9%;

– отдельно необходимо отметить, несмотря на снижение с 63,3% в 2017 году до 59,3% в 2019 году более половины совокупного дохода населения связано с функционированием субъектов малого предпринимательства в Республике Узбекистан, что подтверждает необходимость стимулирования развития данного сектора экономики.

Далее рассмотрим виды расходов домашних хозяйств в соответствии с Методическим положением по обследованию домашних хозяйств [11]:

– в Республике Узбекистан расходы домашних хозяйств подразделяются на потребительские и непотребительские расходы;

– потребительские расходы домашних хозяйств разнообразны и включают в себя такие расходы как покупка продуктов питания, расходы на питание вне дома, покупка алкогольных напитков, табачных изделий, непродовольственных товаров для личного потребления, платные услуги;

– непотребительские расходы домашних хозяйств охватывают расходы на покупку недвижимости, скота, птицы, пчел, арендную плату за землю, квартиру, дом и другие помещения, расходы на ведение подсобного хозяйства, расходы на производственные услуги, налоги, взносы и другие платежи, материальную помощь родственникам и другим лицам, покупку товаров для коммерческих целей, вклады в учреждения банков, покупку акции и других ценных бумаг, погашение кредита, долга и другие непотребительские расходы.

Проанализируем динамику структуры расходов домашних хозяйств в Республике Узбекистан в 2017-2019 годах на основании данных выборочного обследования домашних хозяйств, проводимого Государственным комитетом Республики Узбекистан по статистике (таблица 2).

Таблица 2. Структура расходов домашних хозяйств в Республике Узбекистан
(по результатам выборочного обследования домашних хозяйств; приходится товаров на 100 домашних хозяйств)

№, п/п	Наименование расходов	2017 г.	2018 г.	2019 г.
1.	Всего расходов	100,0	100,0	100,0
	в том числе:			
2.	потребительские расходы	85,3	84,6	84,7
	из них на:			
2.1.	продукты питания	40,3	40,7	38,8
2.2.	непродовольственные товары	28,0	26,9	28,1
2.3.	услуги	17,0	17,0	17,8
3.	непотребительские расходы	14,7	15,4	15,3

**Источник: данные Государственного комитета Республики Узбекистан по статистике*

На основании анализа данных динамики структуры расходов домашних хозяйств Республики Узбекистан в 2017-2019 годах можно сделать следующие выводы:

– большая часть расходов домашних хозяйств направляется на финансирование потребительских расходов. Удельный вес данных расходов составил в 2017 году 85,3%, в 2018 году – 84,6%, в 2019 году – 84,7%;

– доли расходов населения на приобретение продуктов питания, непродовольственных товаров и услуг в указанный период изменяется незначительно и варьируются в интервалах 38,8-40,7%, 26,9-28,1%, 17,0-17,8%, соответственно;

– удельный вес непотребительских расходов населения в 2017-2019 годах постепенно увеличивается с 14,7% в 2017 году до 15,4% и 15,3% в последующие годы.

По итогам изучения экономической сущности, источников формирования и структуры доходов населения, а также основных направлений и структуры расходов домашних хозяйств в Республике Узбекистан можно сделать следующие выводы:

– доходы и расходы домашних хозяйств являются результатом функционирования домашних хозяйств и организации их финансовых отношений с органами государственной власти и управления, коммерческими предприятиями, бюджетными организациями, общественными и благотворительными организациями, другими физическими лицами и свидетельствуют о реализации трудового, предпринимательского или инвестиционного потенциала населения;

– доходы и расходы домашних хозяйств связаны с формированием, распределением и использованием семейного бюджета, личных бюджетов участников домашнего хозяйства, резервного или инвестиционного фондов и других фондов денежных средств домашних хозяйств;

– на процессы формирования доходов и финансирования расходов домашних хозяйств могут влиять различные факторы, например, цели и текущие задачи домашнего хозяйства, макроэкономические факторы, уровень образования и финансовой грамотности членов домашнего хозяйства, принимаемые экономические и финансовые решения;

– в Республике Узбекистан основу доходов домашних хозяйств традиционно составляют доходы наемных работников и доходы от самостоятельной занятости. В последние годы также заметно увеличение удельного веса доходов от социальных и прочих трансфертов в составе совокупных доходов населения;

– в составе расходов домашних хозяйств около 85% занимают потребительские расходы на приобретение продуктов питания, непродовольственных товаров и услуг, тогда как на непотребительские расходы приходится около 15% всех расходов;

– изучение состава и структуры доходов и расходов домашних хозяйств необходимо для разработки и реализации направлений государственной финансовой политики, совершенствованию механизмов оказания финансовой помощи населению, повышения предпринимательской и инвестиционной активности населения, создания и широкого использования различных финансовых инструментов и предоставления домашним хозяйствам широкого спектра разнообразных финансовых услуг.

References:

1. (n.d.). *Konstituciya Respubliki Uzbekistan, prinyataya 8 dekabrya 1992 goda na odinnadcatoi sessii Verhovnogo soveta Respubliki Uzbekistan dvenadcatogo soziva (s izm. i dop.), statya 13.* Retrieved from https://lex.uz/docs/35869
2. (n.d.). *Ukaz Prezidenta Respubliki Uzbekistan ot 07.02.2017 g. № UP-4947 «O Strategii deistvii po dalneishemu razvitiyu Respubliki Uzbekistan»*.
3. Baranova, I. V., & Amagaeva, O. G. (2013). Konceptualnie osnovi finansov domashnih hozyaistv. *Sibirskaya finansovaya shkola*, 5 (100), pp. 53-58.
4. Belozerov, S. A. (2006). Sush'nost i funkcii finansov domashnih hozyaistv. *Vestnik Sankt-Peterburgskogo universiteta. Ekonomika*, № 3, pp. 30-40.
5. Gluhov, V. V. (2010). Rol finansov domashnih hozyaistv v finansovoi sisteme strain. *Sibirskaya finansovaya shkola*, № 5 (82), pp. 72-76.
6. Gluhov, V. V. (2008). Ekonomicheskaya priroda finansov domashnih hozyaistv. *Finansi i kredit*, № 21 (309), pp. 35-38.
7. Gluhov, V. V., Ostanin, V. A., & Rozhkov, Yu. V. (2015). Ekonomicheskaya priroda denezhnih fondov domashnih hozyaistv. *Vestnik Volgogradskogo gosudarstvennogo universiteta. Seriya 3: Ekonomika. Ekologiya*, № 4 (33), pp. 42-51.
8. Gluhov, V. V. (2011). Formi i modeli upravleniya finansami v domashnem hozyaistve. *Problemi ucheta i finansov*, № 1, pp. 3-10.
9. Mgeryan, M. A. (2016). Issledovanie finansov domashnih hozyaistv na makro-, mikro-, nanourovnyah. *Nauchnii vestnik Volgogradskogo filiala RANHiGS. Seriya: Ekonomika*, № 2, pp. 38-44.
10. (2011). *Metodika rascheta sovokupnih dohodov naseleniya, Prilozhenie k postanovleniyu Gosudarstvennogo komiteta po statistike i Ministerstva ekonomiki Respubliki Uzbekistan ot 22 marta 2011 g.* № 3, 5, Retrieved from https://lib.stat.uz/e-stat_ru/sovmest-method/sovmes2404.pdf
11. (2010). *Metodicheskoe polozhenie po obsledovaniyu domashnih hozyaistv, Prilozhenie k postanovleniyu Gosudarstvennogo komiteta Respubliki Uzbekistan po statistike ot 24 dekabrya 2010 g. №18*, Retrieved from https://lib.stat.uz/e-stat_ru/sots-sfera/polojen.pdf

Impact Factor:					
ISRA (India)	= 6.317	SIS (USA)	= 0.912	ICV (Poland)	= 6.630
ISI (Dubai, UAE)	= 1.582	РИНЦ (Russia)	= 0.126	PIF (India)	= 1.940
GIF (Australia)	= 0.564	ESJI (KZ)	= 9.035	IBI (India)	= 4.260
JIF	= 1.500	SJIF (Morocco)	= 7.184	OAJI (USA)	= 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS
International Scientific Journal
Theoretical & Applied Science
p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)
Year: 2021 **Issue:** 06 **Volume:** 98
Published: 05.06.2021 **http://T-Science.org**

QR – Issue QR – Article

Yelena Akhunova
Tashkent Institute of Finance
Senior lecturer
Department of Finance

INFORMATION COMPETENCE OF UNIVERSITY TEACHERS: INCREASED LEVEL OF REQUIREMENTS IN MODERN CONDITIONS

Abstract: *The article discusses the basic requirements for the use of modern information and communication technologies by teachers of higher educational institutions and the level of their information competence in modern conditions.*

Key words: *higher educational institution, information and communication technologies, teacher of a higher educational institution, information competence, requirements for university teachers.*

Language: *Russian*

Citation: Akhunova, Y. (2021). Information competence of university teachers: increased level of requirements in modern conditions. *ISJ Theoretical & Applied Science, 06 (98),* 88-91.

Soi: http://s-o-i.org/1.1/TAS-06-98-12 ***Doi***: https://dx.doi.org/10.15863/TAS.2021.06.98.12

Scopus ASCC: *3304.*

ИНФОРМАЦИОННАЯ КОМПЕТЕНТНОСТЬ ПРЕПОДАВАТЕЛЕЙ ВУЗОВ: ПОВЫШЕННЫЙ УРОВЕНЬ ТРЕБОВАНИЙ В СОВРЕМЕННЫХ УСЛОВИЯХ

Аннотация: *в статье рассматриваются основные требования к использованию современных информационно-коммуникационных технологий преподавателями высших образовательных учреждений и уровню их информационной компетентности в современных условиях.*

Ключевые слова: *высшее образовательное учреждение, информационно-коммуникационные технологии, преподаватель высшего образовательного учреждения, информационная компетентность, требования к преподавателям вузов.*

Введение

В современных условиях цифровизации всех сфер жизни общества, включая систему высшего образования, преподаватели высших образовательных учреждений должны обладать определенным уровнем знаний в области информационно-коммуникационных технологий и уметь применять их на практике [1]. Рассмотрим, наличие каких-именно знаний, навыков и умений в области информационно-коммуникационных технологий требуется от преподавателей вузов как вышестоящим руководством, так и студентами, их родителями и заказчиками кадров [2-16]:

1.Использование текстовых редакторов. Каждый преподаватель должен уметь использовать основные программы, входящие в базовый набор программ Microsoft Windows, в том числе набирать тексты в обычных текстовых редакторах, например, в Microsoft Word. Преподаватель должен уметь использовать указанные программы в подготовке учебно-методических комплексов, текстов лекций, написании учебников, учебных пособий, научных статей, тезисов докладов на конференциях;

2. Использование табличных редакторов. Каждый преподаватель высшего учебного

заведения должен уметь работать с различными табличными редакторами, например, с Microsoft Excel. Спектр возможностей данной прикладной программы огромен, начиная от подготовки простейших таблиц и диаграмм и до проведения сложнейших статистических и эконометрических вычислений. В качестве базовых навыков преподавателей необходимо отметить знакомство с данной программой, умение подготовить таблицу, провести несложные операции со встроенными функциями, сделать диаграмму. Чтобы стать продвинутым пользователем данной программы преподавателю необходимо изучить все возможности программы, включая использование Пакета анализа данных для проведения эконометрических расчетов;

3. Применение программ для подготовки и демонстрации презентаций. Преподаватели проводят лекционные и практические занятия. Для наглядной демонстрации учебного материала необходимо использовать специальные программы, например, Microsoft Power Point, которая позволяет создать презентацию, отформатировать ее в соответствии с целями и задачами преподавателя и организовать показ учебного материала.

4. Использование современных программ-браузеров. Педагогическую или научную деятельность преподавателей невозможно представить без использования учебных, статистических или информационных сайтов сети Интернет. Чтобы проводить успешный поиск необходимого материала преподаватель должен уметь пользоваться одним или несколькими браузерами, например, Google Chrome. Также преподаватель должен уметь использовать официальные данные и другую информацию, размещенную на сайтах органов государственной власти и управления, включая статистические данные;

5. Работа с электронными базами данных международных публикаций Web of Science, Scopus или ScienceDirect. Scopus – это крупнейшая единая база данных, содержащая аннотации и информацию о цитируемости рецензируемой научной литературы со встроенными инструментами отслеживания, анализа и визуализации данных и индексирующая более 20000 изданий от различных издательств. Web of Science представляет собой поисковую интернет-платформу, объединяющую реферативные базы данных публикаций в научных журналах и патентах и охватывающую материалы по естественным, техническим, общественным, гуманитарным наукам и искусству. Платформа также обладает встроенными возможностями поиска, анализа и управления библиографической информацией. Полнотекстовая база данных ScienceDirect позиционируется как ведущая информационная платформа Elsevier для ученых, преподавателей, студентов, специалистов медицинской области и R&D департаментов промышленных предприятий, которая содержит 25% мировых научных публикаций. Мультидисциплинарная платформа ScienceDirect обеспечивает всесторонний охват литературы из всех областей науки, предоставляя доступ к более 14 млн. публикаций из 2500 научных журналов и более 37000 книг издательства Elsevier, а также огромному числу журналов, опубликованных престижными научными сообществами. Каждый преподаватель должен уметь проводить поиск в базах данных Scopus, Web of Science или ScienceDirect по названию статей, наименованию журналов, году публикации и другим критериям. Также преподаватели должны стремится публиковать результаты своей научной деятельности в журналах, индексируемыми указанными базами данных;

6. Создание электронных учебных курсов. Преподаватель должен уметь работать с различными программами, помогающими достаточно быстро и легко разработать на основе ранее подготовленных презентаций электронный курс, а также эффективно организовать контроль знаний студентов. Примером такой программы является iSpring Suite 8, которая представляет собой современный инструмент для быстрой разработки электронных курсов, в котором каждый сможет легко начать работать без предварительного обучения;

7. Использование онлайн-переводчиков и онлайн-словарей. Преподаватель в своей деятельности может столкнуться с необходимостью перевода отдельных источников с иностранного языка на русский язык и наоборот. Таким образом, он должен уметь использовать различные сайты, специализирующиеся на переводе текстов и документов с одного языка на другой, например, таких как бесплатный сервис *Google, который* позволяет мгновенно переводить слова, фразы и веб-страницы с английского на более чем 100 языков и обратно. Также необходимо уметь пользоваться различными онлайн-словарями, например, словарем Мультитран, размещенным на сайте www.multitran.ru;

8. Работа с различными электронными библиотеками. Преподаватель должен знать основы проведения литературного поиска в

электронных библиотеках Cyberleninka или Elibrary.ru. КиберЛенинка – это научная электронная библиотека, построенная на принципе открытой науки, основными задачами которой является популяризация науки и научной деятельности, общественный контроль качества научных публикаций, развитие междисциплинарных исследований. eLIBRARY.RU – это крупнейшая в Российской Федерации электронная библиотека научных публикаций, обладающая богатыми возможностями поиска и анализа научной информации и интегрированная с Российским индексом научного цитирования (РИНЦ). Данные электронные библиотеки являются бесценным источником знаний для студентов и преподавателей;

9. Умение работать с онлайн-базами законодательства. Деятельность различных экономических субъектов регулируется различными нормативно-правовыми документами, знание которым необходимо для преподавателей различных дисциплин. Преподаватель высшего образовательного учреждения должен уметь использовать материалы Национальной базы данных законодательства Республики Узбекистан www.lex.uz, своевременно читать содержание нормативно-правовых документов;

10. Уметь работать в различных образовательных средах. Каждый преподаватель должен знать и уметь работать с современными образовательными средами, включая модульную объектно-ориентированную динамическую управляющую среду Moodle, системы Платонус или HEMIS;

11. Записывать видеолекции. Преподаватель должен уметь подготавливать видеолекции для своих студентов для размещения на персональном Ютуб-канале, сайте Интернета или Телеграм-канале. Видеолекции могут быть подготовлены по каждой теме учебной дисциплины с использованием любой из бесплатных и доступных в сети Интернет программ, например, Bandicam, Movavi Screen Capture или Fast Stone Capture;

12. Работа в социальных сетях. Преподаватель должен ежедневно коммуницировать со своими студентами, включая использование социальных сетей, Telegram или электронной почты. Например, преподаватели открывают для каждой группы или потока специальную группу в Телеграме, с помощью которой активно общаются со студентами, дублируют отправление заданий и получение ответов студентов;

13. Проведение видеоконференций. Коронавирусная пандемия привела к проведению карантинных мероприятий и повсеместному введению онлайн-занятий в виде видеоконференций. Преподаватели вузов должны уметь проводить онлайн-конференции, например, с использованием ZOOM.US, которая представляет собой облачную платформу для проведения онлайн видео-конференций и видео вебинаров в формате высокой четкости;

14. Подготовка электронных учебников. Одной из современных тенденций создания учебно-методических материалов является переход от бумажных носителей к электронным, включая подготовку электронных учебников. Каждый преподаватель должен уметь обладать минимальными навыками работы в соответствующих программах, например, такой как AutoPlay Media Studio.

15. Создание собственного Интернет-сайта. Для демонстрации своих достижений преподаватель может создать собственный Интернет-сайт и разместить его во всемирной паутине. Такие сайты могут содержать книги, презентации, учебные курсы, статьи, заметки и другие материалы преподавателя. Для создания Интернет-сайтов преподаватели могут использовать множество программ разного уровня сложности, одной из наиболее удобных и интуитивно понятных для использования среднему пользователю является программа TurboSite, позволяющая создать собственный сайт в очень короткое время. Также с помощью данной программы можно создать электронный учебник, представляющий собой сборник html-страниц.

16. Прохождение обучения или повышения квалификации на специализированных платформах. Каждый преподаватель должен постоянно повышать квалификацию по выбранной сфере профессиональной деятельности, иностранным языкам, современным педагогическим или информационно-коммуникационным технологиям. В настоящее время существует множество платформ, на которых в платном или бесплатном доступе размещены учебные курсы по различным направлениям обучения. Примером, является платформа https://free.ifrs.academy/, на которой преподаватели, студенты, бухгалтера и другие жители Республики Узбекистан могут пройти обучение на бесплатном онлайн-курсе “Основе МСФО”.

Совершенствование знаний, навыков и умений преподавателей высших образовательных учреждений будет

способствовать повышению качества подготовки кадров в системе высшего образования.

References:

1. Ahunova, E. A. (2016). Osnovnye napravlenija dejatel'nosti prepodavatelej vysshih obrazovatel'nyh uchrezhdenij v Respublike Uzbekistan. *Problemy sovremennoj nauki i obrazovanija*, № 14 (56), pp. 117-119.
2. Ahunova, E. A. (2016). Ispol'zovanie informacionno-kommunikacionnyh tehnologij kak odin iz faktorov povyshenija jeffektivnosti dejatel'nosti prepodavatelej vysshih obrazovatel'nyh uchrezhdenij. *Problemy sovremennoj nauki i obrazovanija*, № 1 (43), pp. 209-211.
3. Ahunova, E. A. (2015). Raznye podhody k razrabotke struktury jelektronnogo uchebnogo kursa v srede Moodle. *Nauka, obrazovanie i kul'tura*, № 2 (2), pp. 26-28.
4. Ahunova, E. A. (2015). Osnovnye jetapy dejatel'nosti prepodavatelja v processe razrabotki i ispol'zovanija jelektronnogo uchebnogo kursa. *Nauka, tehnika i obrazovanie*, № 10 (16), pp. 188-190.
5. Ahunova, E. A. (2015). Osnovy primenenija sovremennyh informacionno-kommunikacionnyh tehnologij v organizacii samostojatel'noj raboty studentov. *Vestnik nauki i obrazovanija*, № 9 (11), pp. 70-72.
6. Ahunova, E. A. (2016). Osnovnye trebovanija k ispol'zovaniju sovremennyh informacionno-kommunikacionnyh tehnologij prepodavateljami vysshih obrazovatel'nyh uchrezhdenij v Respublike Uzbekistan. *Problemy sovremennoj nauki i obrazovanija*, № 36 (78), pp. 80-82.
7. Ahunova, E. A. (2020). Sovremennye trebovanija k prepodavateljam vysshih obrazovatel'nyh uchrezhdenij v oblasti ispol'zovanija sovremennyh informacionno-kommunikacionnyh tehnologij. *Mezhdunarodnyj zhurnal gumanitarnyh i estestvennyh nauk*, № 6-1 (45), pp. 66-68.
8. Hrenova, T. M. (2014). Informacionno-kommunikacionnye tehnologii kak sredstvo informacionnogo obespechenija uchebnyh disciplin. *Nauchnyj poisk*, № 2.8, pp. 75-77.
9. Kornilova, E. A., & Savotchenko, S. E. (2014). O formirovanii informacionno-kommunikacionnoj kompetentnosti pedagogov. *Nauchnye vedomosti BelGU. Ser. Istorija. Politologija. Jekonomika. Informatika*, № 21 (192), vyp. 32/1, pp. 175-181.
10. Goncharova, N. Ju., & Timoshenko, A. I. (2009). Informacionno-kommunikacionnaja kompetentnost' pedagoga kak integrativnyj pokazatel' professionalizma v sovremennyh uslovijah. *Sibirskij pedagogicheskij zhurnal*, № 3, pp. 75-85.
11. Tarbeeva, O. V. (2012). Informacionno-kommunikacionnaja kompetentnost' kak osnova professional'noj dejatel'nosti budushhih menedzherov. *Vestnik VjatGGU*, № 3, pp. 110-113.
12. Lavina, T. A., & Taerova, I. A. (2015). Formirovanie IKT-kompetentnosti prepodavatelej vuza. *Vestnik Cherepoveckogo gosudarstvennogo universiteta*, № 4 (65), pp. 141-143.
13. Bol'shakova, A. S. (2020). Tehnologii organizacii zanjatij studentov v uslovijah distanta. *Tendencii razvitija nauki i obrazovanija*, № 68-4, pp. 24-27.
14. Bol'shakova, A. S. (2020). Jelektronno-obrazovatel'nye resursy, kak pedagogicheskoe uslovie realizacii obrazovatel'nyh programm v uslovijah distanta. *Tendencii razvitija nauki i obrazovanija*, № 63-6, pp. 37-39.
15. Lukashenko, D. V. (2020). Osobennosti i jetapy sozdanija jelektronnogo uchebnika. *Voprosy pedagogiki*, № 10-1, pp. 137-139.
2. Strunina, N. V. (2018). Obzor programm dlja sozdanija jelektronnyh uchebnikov. *Vestnik Kurganskogo gosudarstvennogo universiteta*, № 3 (50), pp. 86-88.

Contents

Scientific publication

«ISJ Theoretical & Applied Science, USA» - Международный научный журнал зарегистрированный во Франции, и выходящий в электронном и печатном формате. **Препринт** журнала публикуется на сайте по мере поступления статей.

Все поданные авторами статьи в течении 1-го дня размещаются на сайте **http://T-Science.org**.

Печатный экземпляр рассылается авторам в течение 3 дней после 30 числа каждого месяца.

Импакт фактор журнала

Impact Factor	2013	2014	2015	2016	2017	2018	2019	2020	2021
Impact Factor JIF		1.500							
Impact Factor ISRA (India)		1.344				3.117	4.971		6.317
Impact Factor ISI (Dubai, UAE) based on International Citation Report (ICR)	0.307	0.829							1.582
Impact Factor GIF (Australia)	0.356	0.453	0.564						
Impact Factor SIS (USA)	0.438	0.912							
Impact Factor РИНЦ (Russia)		0.179	0.224	0.207	0.156	0.126			
Impact Factor ESJI (KZ) based on Eurasian Citation Report (ECR)		1.042	1.950	3.860	4.102	6.015	8.716	8.997	9.035
Impact Factor SJIF (Morocco)		2.031				5.667			7.184
Impact Factor ICV (Poland)		6.630							
Impact Factor PIF (India)		1.619	1.940						
Impact Factor IBI (India)			4.260						
Impact Factor OAJI (USA)						0.350			

INDEXING METADATA OF ARTICLES IN SCIENTOMETRIC BASES:

International Scientific Indexing ISI (Dubai, UAE)
http://isindexing.com/isi/journaldetails.php?id=327

Research Bible (Japan)
http://journalseeker.researchbib.com/?action=viewJournalDetails&issn=23084944&uid=rd1775

РИНЦ (Russia)
http://elibrary.ru/contents.asp?issueid=1246197

Turk Egitim Indeksi (Turkey)
http://www.turkegitimindeksi.com/Journals.aspx?ID=149

DOI (USA)
http://www.doi.org

Open Academic Journals Index (Russia)
http://oaji.net/journal-detail.html?number=679

Japan Link Center (Japan) https://japanlinkcenter.org

Kudos Innovations, Ltd. (USA)
https://www.growkudos.com

Cl.An. // THOMSON REUTERS, EndNote (USA)
https://www.myendnoteweb.com/EndNoteWeb.html

Scientific Object Identifier (SOI)
http://s-o-i.org/

Google Scholar (USA)
http://scholar.google.ru/scholar?q=Theoretical+t-science.org&btnG=&hl=ru&as_sdt=0%2C5

Directory of abstract indexing for Journals
http://www.daij.org/journal-detail.php?jid=94

CrossRef (USA)
http://doi.crossref.org

Collective IP (USA)
https://www.collectiveip.com/

PFTS Europe/Rebus:list (United Kingdom)
http://www.rebuslist.com

Korean Federation of Science and Technology Societies (Korea)
http://www.kofst.or.kr

AcademicKeys (Connecticut, USA)
http://sciences.academickeys.com/jour_main.php

Sherpa Romeo (United Kingdom)
http://www.sherpa.ac.uk/romeo/search.php?source=journal&sourceid=28772

Cl.An. // THOMSON REUTERS, ResearcherID (USA)
http://www.researcherid.com/rid/N-7988-2013

RedLink (Canada)
https://www.redlink.com/

Cl.An. // THOMSON REUTERS, ORCID (USA)
http://orcid.org/0000-0002-7689-4157

TDNet
Library & Information Center Solutions (USA)
http://www.tdnet.io/

Yewno (USA & UK)
http://yewno.com/

RefME (USA & UK)
https://www.refme.com

Stratified Medical Ltd. (London, United Kingdom)
http://www.stratifiedmedical.com/

THE SCIENTIFIC JOURNAL IS INDEXED IN SCIENTOMETRIC BASES:

Advanced Sciences Index (Germany)
http://journal-index.org/

SCIENTIFIC INDEXING SERVICE (USA)
http://sindexs.org/JournalList.aspx?ID=202

Global Impact Factor (Australia)
http://globalimpactfactor.com/?type=issn&s=2308-4944&submit=Submit

International Society for Research Activity (India)
http://www.israjif.org/single.php?did=2308-4944

CiteFactor (USA) Directory Indexing of International Research Journals
http://www.citefactor.org/journal/index/11362/theoretical-applied-science

JIFACTOR
http://www.jifactor.org/journal_view.php?journal_id=2073

Eurasian Scientific Journal Index (Kazakhstan)
http://esjindex.org/search.php?id=1

SJIF Impact Factor (Morocco)
http://sjifactor.inno-space.net/passport.php?id=18062

InfoBase Index (India)
http://infobaseindex.com

Электронно-библиотечная система «Издательства «Лань» (Russia)
http://e.lanbook.com/journal/

International Institute of Organized Research (India)
http://www.i2or.com/indexed-journals.html

Journal Index
http://journalindex.net/?qi=Theoretical+%26+Applied+Science

Open Access Journals
http://www.oajournals.info/

Indian citation index (India)
http://www.indiancitationindex.com/

Index Copernicus International (Warsaw, Poland)
http://journals.indexcopernicus.com/masterlist.php?q=2308-4944

Signed in print: 30.06.2021. Size 60x84 1/8

«Theoretical & Applied Science» (USA, Sweden, KZ)
Scientific publication, p.sh. 48.875. Edition of 90 copies.
http://T-Science.org E-mail: **T-Science@mail.ru**

Printed «Theoretical & Applied Science»