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ARTS

THE IMPACT OF COMPLEX DRAMATIC WORKS ON THE DEVELOPMENT OF PUPPET THEATER

Akzhol Sabit

*1st-year Master's student in "Art Studies" at the Kazakh National Academy of Choreography
(Astana, Kazakhstan)*

КҮРДЕЛІ ДРАМАТУРГИЯЛЫҚ ШЫҒАРМАЛАРДЫҢ ҚУЫРШАҚ ТЕАТРЫНЫҢ ДАМУЫНА БЫҚПАЛЫ

Сабит Акжол

Қазақ Ұлттық Хореография Академиясының «Өнертану» мамандығы бойынша 1 курс магистратура
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Abstract

The article explores the influence of complex dramaturgy on the development of puppet theater art. Puppet theater is positioned not only as a form of children's entertainment but also as a sophisticated art form with significant philosophical and cultural value. Using the experience of the Almaty State Puppet Theater as a case study, the paper analyzes the staging of complex dramatic works and their impact on advancing acting skills, directorial innovations, and technical capabilities. Additionally, it highlights how complex dramaturgy broadens the genre and technical scope of puppet theater and contributes to the cultural education of audiences.

Аннотация

Мақалада күрделі драматургиялық туындылардың қуыршақ театры өнерінің дамуына әсері қарастырылады. Қуыршақ театры балалар үшін ойын-сауық қана емес, философиялық және мәдени маңызы бар жоғары өнер түрі ретінде ұсынылады. Алматы қаласындағы Мемлекеттік қуыршақ театрының тәжірибесіне сүйене отырып, күрделі драматургиялық қойылымдарды сахналаудың ерекшеліктері, олардың актерлік шеберлік, режиссерлік шешімдер және техникалық мүмкіндіктердің дамуына әсері талданады. Сондай-ақ, күрделі драматургияның қуыршақ театрының жанрлық және техникалық шекараларын кеңейтудегі рөлі және көрермендер мәдениетінің дамуына қосар үлесі талқыланады.

Keywords: Complex dramaturgy, puppet theater, acting skills, directorial innovations, technical capabilities, culture, philosophy, performing arts.

Кілт сөздер: Күрделі драматургия, қуыршақ театры, актерлік шеберлік, режиссерлік шешімдер, техникалық мүмкіндіктер, мәдениет, философия, сахналық өнер.

Кез-келген дүниенің бастауы бар. Адамзат баласы, топтасып, тайпалық ғұмыр кешкелі, қазіргі күнге дейін тоқтаусыз даму барысында келе жатқаны аян. Адамның сенім-нанымы, салт-жоралғысы уақыт өте келе бар мамандық атаулының пайда болуына түрткі болды. Театр өнері де бұл тұста шеткері қалмағаны мәлім. Бастапқыда үңгірде ошақ басында көлеңкемен бейнелерді жасау арқылы, өздерінің көңілін аулаған адамдар думаны, бүгінгі “көлеңке театрының” пайда болуының негізі болды. Тотемшілдік сенімі адам баласына жан-жануар, өсімдік, табиғат келбетін мүсінше қылып жасау арқылы, қуыршақ өнеріне негіз болып, оны адам жанының қазіргі күнге дейінгі серігі етті.

Қуыршақ театрының нақты қашан, қайда пайда болғаны анықталмаған құпия. Дейтұрғанмен археологиялық зерттеуге сүйенсек ежелгі Мысыр жеріндегі қазбалардан «арқанмен басқарылатын мүсіншелер» табылғаны мәлім. Құдайларды дәріптеуші, аңыздарды баяндаушы ретінде бастау алған қуыршақ театры уақыт өте келе жетіліп

алаңдар мен жәрменкеде ғана қойылмай, гострольдік сапармен де жүре бастады. Тек құдайлар емес біртіндеп батырлар, патшалар мен көсемдер, сайқымазақтар сынды кейіпкерлер қосылып, қарапайым халыққа етене жақын өнерге айналды. Бүгінгі күнде Қазақ елінде Қуыршақ театры өнерінің кенжелеп тұрғаны сияқты, әлемдік сахнада да қуыршақ өнері бір кезеңдерде тиісті биіктігінде бағаланбады. Халықтың қызығушылығына ие, көптің көңілінен шығатын өнер болсада: - “жәрменкелік, ойын-күлкі, жеңіл-желпі өнер түрі” - деген стереотиптің болғанын тарихтан айқын көруге болады. Алайда бүгінгі таңда адамзат баласына қажет өнер екені, мәдениет, дәстүр, тарихты дәріптеуде теңдесіз театр екені даусыз. Ешқандай ұлттың нақты төл өнеріне жатпайтын, жалпы адамзаттың ортақ жетістігі деп толық сеніммен айтуға болады. Себебі бүгінде әр мемлекет өзінің кішкентай үлесін қосқан үлкен өнер түріне айналғаны ақиқат.

Қазақ қуыршақ өнерінің түбі басқа мемлекеттердегідей бағзы заманнан бастау алады.

Қазақтың тотемшілдік, түрлі мүсінше, кескін-келбетпен рәсім-жоралғы өткізетін бақсылықтан бөлек, көк түркілер заманынан жалғасып келе жатқан төл қойылымы болғаны археологтармен зерттелген дүние. Археологиялық, этностық зерттеулер ежелгі түркі заманынан тау ешкісі ортеке бейнесіндегі қуыршақтардың болғанын мәлімдейді. Бұл тек әртістік ғана емес, музыкалық біліктілікті көрсететін, күрделі механизмге құрылған толыққанды көрсетілім.

Көне өнердің құрметіне, Қазақстанның түпкір-түпкірінде, жылда “Ортеке” фестиваль сайысы өтеді. Және төл өнеріміз 2022 жылы Марокконың Рабат қаласында өткен ЮНЕСКО-ның 17-ші сессиясында дүниежүзілік материалды емес мәдени мұралар санатына енгізілді. [1]

Еліміздегі тұңғыш кәсіби, әрі аяғына нық тұрған қуыршақ театры - 1935 жылы құрылған Алматы Мемлекеттік қуыршақ театры болып табылады. Театрдың қоржыны “Алдар көсе”, “Өтеген батыр” спектакльдерінен бастау алды. Спектакльдерге қазақ драма театрының актерлері Қапан Бадырмен Сейфулла Телғара режиссерлік етті. Латиф Хамиди, Борис Ерзакович алғашқы қойылымдарға музыка жазып, көркемдеді.

Қуыршақ театры адамзат өміріне керекті мәдени ортаның бірі және маңызды бөлігі деп айтуға негіз бар! Баланы жастайынан тәрбиелеп, ой-қиялын дамытып, көңіл көкжиегін кеңейтіп, жүрегіне адалдық, кеудесіне өрлік пен өжеттілік, рухына беріктік, болмысына, сана-сезіміне тазалық қасиеттерін сіңіру үшін Қуыршақ өнері керек екені айқын! Адам өскенде мәдениетті, салмақты, саналы болуы үшін, болашақта үлкен театрларға, өнер ордаларына барып тұруы үшін, кішкентайынан жүрегінен өнерге сусындататын мекен ол әрине - Қуыршақ театры.

Қазіргі таңда, маңыздылығы мен мәні жоғары өнердің еленбей, ескерусіз қалып жатқаны жүрекке қаяу, көңілге өкініш салады. Ең құнды өнердің біріне әлі күнге дейін елімізде тиісті деңгейде көңіл бөлмейтіні, назар аудармайтыны жабырқатады. Өлі күнге дейін халық ішінде де бұл өнерді жеңіл, балаға арналған өнер деп қабылдайтын, бағаламайтын жандар жетерлік. Бұл нені білдіреді? Бұл дегеніміз Қазақ халқы әлі театр өнеріне деген көзқарасын толыққанды қалыптастыра алмай келе жатыр. Театр десе қарапайым халыққа бірден сатиралық, әзіл-оспақ театрлары келетіні жалған емес. Яғни, жалпы театр өнері әлі күнге халық жүрегінен ойып тұрып, тиісті орынын таппаған.

Елімізде қуыршақ театры осы уақытқа дейін негізінен, жеңіл әрі балаларға арналған туындылармен байланысты болып келгені рас, әліде солай. Алайда, неге бұл өнер тек жас көрерменнің еншісіне байланып, өсім-дамусыз бейжай қала бермек? Шын мәнінде қуыршақ театры кез-келген жанрдағы шығарманы игеруге қарым-қабылеті жететіні айдан анық. Сондықтан күрделі драматургиялық шығармаларды сахналау арқылы қуыршақ театрының әлеуетін арттыуға ықпал жасау қажет. Себебі күрделі шығармаларды қою жанрлық және техникалық мүмкіндіктерді

кеңейтіп, оның философиялық тереңдігін ашуға, әртістердің шеберлігінің шындалып, жаңа деңгейге көтерілуіне ықпал етеді. Классикалық және заманауи күрделі драматургияны сахналау театрды балалар аудиториясынан алшақтатып, ересектер аудиториясына бағыттау емес. Керісінше қуыршақ театрын тек ойын-сауық құралы ғана емес, маңызды философиялық сұрақтарды қозғайтын, жас ерекшелігіне де, жанр түріне де шектелмейтін, биік өнер түрі ретінде қарастыру, толағай өнердің өзіне тиесілі шыңына шығаруды көздеу. Себебі Қуыршақтардың шартты табиғаты күрделі тақырыптарды жеткізуге мүмкіндік беретіні ақиқат. Мысалы, кино әлеміндегі болсын, анимация өнеріндегі болсын, қоршаған ортамыздағы шынайы тіршілікті болсын айнытпай, қаз-қалпында, боямасыз көрерменге ұсынып, ерекше әсер қалдыра алатын қуыршақ кейіпкер деп айту жаңсақ пікір емес. Бұл көрерменге де оқиғаны тереңірек түсінуге және әртүрлі интерпретация жасауға жағдай жасайды.

Күрделі драматургия не үшін қажет? Қуыршақ театрының ауқымын кеңейтудің пайдасы не? - деген сұрақ туындауы заңды. Әлем бір орында тұрмайтыны, сағат санап, сәт сайын дамып, өзгеріп, жетіліп келе жатқаны айқын. Технология, медиа, анимация дамыған сайын бүлдіршіндердің ойлау түйсігі, көзқарасы, талғамы өзгеруде. Оларды қазір ескі қуыршақ жүйелерімен, бір сарынды ертегілермен ұзақ уақыт қызықтырып, назарын ұстап отыру қиын шаруа, әрі, бара-бара мүмкін емеске айналу алдында. Сондықтан кішкентай бала деп, кішкентай шығармаға жармасып отыра бермей, ауқымды, күрделі дүниелерді қойған абзал. Кез-келген жаңа материал қою барысында жаңа технологиялар мен қуыршақ түрлері енгізілетіні мәлім. Демек қарапайым тұрақты шығармалардың қолданатын қуыршақтары да бірдей деген сөз. Ал экспериментке барып барлық мүмкіндікті қолданса қуыршақтар, көлеңкелер, жарық эффектілері, анимация – мұның бәрі қуыршақ театрының көркемдік құралдарын байытуға үлкен септігін тигізеді. Әрі, Күрделі драматургия қуыршақ театры актерлерінің шеберлігін жаңа деңгейге көтеруге де үлес қосар еді. Олар тек қуыршақты басқарумен шектелмей, оның эмоциясын, мінезін, ішкі қатығысын көрсетуі үшін тереңірек зерттеп, драмалық қабілеттерін шыңдай түсер еді. Режиссерлер болса, сахналық кеңістікті барынша тиімді пайдаланып, символикалық және шартты элементтерді үйлестіруге ұмтылады. Олай болса, 90 жылға жуық тарихы бар Алматы қуыршақ театрында қойылған бірнеше күрделі драматургиялық спектакльдер сөзге тиек етілмек. Шамамен 2018 жылдан бастап театр жаңаша қарқынмен, балалар аудиториясынан бөлек, ересектерге арналған ауқымды шығармаларға батыл қадаммен ден қойғаны арқылы, бүгінде қоржынында 9 шақты драмалық, трагедиялық күрделі спектакль бар.

Күрделі драматургиялық жұмыстың бастауының бірі болған Евгений Ионовтың «Ана жүрегі» драмасы. Режиссер Антон Зайцев ана мен

бала арасындағы тылсым сезім иірімін қуыршақ өнерімен астастырып, заманауи кейіпкерлер образы мен қоғамның өзекті мәселелерін жақсы көрсете алды. Иә, қай заманда, қай мекенде болмасын ана мен бала ұғымы ешқашан құндылығын жоғалтпайды. Заманауи стилистика негізінде сахналанған қойылым көпшілікке анаға деген құрмет, ананың қадірі, кеше мен бүгіннің өзара үндестігі, байланысы жайында күрделі ойларды дәл жеткізіп оң бағасын алды. Оған дәлел: - 2018 жылы «Ассалаумағалейкум – V» халықаралық қуыршақ театрларының фестивалінде бас жүлде мен ең үздік қойылым; - 2019 жылы Санкт-Петербургтегі Х «КУКАРТ» халықаралық фестивалінде Үздік актерлік ансамбль және Ең үздік спектакль жүлделерімен тұғырдан көрініп, көзайымға айналуы. [2]

Қуыршақ театры десе бүлдіршіндер мен ертегі ойға бірінші келері анық. Дегенмен сол стереотиптің бұзылуына әсер еткен қойылымның бірі бала түгілі ересек жанның өзіне ауыр тиіп, психологиялық салмақ салып, жан-дүниесін түршіктірмей қоймайтын Еврепиттің «Медея» трагедиясы. Қалтқысыз сенген сүйгені үшін, жан дүниесін кернеген ұлы күш махббат үшін ата-анасын аттап, ағасын өлтірседе өзінің бойындағыдай алпауыт сезімді сезіне алмаған кейіпкердің жан-дүниесі, тағдыры қандай қайғылы дерсіз. Адамның әрекетін түсіну өте қиын өзіңіз ойлап көріңізші тас емшегін жібітіп, тар құрсағын кеңейткен, бауыр еті баласын құрбан етіп, өз қолыңмен өлтіру ақылға қандай қонымсыз, қабылдауға қаншалық қиын болса. Қуыршақ театры сахнасынан бұл бейнені көру де бастапқыда естір құлаққа сондай оғаш, түрпі тиері анық. Дегенмен, режиссер Айдын Салбан мен суретші Алтынай Жүсіпәлі дйттеген мақсаттарына жетіп, сәтті қойылым жасады деп айтуға толық негіз бар. Сүйгені үшін бәрін тәрк еткен әйелдің тағдырын қуыршақ арқылы жеткізуі, қазақ қуыршақ театр әлеміне жаңалық болып, қуыршақ өнері кез-келген тақырыпты алып шыға алатындығына және мүмкіндігі жоғары екендігіне дәлелді жұмыс бола білді. Спектакль 2018 жылы Өскемен қаласында өткен Рүстем Есдәулетов атындағы II Республикалық театр фестивалінде Үздік режиссер және Арнайы сыйлыққа ие болды. Аталмыш қойылым 2023 жылы Атырау қаласындағы Чапай Зұлхаш атындағы I Республикалық фестивальде Үздік сценография номинациясын қанжығаға байлады.

Ересектерге арналған спектакльдердің арасынан театрдың жаңалығы болып, дамуына үлкен септігін тигізген, алдыңғы қатардағы қойылымның бірі әлемге әйгілі Уильям Шекспирдің «Ромео мен Джульетте» трагедиясы. Режиссер Дина Жұмабай спектакльді қою барысында Ромео мен Джульетта кейіпкері үшін кастинг жариялап 50-ге жуық бақ сынаушы арасынан Т.Жүргенов атындағы Қазақ Ұлттық Өнер Академиясының 3 курс білім алушылары Амангелдіұлы Ғалым мен Төребай Салтанатты тандап алды. Бұл өз кезегінде театрға үлкен

жарнама әрі, жастарға берілген керемет мүмкіндік болды. Буыны қатпаған жас өнерпаздардың жалындаған оттары мен жігері, алқынған албырт сезімі шынай болатынына сенген Дина Жұмабай мүлт кетпеді. Пендешілік пен кек, менменшілдік пен өктемдікке толы тағдырларында, әулет пен әсем сезімнің арасындағы алаулаған отқа өртенген қос жүректің мөлдір махаббаты бейнеленген туынды, театрды Республикалық және халықаралық деңгейдегі фестивальдерде топ жарғызып, шыңдарға жетеледі. 2021 жылы Қарағанды қаласындағы «Сын - шын болсын» фестивалінде I орын; 2022 жылы II Халықаралық «Әбіш әлемі» фестивалінде Үздік режиссерлік жұмыс; 2022 жылы Болгария Республткасында өткен XVIII Халықаралық «Алтын дельфин» фестивалінде Гран-при, Үздік Актер (Шоқан Құлназар), Үздік дебют (Ұлан Асанбек, Ұлпан Серік) номинацияларына ие болды.

Дина Жұмабайдың театр қоржынына тарту еткен ерекше орыны бар тағы бір спектакль «Макбет. Иллюзия» Уильям Шекспирдің ықылым заманнан әйгілі шығармасы. Классиканы жаңаша интерпретациялауға арналған шығармашылық жұмысы дәстүрлі трагедияны қайта ойластырып, оны метафоралық және визуалды тәсілдер арқылы жаңа қырынан танытады. Қойылымның басты ерекшелігі – классикалық мәтіннің философиялық тереңдігін қуыршақ театрының эстетикасымен үйлестіру. Ересектер аудиториясына бағытталған бұл қойылым драматургия мен қуыршақ өнерін шебер үйлестіре отырып, көрерменді адамдық эмоциялар, амбициялар және ішкі қайшылықтар әлеміне жетелейді. Спектакльдің көркемдік бейнесі Юлия Чернова мен Анна Цойдың жұмыстарымен толыққан. Қойылымда билікке ұмтылу, махаббат пен сатқындық сияқты адамзатқа ортақ тақырыптар ерекше айқындалған.

Қойылым еліміздегі V-Халықаралық эксперименталды «Балауса» фестивалінде бас жүлде, II Батум халықаралық қуыршақ театрлары фестивалінде Үздік режиссер номинациясына ие болды. Бұл Алматы Қуыршақ театрының халықаралық деңгейде танылғанын және оның Қазақстандық қуыршақ өнерін жаһандық сахнада дамытуға қосқан үлесін көрсетеді.

Дина Жұмабай классикалық мәтіндерге инновациялық тәсілдер қолдана отырып, оларды қазіргі заман көрерменіне түсінікті және жақын ете алды. Бұл қойылым Алматы Қуыршақ театры репертуарындағы ең ерекше жұмыстардың бірі және заманауи театр өнеріндегі жаңа тенденциялардың үлгісіне айналды.

Ой мен сана, қатігездік пен ізгілік, жан мен тән арасындағы арпалысты спектакль жақсы жеткізе білген. Ондағы кейіпкерлердің барлығы дерлік елес бейнесінде тіл қатады. Басты кейіпкерлердің ішкі әлемінде орын алатын шым-шытырық шырғалаңға толы мағынасыз қиял мен мазасыз ойлардың метафоралық элементтері – тірі кептер, қатқан мұз сынды детальдар арқылы режиссер кейіпкер характерін берудегі ұқсастыққа баса мән береді. Жындар мен шайтандар образын адам мен құс

бейнелерінде салыстыру арқылы да символикалық шешімдерді үздік қолданады. Негізгі тақырып – ұрпақ жалғастығы болғанымен, астарындағы билік пен абырой, даңқ пен дақырт, адамдық пен зұлымдық, қарғыс пен қан, жалғыздық пен қорқыныш, өкініш пен тыныштық ұғымдары қатар қабысады.[3]

Спектакльдің режиссерлік идеясы иллюзия және биліктің деструктивті табиғатының көркем бейнесіне негізделген. Шекспирдің «Макбет» трагедиясында көтерілген билікке деген құмарлық, адамның өзін-өзі жоюы мен кінәнің адам психологиясына әсері бұл қойылымда қуыршақтардың архетиптік бейнелері арқылы ашылады. Дегенмен аталмыш негіздер екінші планда қалып, бірінші планға Макбет пен Леди Макбеттің қарым-қатынасы, отбасылық жағдайының, мұрагердің болмауы, және психологиялық салдары көрсетілген. Қойылымның сахналық дизайны минималистік стильде орындалған, бұл кейіпкерлер мен олардың әрекеттеріне ыңғайлылық мүмкіндігін береді. Жарық пен көлеңке ойындары, түстік акценттердің ауысуы сахналық кеңістікті драматизмге толы етеді. Шекспирдің түпнұсқалық мәтіні қуыршақ театрының табиғатына бейімделген. Классикалық тіл мен мәтін сақталғанымен, көркемдік әдістер спектакльдің қабылдануын жеңілдетеді және оны түсінікті етеді. Режиссер оқиғаны философиялық және символикалық тұрғыдан қайта құруға назар аударған. Байқасаңыздар, «Макбет. Иллюзия» атауы қойылымның басты идеясын ашады: билікке деген құмарлық – бұл алдамшы мақсат. Қуыршақтар адамның басқаруға деген ұмтылысын, бірақ сонымен бірге өз қалауын жүзеге асырудағы дәрменсіздігін бейнелейді. Бұл спектакльдің басты философиялық пайымы болып табылады. Жалпы қойылым заманауи қазақ театр өнерінің жаңа мүмкіндіктерін көрсететін жарқын мысал. Режиссер Дина Жұмабайдың шеберлігі арқасында классикалық трагедия жаңа өмірге ие болды. Бұл спектакль шекспирлік мұраның шексіз көркемдік әлеуетін дәлелдейді және қуыршақ өнерінің драмалық мазмұнды жеткізудегі әлеуетін көрсетеді.

Қуыршақ театрының сахнасында күрделі драматургиялық шығармаларды қою – бұл өнер түрінің жаңа деңгейге көтерілуіне ықпал ететін маңызды фактор. Мұндай шығармаларды сахналау театрдың жанрлық және техникалық шекарасын кеңейтіп қана қоймай, оның кәсіби әлеуетін айтарлықтай арттырады. Күрделі драматургияны сахналау арқылы қуыршақ театры актерлік шеберліктің тереңдігін, режиссерлік шешімдердің инновативтілігін, қуыршақ жасау техникасының жетілгендігін және көрермендердің қабылдау деңгейін жақсартады.

Ең алдымен, актерлік шеберліктің жаңа қырлары ашылады. Қуыршақ театры актерден тек қуыршақты басқару шеберлігін ғана емес, сонымен бірге оның эмоциясын, мінезін, ішкі қайшылықтарын көрерменге дәл жеткізе білуді талап етеді. Күрделі драматургияны сахналау

барысында актерлер қуыршақтың қимыл-қозғалысы арқылы кейіпкердің ішкі әлемін ашуға, оның жан дүниесіндегі драманы көрерменге жеткізуге машықтанады. Мұндай қойылымдар актерлерді терең психологиялық зерттеулер жүргізуге, драмалық қабілеттерін шыңдауға ынталандырады. Олар тек физикалық шеберлікпен шектелмей, күрделі эмоциялар мен көркемдік шешімдерді қуыршақ арқылы жеткізудің жаңа әдістерін меңгереді.

Режиссерлік тұрғыдан алғанда, күрделі драматургия қуыршақ театры сахнасына символикалық және шартты элементтерді ендіруге мүмкіндік береді. Режиссерлерге сахналық кеңістікті барынша тиімді пайдалану, визуалдық эффекттерді, жарық пен көлеңке ойындарын және музыкалық сүйемелдеуді үйлестіру міндеті жүктеледі. Мұндай шығармалар қуыршақ театрының эстетикалық мүмкіндіктерін кеңейтіп, режиссерлік шеберлікті жаңа деңгейге көтереді. Сонымен қатар, режиссерлердің символикалық шешімдерді табу қабілеті күрделі тақырыптарды тереңірек түсінуге және оны көрермендерге әсерлі жеткізуге мүмкіндік береді.

Қуыршақ жасау техникасы да күрделі драматургиялық шығармаларды сахналау барысында дамудың жаңа сатысына көтеріледі. Жай ғана ойын-сауықтық сипаттағы қуыршақтардың орнына, күрделі механикалық құрылғыларды, анимациялық элементтерді, жарық диодтарын және басқа да заманауи технологияларды қолдану қажеттігі туындайды. Бұл тек көркемдік сапаны арттырып қана қоймай, театр өнеріне жаңа технологияларды интеграциялаудың жарқын мысалы бола алады. Қуыршақ жасау шеберлері үшін бұл салада жұмыс істеу шығармашылық тәжірибені арттырып, жаңа материалдар мен техникаларды сынауға жол ашады.

Көрерменнің қабылдау тұрғысынан алғанда, күрделі драматургиялық шығармаларды сахналау қуыршақ театрына жаңа аудиторияны тартады. Балалар аудиториясына арналған жеңіл қойылымдармен шектелу бұл өнер түрінің әлеуетін толыққанды ашпайды. Күрделі тақырыптарды қозғайтын қойылымдар жасөспірімдер мен ересек көрермендердің назарын аударуға мүмкіндік береді. Сонымен қатар, қуыршақтардың шартты табиғаты көрерменге оқиғаны тереңірек түсінуге, символикалық мән-мағыналарды ұғынуға және шығарманы әртүрлі қырынан интерпретациялауға мүмкіндік береді. Мұндай қойылымдар көрерменнің эстетикалық талғамын арттырып, театр өнерін түсіну қабілетін жетілдіреді.

Күрделі драматургия қуыршақ театрының мүмкіндіктерін арттырып қана қоймай, оның мәдениеттегі орнын қайта анықтайды. Бұл театр түрі тек балаларға арналған ойын-сауық ретінде емес, көркемдік, философиялық және тәрбиелік мәні бар биік өнер ретінде танылады. Қуыршақтардың шартты табиғаты драмалық және философиялық идеяларды жеткізуге ерекше қолайлы. Сондықтан күрделі шығармаларды

сахналау қуыршақ театрын әлемдік деңгейдегі заманауи өнердің ажырамас бөлігі ретінде орнықтыруға ықпал етеді.

Қорыта айтқанда, қуыршақ театрының сахнасында күрделі драматургиялық шығармаларды қою арқылы актерлік шеберлік тереңдейді, режиссерлік шешімдер инновативті сипатқа ие болады, қуыршақ жасау техникасы жетіледі және көрермендер театралдық мәдениеттің жаңа деңгейін түсіне бастайды. Бұл қуыршақ театрының дамуына ғана емес, жалпы театр өнерінің көкжиегін кеңейтуге септігін

тигізеді. Қуыршақ театрының болашағы оның күрделі тақырыптарды игеру қабілетіне тікелей байланысты екенін атап өту қажет.

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BIOLOGICAL SCIENCES

TROPILAELOPS MITES IN HONEYBEE COLONIES AND CONTROL MEASURES

Mahmudov S.,

*Doctor of Philosophy in Engineering, Associate Professor
Scientific Research Institute of Animal Husbandry*

Dunyamaliyev F.,

Director of the "Beekeeping" Center

Mammadov M.,

Laboratory Manager of the "Beekeeping" Center

Najafov R.

Laboratory Manager of the "Beekeeping" Center

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Abstract

Tropilaelaps mites are ectoparasitic organisms that feed on the hemolymph of honeybee pupae, leading to substantial damage to bee colonies. This infestation results in physical deformities in both pupae and adults, viral transmission, and a decline in colony productivity. The reproductive cycle of these mites is rapid and occurs exclusively within capped brood cells, which complicates effective control. Mitigation strategies include the application of formic acid, thymol, and queen bee caging. Research has demonstrated that appropriate intervention can halt mite proliferation and preserve colony productivity. Additionally, mite spread can be facilitated by the transfer of infected brood frames to healthy colonies and through robbing behavior. Consequently, beekeepers must vigilantly monitor these activities. Despite the cessation of egg-laying by queens in winter and low environmental temperatures, Tropilaelaps mites can remain dormant until spring. Although these mites typically perish within a few days in the absence of bees, some individuals can survive. Like Varroa destructor, Tropilaelaps mites are expected to continue spreading in apiaries, necessitating sustained control efforts and preventive measures by beekeepers and colony managers.

Keywords: Tropilaelaps mites, honeybee diseases, parasitic mites, formic acid, thymol, Varroa destructor, control strategies, queen bee caging, productivity, colony health.

Tropilaelaps mites are parasitic mites that feed on the hemolymph (blood) of male and worker bee pupae, and also reproduce on honeybee brood. Infestation with these mites leads to significant colony damage, including malformed pupae and adults (e.g., stunted growth, damaged appendages), parasitic mite syndrome (PMS), and a reduction in the worker bee population. This can result in colony failure or absconding, contributing to the dispersal of mites to new apiaries. Furthermore, Tropilaelaps mites are vectors of viral pathogens that exacerbate colony health deterioration and increase susceptibility to additional diseases.



The life cycle of Tropilaelaps mites is very similar to that of Varroa mites, as both species are parasitic feeders on the developmental stages of honeybee brood. However, the life cycle of Tropilaelaps mites is

shorter, giving them a higher reproductive rate compared to Varroa mites.

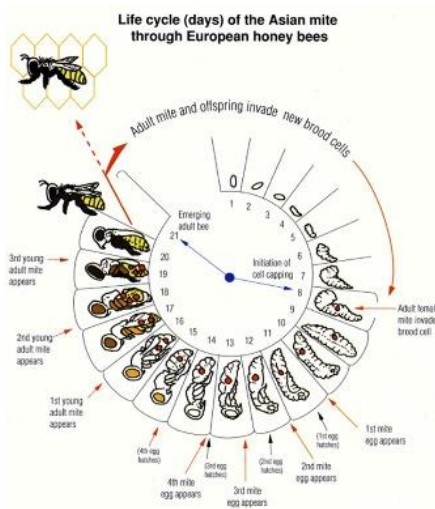


Studies based on foreign literature have shown that in some hives, both Varroa and Tropilaelaps mites can coexist in a honeybee colony. However, unlike Varroa mites, which can live for several months on adult bees, Tropilaelaps mites can only survive on adult worker bees for about 3 days, as the adult Tropilaelaps mite's mouthparts are unable to pierce the adult bee's body membrane and feed on it. For this reason, Tropilaelaps mites spend most of their life in the brood and continue to reproduce and survive within the honeybee colony as long as there are bees present.



Considering that *Tropilaelaps* mites cannot survive for a long time on adult bees, the vast majority of adult mites (>95%) will typically mate and enter the brood cell within 2 days after the adult bee emerges from the capped brood to lay more eggs.

Tropilaelaps mercedesae has a very limited dispersal phase because it does not require feeding after mating and can invade brood cells to lay eggs within less than two days after emerging. In comparison, *V. destructor* requires about five days after mating for the sperm to be ready to fertilize the female eggs. During this period, *V. destructor* primarily feeds on adult honeybees, which increases the likelihood of contact with lethal doses of treatment. This difference not only allows *T. mercedesae* to reproduce at an accelerated rate but also complicates control through chemical methods. The shortened dispersal phase limits *T. mercedesae*'s ability to interact with long-term chemical treatments, ultimately reducing effectiveness. Amitraz-based medications are generally ineffective against *Tropilaelaps* in closed brood cells. Formic acid, due to its ability to penetrate cell cappings and kill mites hidden in capped brood cells, remains the only chemical that has been successfully tested for consistent and effective control of *T. mercedesae*.



Biology and Harm of *Tropilaelaps* Mites:

Tropilaelaps mites, especially *Tropilaelaps clareae* and *Tropilaelaps mercedesae*, are parasitic mites that feed on the pupae of male and worker honeybees. By damaging honeybee larvae during their developmental stages, these mites cause the following problems in bee colonies:

- **Deformations:** The mites attack developing pupae, causing damage to the wings, legs, and abdomen

- **Spread of Viruses:** *Tropilaelaps* mites accelerate the spread of viruses within the bee colony.

- **Parasitic Mite Syndrome (PMS):** This syndrome leads to the weakening of bee colonies and eventually results in the gradual destruction of the colony.

- **Reduced Productivity:** The weakening of the bee colony leads to decreased honey production and reduced pollination efficiency.

Tropilaelaps mites can cause deformities in both pupae and adults, leading to a reduction in the worker bee population. These mites can also carry viruses that affect the health of the bees. The female *Tropilaelaps* mite enters capped brood cells of worker and male bees, where it lays 1-4 eggs (usually 3 or 4). The development from egg to adult takes about a week, and the mature mites (usually around 2-3) will leave the brood cell along with the emerging young adult bee. While in the capped cell, the mite's larval stage is white and feeds on the developing bee. Adult *Tropilaelaps* mites are active, about 1 mm in length and typically 0.5 mm in width, making them roughly one-third the size of a *Varroa* mite. Since *Tropilaelaps* mites cannot survive for long on adult bees, the majority of adult mites (>95%) will mate and enter the brood cell within 2 days after the adult bee emerges from the capped cell to lay more eggs.

Simple Detection Methods for Mites in Bee Colonies. There are several methods for detecting *Tropilaelaps* mites. One of the quick, easy, and effective methods is the "capping" method. To collect mites using this method:

1. Remove a frame of capped brood from the bee colony.
2. Shake the adult bees off the frame.
3. Firmly strike one side of the frame onto a white surface.
4. Flip the frame over and strike it again.
5. Repeat steps 3 and 4, making a total of four strikes (two on each side).
6. Then, measure the quantity of mites.

Tropilaelaps mites will be visible on the white surface. It's important to remember that *Tropilaelaps* mites are small and move quickly, so using a white surface, such as a tray, is recommended to help collect the mites that fall off.

Control Measures for *Tropilaelaps* Mites: Widely recommended beekeeping management strategies for controlling *Tropilaelaps* include the use of healthy queen bees and the removal of brood frames that can be taken out. One successful cultural control method for treating *Tropilaelaps* infestations involves using queen cages. The population of *Tropilaelaps* mites in a bee colony can significantly decrease if the queen is caged for a period of nine days and the colony is deprived of brood by removing capped brood cells during this time. This period without brood reduces the mite population as the mites rely on the developing pupae for their reproduction.

To prevent the further spread of *Tropilaelaps* mites, serious monitoring programs have been established worldwide. The transportation of honeybees from a *Tropilaelaps*-infected area to a *Tropilaelaps*-free region should be done using bee packages (only adult

bees, without frames), rather than established colonies. These packages must be kept at least two days away from any honeybee colonies. After this two-day period, any *Tropilaelaps* mites carried within the package will die, as there is no brood to support mite feeding [1, 2]. According to other literature sources, caging the queen has been proven to increase the effectiveness of treatments for both *T. mercedesae* and *V. destructor*, forcing both mite species into an uncapped developmental stage where they cannot reproduce under the cell cap-pings [3, 4]. In addition to providing a potential treatment condition for *T. mercedesae*, caging the queen can eliminate brood at the right age for mite feeding in the colony, thus starving the mites. In a colony without capped brood or larvae, a newly laid honeybee egg would take 6.5 days to reach the appropriate stage for *T. mercedesae* to feed, which is much longer than the three days the mites can survive without feeding [5, 6]. Additionally, *T. mercedesae* will not be able to reproduce in a capped brood cell nine days after the initial egg is laid. Chemical controls against *V. destructor* have shown high effectiveness [7].

Research has been conducted in many countries' Honeybee Research Institutes and Research Centers using formic acid and thymol against *Tropilaelaps* mites. The study involved the experimental division of 36 bee colonies into two groups for treatment (formic acid and thymol). Formic acid (70%) and thymol were applied in six treatments, including a control group. (T0=0,0 ml, T1=5ml, T2=10ml, T3=15ml, T4=20ml and T5=25ml) and (T0=0.0g, T1=5g, T2=10g, T3=15g, T4=20g, and T5=25g). The treatments were randomly applied over a period of 5 weeks with 3 repetitions. The maximum number of *Tropilaelaps* mites collected was 782 and 518, respectively, in the collection containers for the treatments using 25 ml of formic acid and 25 g of thymol. The highest efficacy of formic acid and thymol against the mites was 97% and 95.3%, respectively. In the formic acid group (T5, 25 ml), the maximum honey yield was 22.54 kg per bee colony, while in the thymol group (T5, 25 g), the maximum yield was 20.7 kg per colony. All results clearly showed that formic acid and thymol treatments were effective against *T. mercedesae*. Throughout the study, no queen bees were lost, and there were no deaths of adult worker bees in any of the colonies.

This effectiveness is due to these treatments not only killing the mites on the open adult bees but also eliminating the mites in the sealed brood cells.

Conclusion: *Tropilaelaps* mites pose a serious threat to honey bee colonies. Given the biological characteristics of the mites and their impact on bee colonies, a combination of chemical, biological, and cultural control measures should be implemented. These measures are vital for protecting the health of the bees and increasing honey production.

Tropilaelaps mites are carried by adult honey bees both within and outside the colony. Foretic mites (mites attached to adult bees) can be transferred to other colonies when the adult bees are moved to another colony. This transfer can occur during attacks on other colonies or when frames contaminated by the pests are shared between colonies, as well as through other unintended methods of contact.

Beekeepers must strictly adhere to monitoring and preventive measures to limit the spread of these mites.

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INFLUENCE OF BIOLOGICAL PRODUCTS ON THE EFFICIENCY OF COMPOSTING LEAF LITTER FROM DIFFERENT TYPES OF TREES**Kartyzhova L.,***Leading researcher. Ph.D. in biology
Institute of Microbiology, NAS of Belarus***Ananyeva I.,***Leading researcher. Ph.D. in biology
Institute of Microbiology, NAS of Belarus***KLishevich N.,***Institute of Microbiology, NAS of Belarus***Aleshchenkova Z.,***Institute of Microbiology, NAS of Belarus***Yakovlev A.,***Central Botanical Garden NAS of Belarus of Belarus***Bulavko G.***Central Botanical Garden NAS of Belarus of Belarus***ВЛИЯНИЕ БИОПРЕПАРАТОВ НА ЭФФЕКТИВНОСТЬ КОМПОСТИРОВАНИЯ ЛИСТОВОГО ОПАДА ДЕРЕВЬЕВ РАЗНЫХ ПОРОД****Картыжова Л.Е.***Институт микробиологии НАН Беларуси, Минск,
Ведущий научный сотрудник, кандидат биологических наук, доцент***Ананьева И.Н.***Институт микробиологии НАН Беларуси, Минск,
Заведующий лабораторией, кандидат биологических наук, доцент***Клишевич Н.Г.***Институт микробиологии НАН Беларуси, Минск,
Научный сотрудник***Алещенкова З.М.***Институт микробиологии НАН Беларуси, Минск,
Главный научный сотрудник, доктор биологических наук, профессор***Яковлев А.П.***Центральный ботанический сад НАН Беларуси, г. Минск,
Заведующий лабораторией, кандидат биологических наук, доцент***Булавко Г.И.***Центральный ботанический сад НАН Беларуси, Г. Минск,
Ведущий научный сотрудник, кандидат биологических наук*<https://doi.org/10.5281/zenodo.14577654>**Abstract**

An environmentally friendly way to utilize plant waste that accumulates in parks and gardens is to compost it using decomposing microorganisms. The biopreparations Polibact (a microbial preparation based on cellulose-destroying, nitrogen-fixing, phosphate-mobilizing microorganisms) and PoliFunCur (a biofertilizer based on aerobically fermented bird droppings and an effective nitrogen-fixing bacterial strain of microorganisms), developed at the Institute of Microbiology of the National Academy of Sciences of Belarus, were used to compost leaf litter from various tree species growing in the Central Botanical Garden in Minsk (Belarus). The combined use of biopreparations and their use with soil during composting of leaf litter from trees of different species contributes to an increase in the moisture content of the composted mass by 28 and 49%, an increase in its biogenicity by 37 and 110%, an increase in the number of microorganisms that assimilate mineral forms of nitrogen by 15.4 and 38.0% and ammonify by 4.0 and 86.2%, activation of the microbiological transformation of organic matter by 1.3 and 86.7 times, and acceleration of its mineralization processes by 74 and 77% compared to the control, respectively. It has been established that the activity of the process of microbiological transformation and mineralization of organic matter of composted plant mass depends on the tree species and the type of treatment (biological preparations, biological preparations together with soil), which have a significant positive effect on these processes, accelerating them and ensuring the utilization of plant waste and the production of organic fertilizer available to plants.

Аннотация

Экологически чистым способом утилизации растительных отходов, скапливающихся на территории парков и садов является их компостирование с использованием микроорганизмов-деструкторов. Разработанные в Институте микробиологии НАН Беларуси биопрепараты Полибакт (микробный препарат на основе целлюлозоразрушающих, азотфиксирующих, фосфатмобилизующих микроорганизмов) и ПолиФунКур (биоудобрение на основе аэробно ферментированного птичьего помета и эффективного азотфиксирующего бактериального штамма микроорганизмов) были использованы при компостировании листового опада разных пород деревьев, произрастающих на территории Центрального ботанического сада в городе Минске (Беларусь). Совместное применение биопрепаратов и применение их с почвой при компостировании листового опада деревьев разных пород способствует увеличению влажности компостируемой массы на 28 и 49 %, повышению ее биогенности на 37 и 110 %, увеличению численности микроорганизмов, усваивающих минеральные формы азота на 15,4 и 38,0 % и аммонифицирующих на 4,0 и 86,2 %, активации микробиологической трансформации органического вещества в 1,3 и 86,7 раз, ускорению процессов его минерализации на 74 и 77 % по сравнению с контролем, соответственно. Установлено, что активность процесса микробиологической трансформации и минерализации органического вещества компостируемой растительной массы зависит от породы деревьев и вида обработки (биопрепараты, биопрепараты совместно с почвой), которые оказывают значимое положительное влияние на эти процессы, ускоряя их и обеспечивая утилизацию растительных отходов и получение органического, доступного для растений, удобрения.

Keywords: Tree leaf fall, oak, maple, birch, moisture, acidity, organic matter, biopreparations, mineralization, biogenicity, plant compost

Ключевые слова: Листовой опад деревьев, дуб, клен, береза, влажность, кислотность, органическое вещество, биопрепараты, минерализация, биогенность, растительный компост

Введение. Наиболее действенным методом переработки отходов органического происхождения является их трансформация с использованием микроорганизмов-деструкторов, посредством которых происходит разложение сложных органических соединений. Субстрат, полученный в результате биохимической деятельности микроорганизмов и используемый в качестве органического удобрения, обеспечивает повышение плодородия почвы и продуктивность сельскохозяйственных культур, активный рост декоративных и хвойных насаждений. Применение микроорганизмов-деструкторов при переработке листового опада, скошенной травы, сорняков является экологически чистым способом утилизации скапливающихся на территории парков и садов растительных отходов [1-4].

Целью данных исследований было изучение влияния микробных препаратов на процесс компостирования листового опада деревьев разных пород, биогенность компоста, состав и структуру его микробиома.

Материалы и методы. Объектами исследования служили:

- листовой опад клена серебристого и остролистого, березы бородавчатой, дуба черешчатого и красного;

- микробный препарат Полибакт на основе целлюлозоразрушающих (*Bacillus amyloliquefaciens* БИМ В-843, *Bacillus amyloliquefaciens* БИМ В-845, *Pseudomonas brassicacearum* БИМ В-446), азотфиксирующих (*Brevibacillus parabrevis* БИМ В-818) и фосфатмобилизующих (*Bacillus megaterium* БИМ В-445Д) бактерий;

- биоудобрение ПолиФунКур, содержащее органический субстрат (конечный продукт аэробной ферментации птичьего помета) и ассоциативный диазотроф (*Brevibacillus sp.* БИМ В- 818 Г).

Изучение влияния биопрепаратов на влажность и кислотность, численность микроорганизмов основных эколого-трофических групп компостируемого листового опада проводили по следующей схеме опыта:

Вариант 1 – листовой опад + вода (Контроль 0);

Вариант 2 - листовой опад + вода + почва (Контроль 1);

Вариант 3 – листовой опад + 10% рабочий раствор Полибакта и ПолиФунКура;

Вариант 4 листовой опад + почва + 10% рабочий раствор Полибакта и ПолиФунКура + почва.

Заложенные компосты были сформированы из листового опада определенной породы (клен, дуб, береза) деревьев. Объем вносимых микробных препаратов составлял 2% от объема компостируемого субстрата.

С целью ускорения процесса трансформации растительных остатков при их компостировании биопрепараты вносили поэтапно: микробный препарат Полибакт (на стадии закладки) и биоудобрение ПолиФунКур (через неделю) в соотношении 1:1.

Опытные варианты включали 10% рабочий раствор микробных препаратов, который представлял собой гомогенизированную жидкую массу, контрольные – воду, в том же объеме. Закладку листового опада на компостирование по данной схеме проводили в воздухопроницаемые тканевые сосуды/контейнеры (ГОСТ 32522-2013, мешки тканые полипропиленовые).

В схему опыта входили контрольные варианты без применения биопрепаратов, но с увлажнением листового опада водой в объеме, соответствующем количеству используемых препаратов.

Опыт заложен в трехкратной повторности в полевых условиях на производственных площадках Центрального ботанического сада НАН Беларуси.

Компостируемый растительный субстрат периодически перемешивали и одноразово увлажняли водой.

Отбор образцов компостируемого субстрата для микробиологических исследований биогенности, состава и структуры микробоценоза, проводили через 1, 2 и 3 мес. от начала компостирования.

Микробиологическую активность компостируемого растительного субстрата изучали согласно общепринятым в почвенной микробиологии методам [5, 6]. Для оценки влияния исследуемых факторов (порода деревьев, биопрепараты) на микробиоту компоста использовали чашечный метод Коха. Численность аммонифицирующих, усваивающих минеральные формы азота, олигонитрофильных, углеродооксилирующих, усваивающих гумусовые компоненты, нитрифицирующих, денитрифицирующих, фосфатмобилизующих микроорганизмов определяли на селективных питательных средах: мясо-пептонном (МПА), мясо-суловом (МСА), крахмало-аммиачном (КАА) агарах, среде Эшби, цитратном агаре (ЦА), нитритном агаре (НА), голодном агаре (ГА), водном агаре (ВА), средах Виноградского, Гильтая, Чапека, Муромцева

соответственно. Численность микроорганизмов выражали в количестве колониеобразующих единиц в пересчете на 1 г абсолютно сухой почвы (КОЕ/г а.с.п.). Определение биогенности образцов компостируемого растительного субстрата проводили через 3 мес. компостирования. Влажность и кислотность определяли общепринятыми методами [7].

Результаты. В результате проведенных лабораторных и полевых исследований выявлены существенные различия в эффективности процесса компостирования органического субстрата.

Установлено, что лиственный опад клена, дуба, березы в течение всего периода компостирования (3 мес.) представлял собой рыхлый, темного цвета субстрат. Коэффициент его влажности составил в контроле - 2,03, 2,85, 1,61; с добавлением почвы - 2,14, 2,27, 1,47; биопрепаратов - 3,21, 3,14, 3,30; биопрепаратов и почвы - 3,03, 2,73, 2,54, соответственно (рис. 1). Применение биопрепаратов как отдельно, так и совместно с почвой способствовало сохранению влажности: превышение контрольных показателей коэффициента влажности, в среднем, составило 49 и 28%, соответственно (рис. 1).

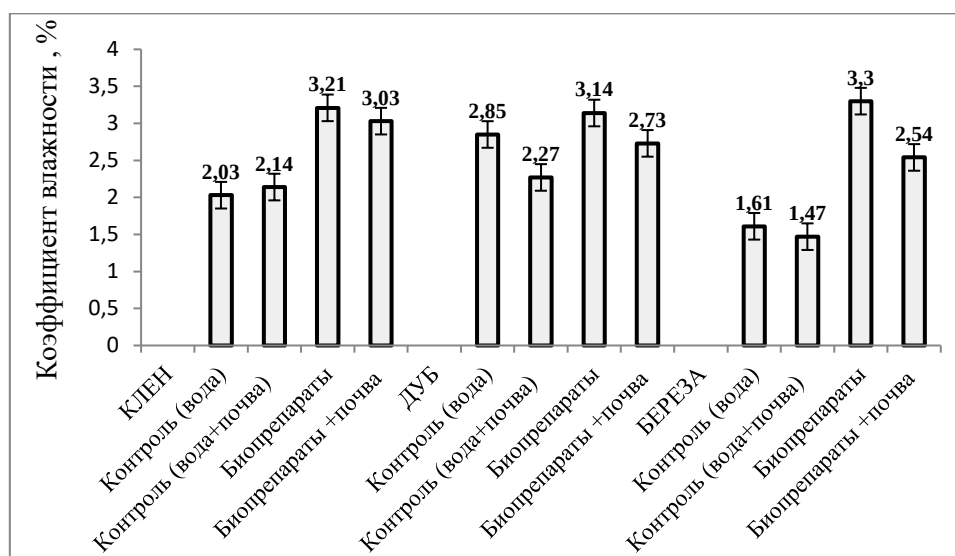


Рис. 1. Изменение коэффициента влажности компостов из листового опада разных пород деревьев по вариантам опыта

Установлено, что общая численность микроорганизмов, участвующих в процессе разложения органического вещества, зависит от используемого листового опада и микробных препаратов (рис. 2, 3).

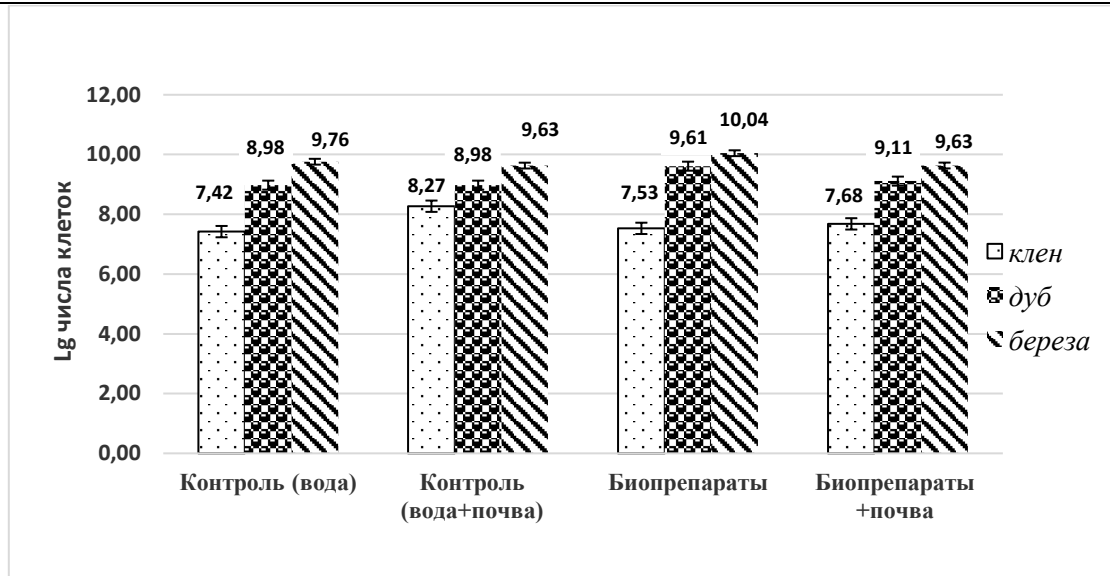


Рис. 2. Биогенность компостируемого листового опада по вариантам опыта

Статистическая обработка полученных данных показала, что применение биопрепаратов по сравнению с другими вариантами опыта оказало наиболее значимое влияние на биогенность компостов из листового опада всех пород деревьев, превышающую контрольные показатели на 217%. В результате статистической обработки полученных данных установлено, что эффективность микробиологической трансформации органического вещества листового опада зависела от породы деревьев. Биогенность компоста контрольных вариантов из листьев березы составила $5,74 \cdot 10^9$ КОЕ/г а.с.в. ($F > F_{\text{крит.}} = 14,85 > 5,14$ при $P = 0,004$ ($< 0,05$)), что на порядок было выше, чем в варианте с листьями дуба и на 2 порядка в варианте с листьями клена.

Использование биопрепаратов способствовало увеличению биогенности компостов из листового опада всех исследуемых пород деревьев, максимальное ее значение установлено в компосте с листьями березы ($1,11 \cdot 10^{10}$ КОЕ/г а.с.в.) и дуба ($4,1 \cdot 10^9$ КОЕ/г а.с.в.). Применение микробных препаратов совместно с почвой стимулирует микробоценоз компоста из листьев березы ($4,9 \cdot 10^9$ КОЕ/г а.с.в.) по сравнению с компостом из листового опада дуба, а также клена (рис.3).

Необходимо отметить, что применение биопрепаратов вызывало увеличение влажности компостов из листьев клена, дуба и березы на 35,0, 5,0

и 84,0 %, соответственно, и, как следствие, повышение их биогенности (рис. 4). Обработка компостируемой растительной массы водой не обеспечивало сохранение в ней влаги, тогда как последовательное внесение микробного препарата Полибакт и биоудобрения ПолиФунКур, способствовало получению равномерно-увлажненной, с однородной структурой, активно разлагаемой растительной массы.

В процессе компостирования листового опада происходит изменение кислотности среды. Наибольшее подкисление среды происходит при компостировании листового опада клена: в контрольном варианте (лиственный опад + вода) кислотность среды соответствовала pH 4,87 усл. ед. (рис. 5). Необходимо отметить, что использование как биопрепаратов, так и биопрепаратов с почвой при компостировании листового опада клена и дуба приводило к подкислению среды на фоне контрольных показателей, кислотность среды, в среднем, увеличилась на 10 и 14% соответственно. В компостах из листового опада березы применение микробных препаратов и микробных препаратов с почвой существенного изменения кислотности среды не выявлено.

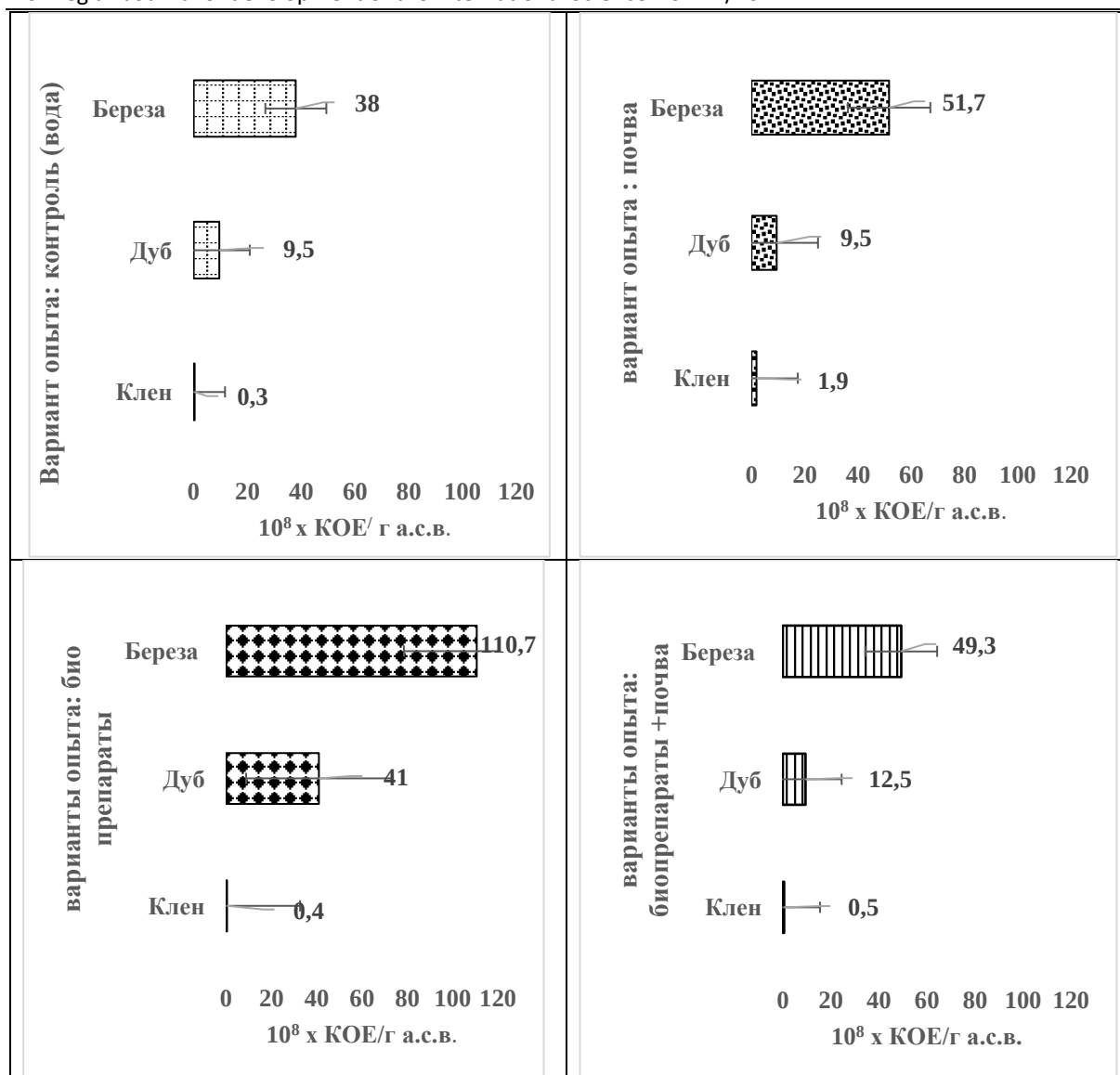


Рис. 3. Влияние вида обработки на биогенность компостируемой растительной массы

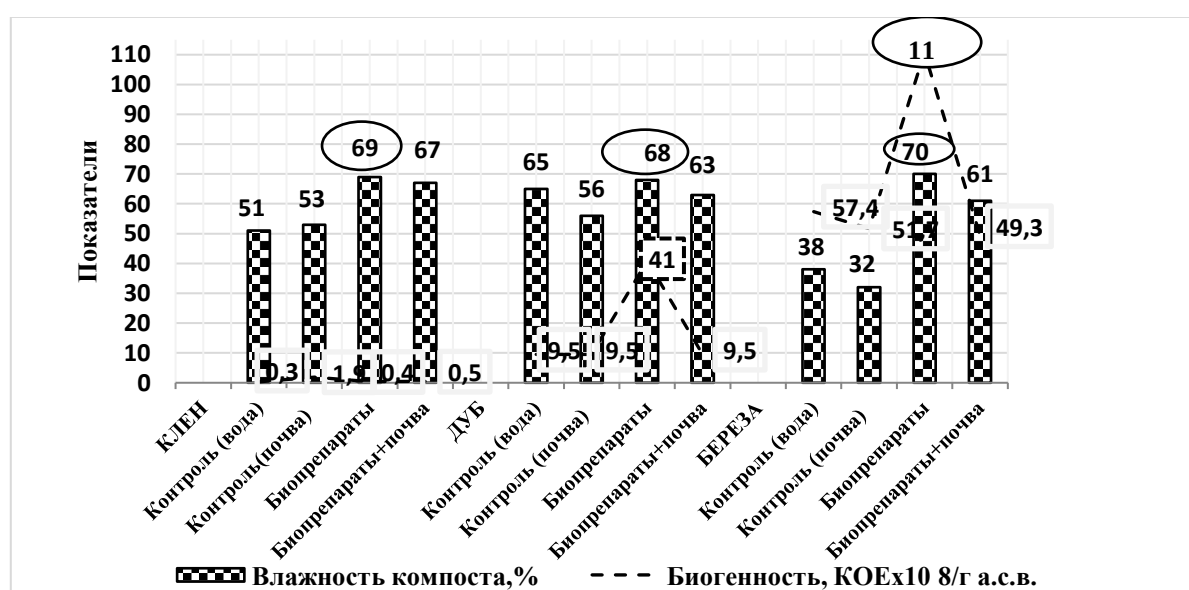


Рис. 4. Изменение влажности и биогенности компостов по вариантам опыта

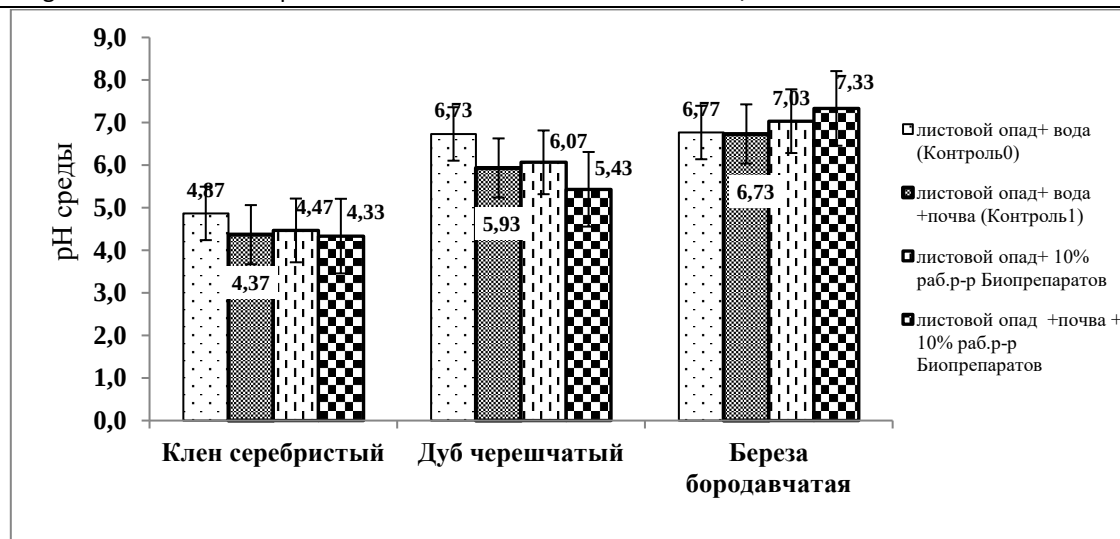


Рис. 5. Изменение кислотности среды под воздействием разных вариантов обработки компостируемого субстрата

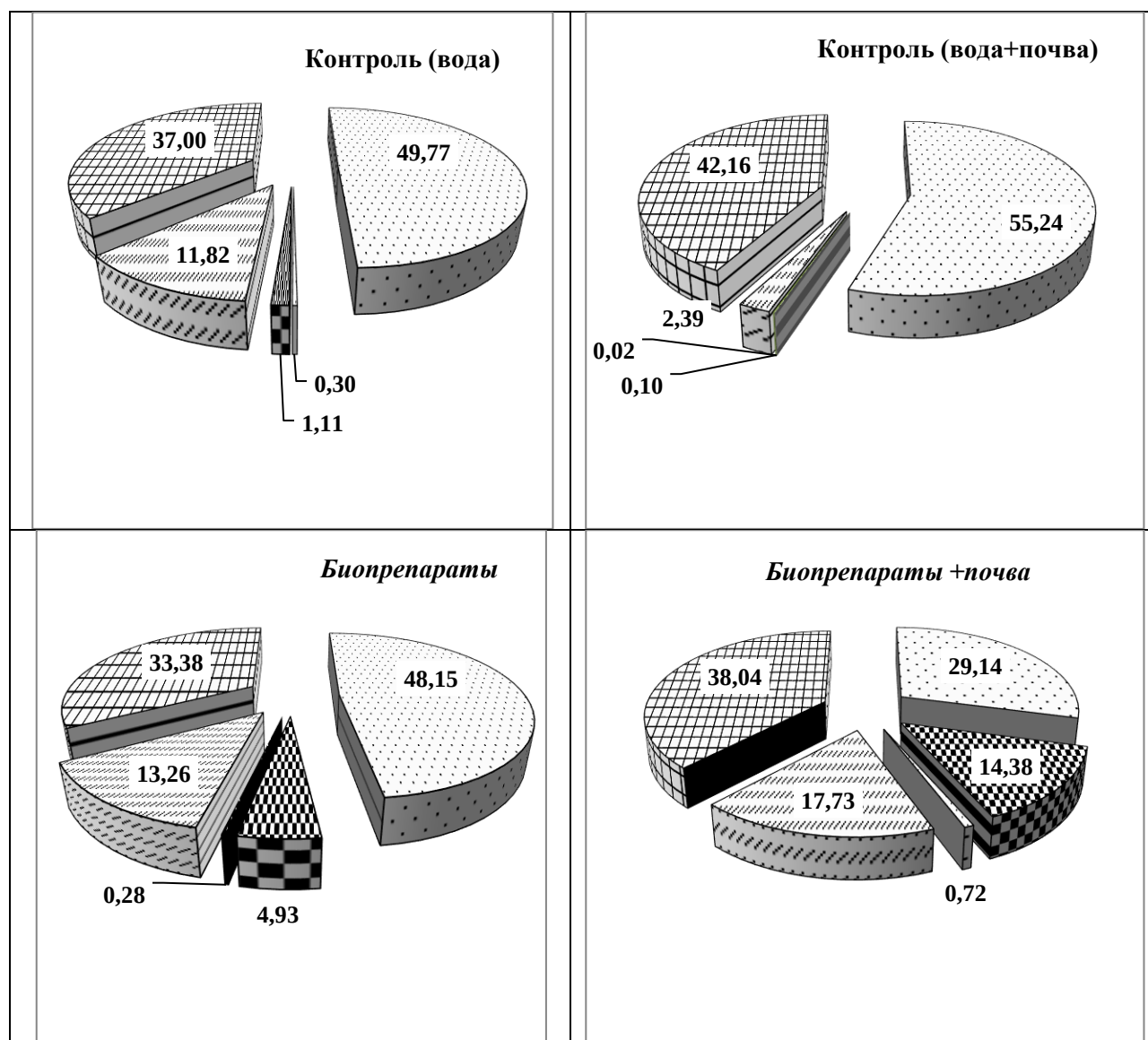
Процессы трансформации органических веществ компостируемого листового опада обусловлены составом и функциональной активностью микробоценоза. Сравнительный анализ структуры микробоценоза исследуемых компостов, показал, что наиболее активное участие в деструкции растительных остатков в контрольном варианте (вода) при компостировании листового опада клена принимает группа аммонифицирующих микроорганизмов (рис. 6), их долевое участие в структуре микробоценоза компоста составило 49,77 (вода) и 55,24% (вода+почва).

Применение биопрепаратов при компостировании листового опада разных пород деревьев оказало значимое влияние на структуру микробоценоза компостов. Применение биопрепаратов отдельно и совместно с почвой при компостировании вызвало изменения структуры микробоценоза компостов листового опада клена. Так, в компостах листового опада клена возрастает в 37 и 153 раза количество спорных аммонифицирующих микроорганизмов по сравнению с контрольным вариантом (вода+почва). Увеличение их долевого участия обусловлено обогащением компостируемой массы конкурентоспособной целлюлозоразрушающей микробиотой, входящей в состав Полибакта.

Количество активных форм аммонифицирующих микроорганизмов в структуре микробоценоза

компоста из листьев клена в варианте с добавлением биопрепаратов и почвы составило 29,1%, что на 26,1% меньше, чем в контроле. Применение биопрепаратов, как отдельно, так и совместно с почвой способствовало увеличению численности олигонитрофильных микроорганизмов, долевое участие которых при компостировании листового опада клена возросло на 10,9 и 15,3%, соответственно. Установлено, что активность процессов минерализации органических веществ в контрольных вариантах (вода) и (почва) опыта существенно не различалась, $K_{мин.}$ составил 0,75 усл. ед. В компосте на основе листового опада клена, полученном с применением микробных препаратов и почвы, $K_{мин.}$ составил 1,31.

Изменения в структуре микробоценоза компоста листового опада дуба с применением биопрепаратов отмечались в отношении олигонитрофильных микроорганизмов. В тоже время численность углеродооксилирующих и аммонифицирующих (активных) микроорганизмов увеличивалось на 2,0 (биопрепараты) и 35,0% (биопрепараты с почвой), соответственно, что вероятно связано с биохимическим составом листьев дуба. Долевое участие углеродооксилирующих микроорганизмов в структуре микробоценоза вариантов опыта с биопрепаратами и почвой составило, в среднем, 29,6% (контроль - 3%) (рис. 7).



Примечание: Группы микроорганизмов:

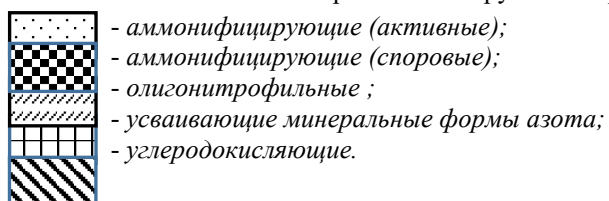
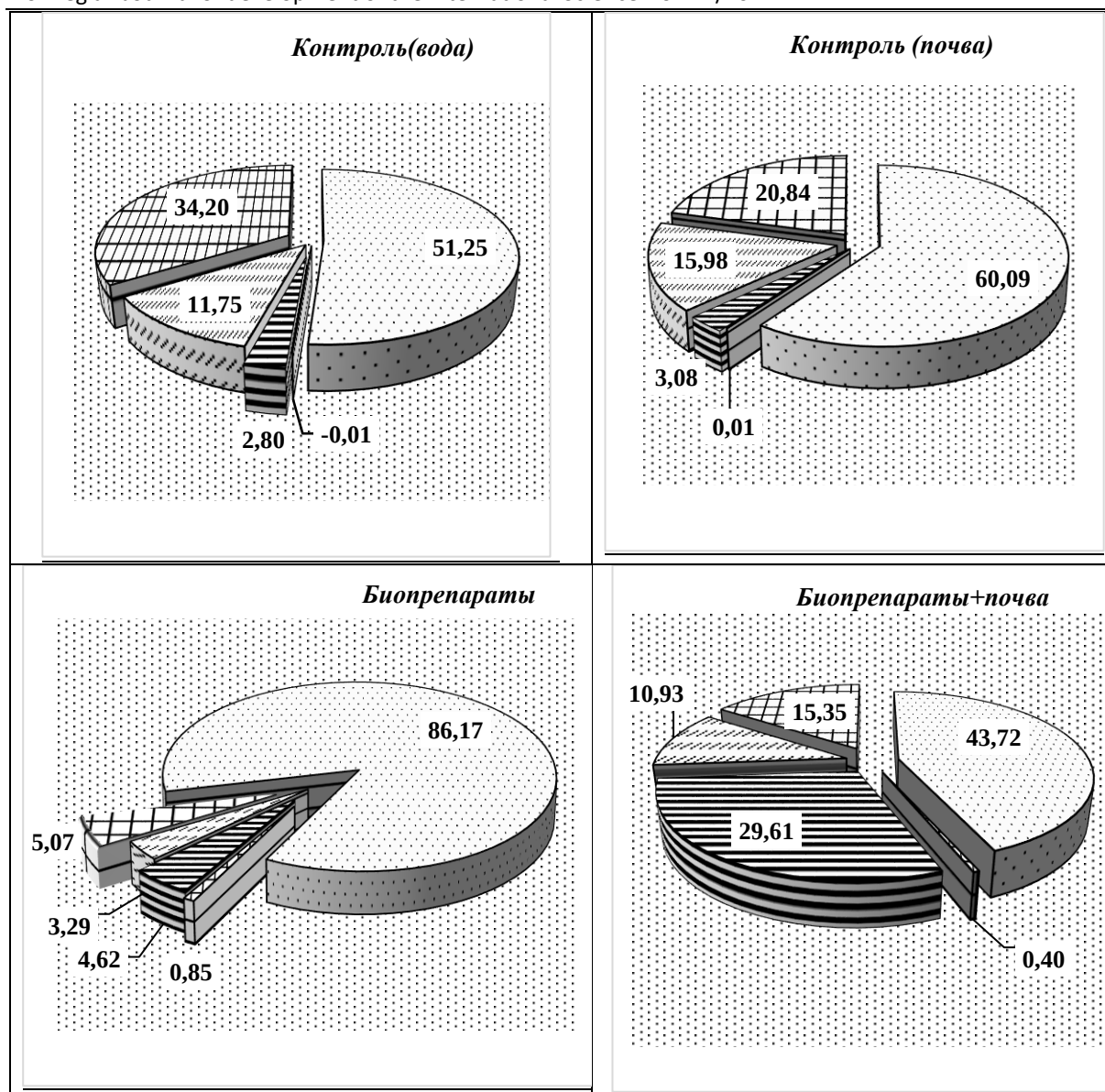


Рис. 6. Структура микробоценоза компостируемого листового опада клена



Примечание: Группы микроорганизмов :

-  - аммонифицирующие (активные);
-  - аммонифицирующие (споровые);
-  - олигонитрофильные;
-  - усваивающие минеральные формы азота;
-  - углеродокисляющие

Рис. 7. Долевое участие микроорганизмов основных эколого-трофических групп при компостировании листового опада дуба

Установлено, что добавление почвы к биопрепаратам при компостировании листового опада дуба не оказало значимого влияния на активность процессов минерализации органического вещества: $K_{мин.}$, в среднем, составил 0,35 усл. ед., что в 1,9 раз меньше контрольного (вода) показателя. Применение микробных препаратов при компостировании листового опада дуба не увеличивало численность микроорганизмов, усваивающих минеральные формы азота. Их доля в структуре микробиоценоза

составила 5,0% и процессы минерализации органического вещества проходили неактивно.

Необходимо отметить, что в вариантах с применением биопрепаратов отдельно и совместно с почвой повышение активности минерализационных процессов отмечается в компостах из листьев березы: $K_{мин.}$, в среднем, составил 0,75 (на 67% выше контроля, вода) и 1,14 (на 153% выше контроля, вода) усл. ед., соответственно (рис.8).

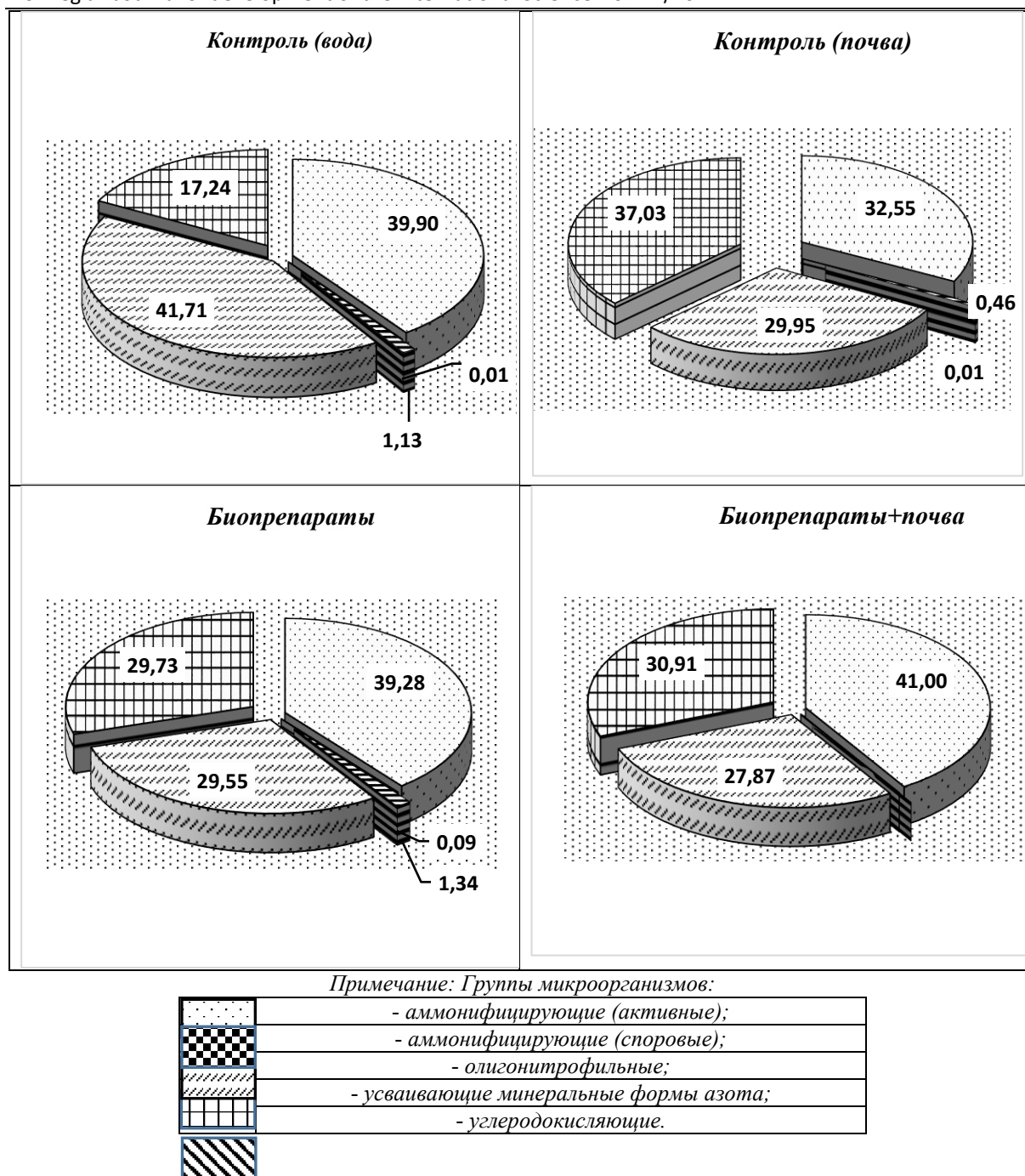


Рис. 8. Долевое участие микроорганизмов основных эколого- трофических групп в структуре микробиоценоза компоста на основе листового опада березы

В компосте из листьев березы (вода) численность аммонифицирующих микроорганизмов превышает таковую в компосте из листьев клена ($1,31 \times 10^7$ КОЕ/г а.с.в.) и дуба ($4,84 \times 10^8$ КОЕ/г а.с.в.) на 2 и 1 порядок соответственно, что свидетельствует о значимости породы деревьев и ее влиянии на функциональную активность аммонифицирую-

щих микроорганизмов. При использовании микробных препаратов максимальное их количество установлено в компосте из листьев березы, которое составило $4,36 \times 10^9$ КОЕ/г а.с.в., что превышало контрольные показатели в 1,9 раз ($2,29 \times 10^9$ КОЕ/г а.с.п.) (рис. 9).

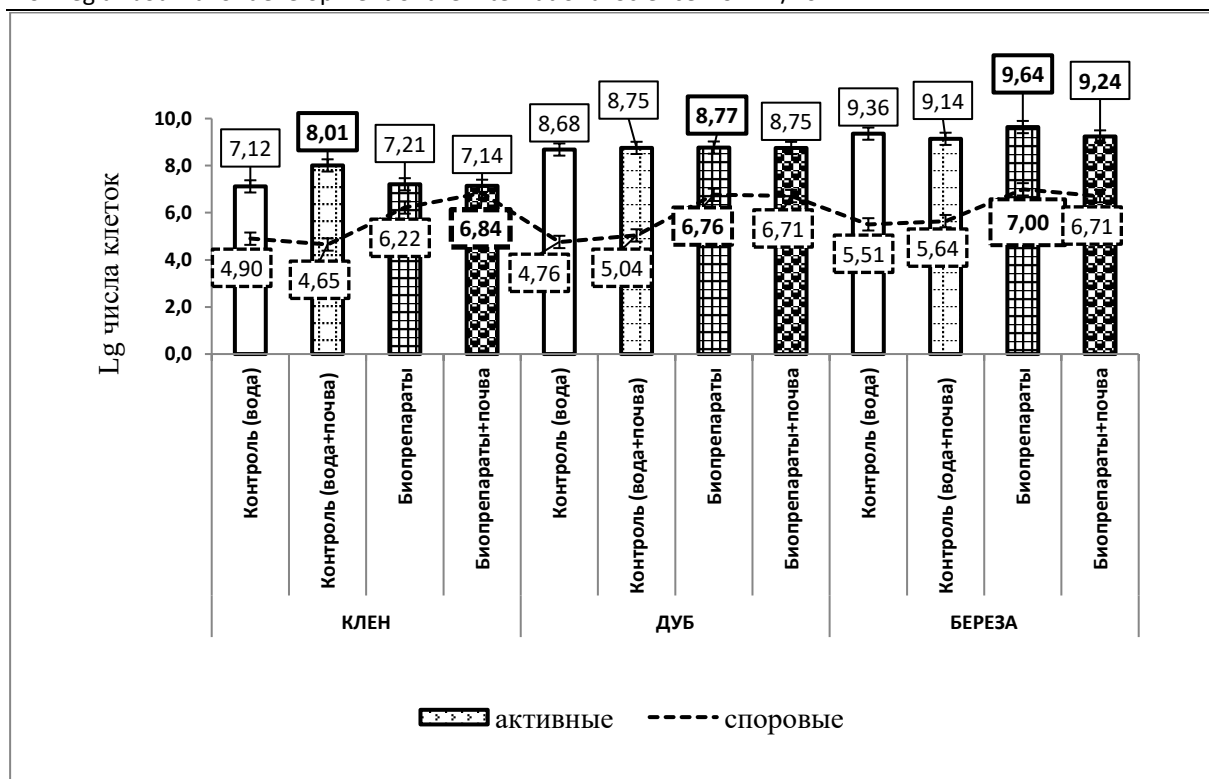


Рис. 9. Влияние биопрепаратов на численность аммонифицирующих микроорганизмов

Применение биопрепаратов и биопрепаратов с почвой стимулирует деятельность споровых аммонификаторов, обеспечивающих разложение более сложных органических соединений. Максимальное их количество установлено в компостах из листьев всех пород деревьев, в вариантах с применением биопрепаратов и в сочетании их с почвой, которое составило $9,9$ и $5,08 \cdot 10^6$ КОЕ/г а.с.в. (компост из листьев березы); $5,78$ и $5,11 \cdot 10^6$ КОЕ/г а.с.в. (компост из листьев дуба); $1,67$ и $6,88 \cdot 10^6$ КОЕ/г а.с.в. (компост из листьев клена). По сравнению с контрольными вариантами (вода, вода + почва) применение биопрепаратов, биопрепаратов совместно с почвой способствовало увеличению численности спорных аммонифицирующих в 21 и 153 раза (компост из листьев клена), в 101 и 27 раз (компост из листьев дуба); в 310 и 11,5 раз (компост из листьев березы).

Количество углеродооксилюющих микроорганизмов (УОМ) в компостируемой массе контроль-

ных вариантов изменялось в зависимости от породы деревьев. Так, в компосте из листового опада клена количество УОМ было на 2 порядка меньше, чем в компостах из листьев дуба и березы, что, по-видимому, обусловлено биохимическим составом листового опада деревьев разных пород (рис.10).

Установлено, что применение биопрепаратов для компостирования листового опада клена и дуба приводило к подкислению, а биопрепаратов совместно с почвой – к подщелачиванию среды, тогда как их использование при компостировании листьев березы вызывало формирование обратной реакции среды. В рамках проводимого эксперимента установлено, что при нейтральной реакции среды (рН 6,88) активизируется размножения УОМ в компосте из листьев дуба, максимальный титр жизнеспособных клеток составил $3,82 \cdot 10^8$ КОЕ/г а.с.в. (биопрепараты с почвой), из листьев березы при щелочной реакции среды (рН 8,03) - $1,23 \cdot 10^8$ КОЕ/г а.с.в. (биопрепараты) (рис.11-13).

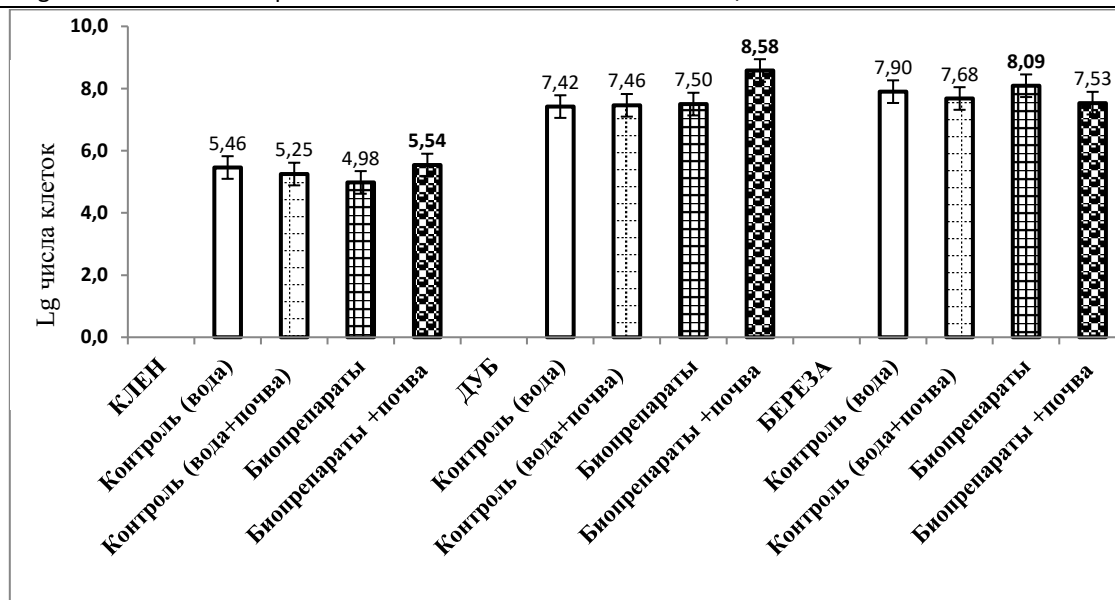


Рис. 10. Численность углеродоксилирующих микроорганизмов в компостах из листового опада деревьев разных пород

К микроорганизмам, завершающим процесс минерализации органических соединений, относятся олигонитрофильные микроорганизмы. Увеличение численности микроорганизмов данной группы отмечается при использовании биопрепаратов. Максимальное количество олигонитрофильных микроорганизмов отмечалось в компосте из листового опада березы ($3,28 \times 10^9$ КОЕ/г а.с.в.) (рис. 14).

Установлено, что применение биопрепаратов для компостирования листьев дуба приводило к незначительному снижению численности олигонитрофильных микроорганизмов по сравнению с контролем (листовой опад+вода + почва), что указывает на активную фазу микробиологической трансформации органического вещества. Совместное применение биопрепаратов с почвой ускоряло процессы трансформации органического вещества в компосте, количество олигонитрофильных микроорганизмов увеличилось на порядок по сравнению с контролем (листовой опад дуба+почва) и составило $1,41 \times 10^8$ КОЕ/г а.с.в.

Оценку активности минерализационных процессов органического вещества проводили на основании анализа долевого участия микроорганизмов, усваивающих минеральные формы азота, аммонификаторов.

Установлено, что применение биопрепаратов активизировало деятельность микробного сообщества, усваивающего минеральные формы азота. На рисунке 15 представлена диаграмма численности микроорганизмов, усваивающих минеральные формы азота в образцах компостов из листьев клена (10^7 КОЕ/г а.с.в.), дуба (10^8 КОЕ/г а.с.в.) и березы (10^9 КОЕ/г а.с.в.). Как видно, наиболее активное участие данная группа микроорганизмов принимает при компостировании листового опада березы с применением микробных препаратов. Численность микроорганизмов, усваивающих минеральные формы азота в данном варианте увеличилась в 3,7 раза. Совместное применение микробных препаратов с почвой при компостировании листьев клена оказывает также стимулирующее влияние на размножение микроорганизмов, усваивающих минеральные формы азота, численность которых увеличилась в 2 раза по сравнению с контролем.

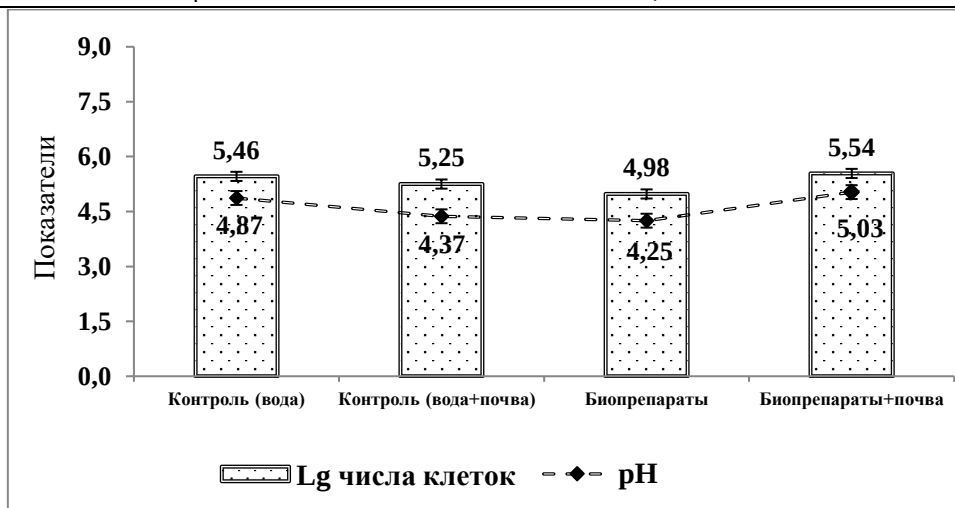


Рис. 11. Численность УОМ и кислотность среды, компост из листьев клена

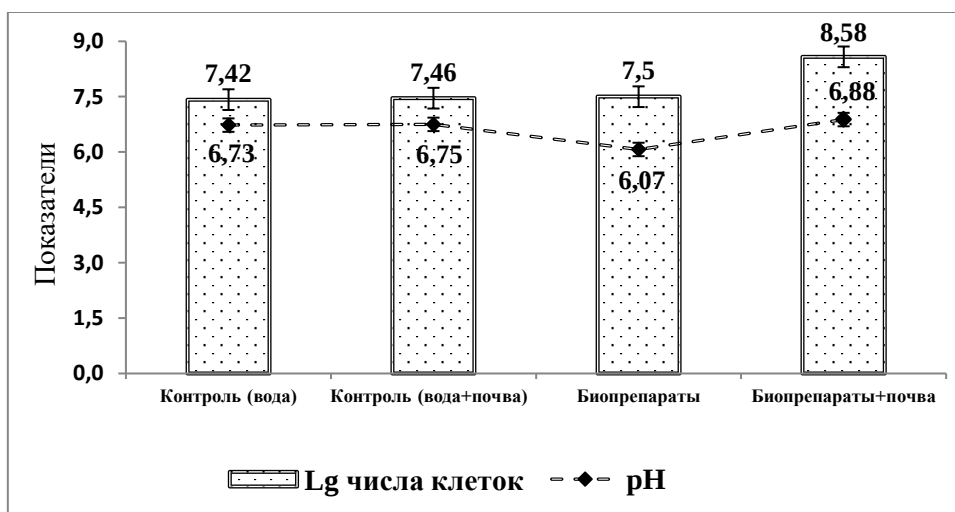


Рис. 12. Численность УОМ и кислотность среды, компост из листьев дуба

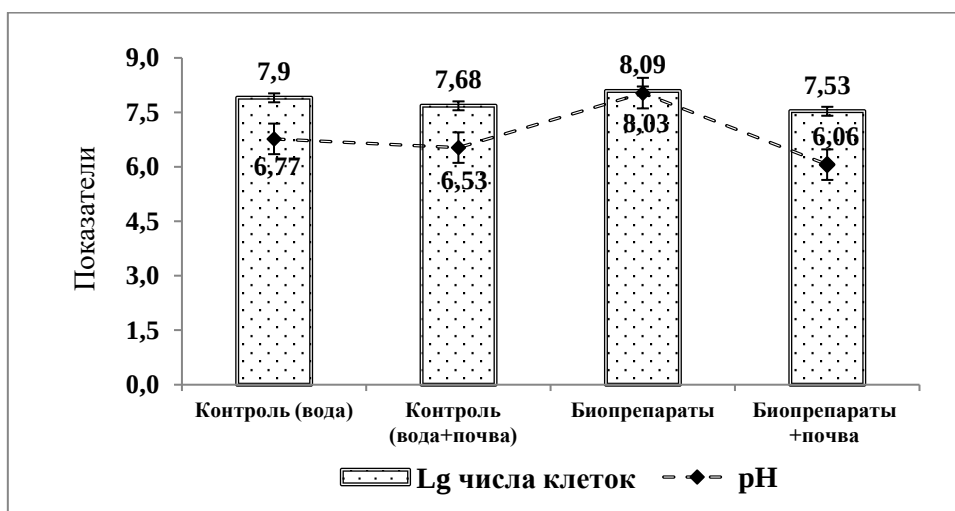


Рис. 13. Численность УОМ и кислотность среды, компост из листьев березы

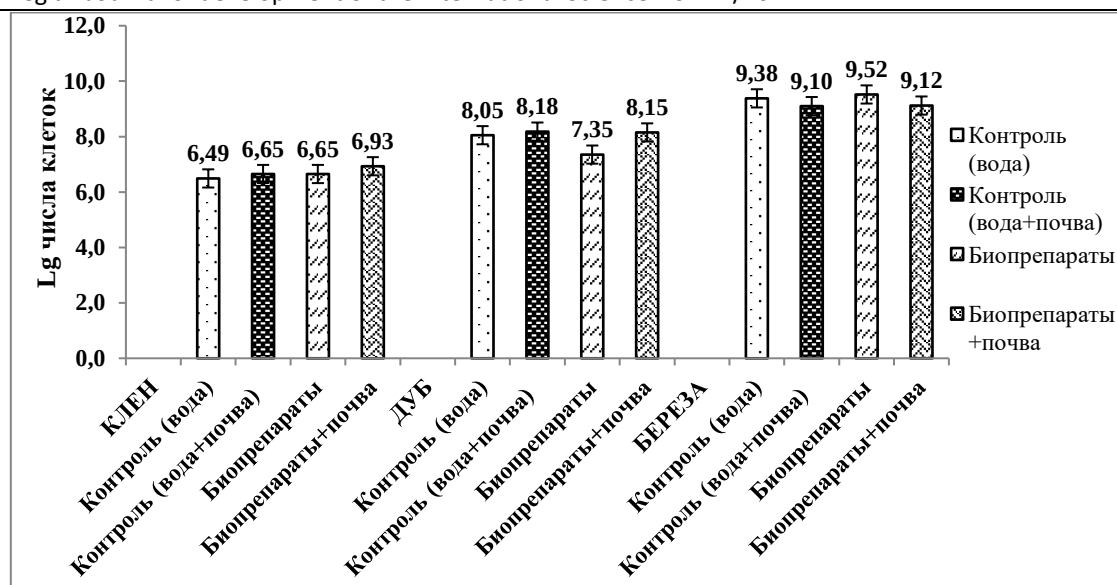


Рис. 14. Численность олигонитрофильных микроорганизмов при компостировании листового опада деревьев разных пород

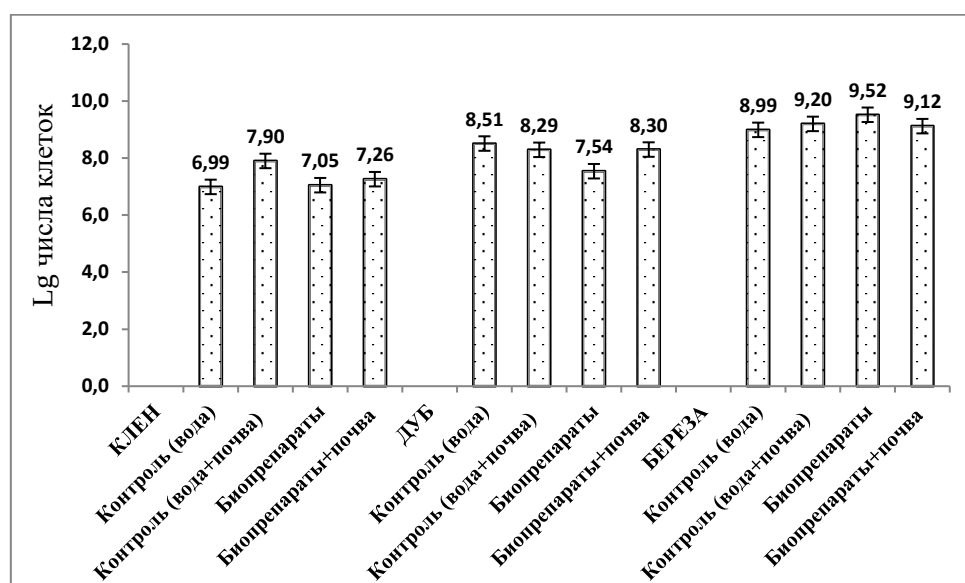
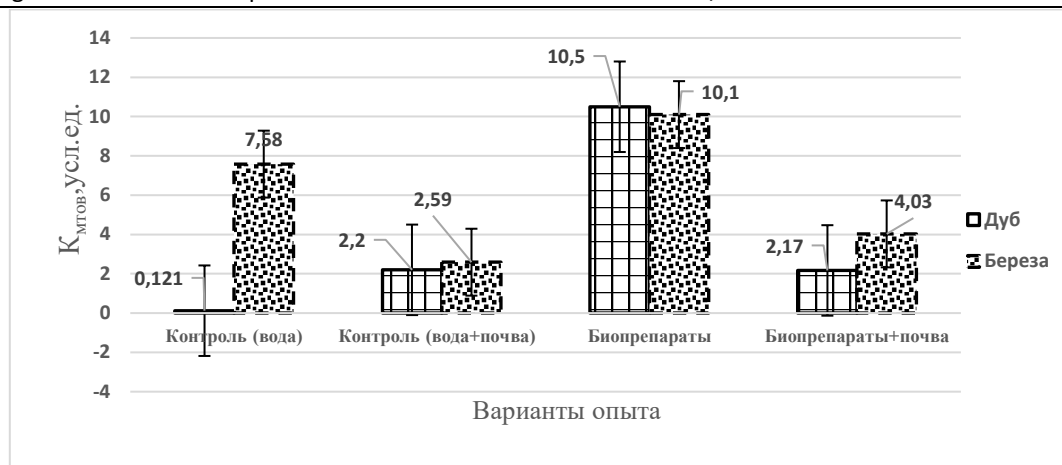


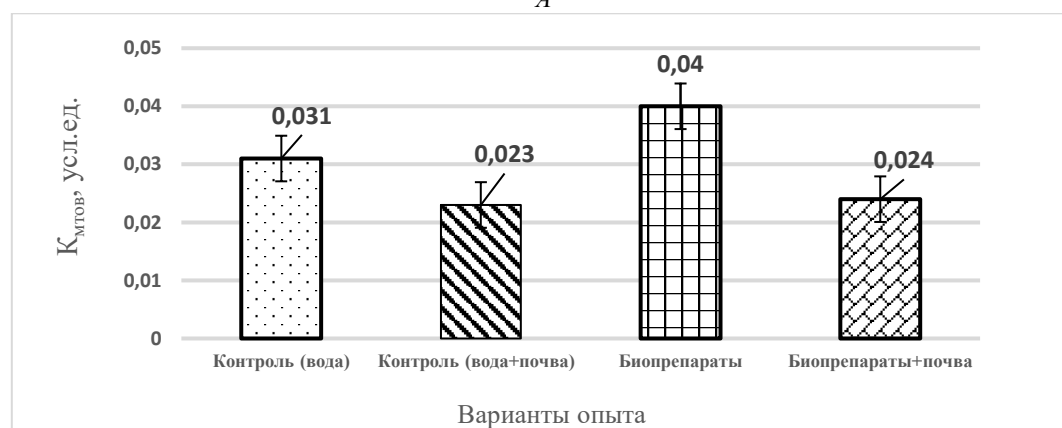
Рис. 15. Численность микроорганизмов, усваивающих минеральные формы азота при компостировании листового опада деревьев разных пород

Интенсивность микробиологических процессов, связанных с трансформацией органического вещества и его минерализацией зависит от функциональной активности микроорганизмов, усваивающих минеральные формы азота и аммонифицирующих. Установлено, что использование биопрепаратов, обеспечивающих активное функционирование микроорганизмов основных эколого-трофических групп микробиоценоза компостов способствует

ускорению процессов микробиологической трансформации органического вещества. Максимальный коэффициент микробиологической трансформации органического вещества установлен в компостах из листьев березы и дуба, который составил 10,5 и 10,1 усл. ед. соответственно (рис. 16А). В компосте из листьев клена интенсивность микробиологической трансформации органического вещества – невысокая, однако, превышает контрольные показатели на 29% (рис. 16Б).



А



Б

Растительные объекты : А- компост из листьев дуба и листьев березы, Б- компост из листьев клена
Рис. 16. Интенсивность микробиологической трансформации органического вещества при компостировании листового опада

Установлено, что биохимические процессы разложения органического вещества в компостах из листового опада клена, полученных с применением биопрепаратов и почвы преобладают над процессами восстановления. $K_{мин}$ в компосте из листьев клена составил 1,31 усл. ед. и превысил контрольные показатели на 77 %. Применение биопрепаратов и биопрепаратов с почвой способствовало ускорению минерализационных процессов при компостировании листового опада березы, активность которых превысила контрольный показатель ($K_{мин.} = 0,76$ усл.ед.) в 1,77 раз. Установлено, что использо-

вание биопрепаратов отдельно и совместно с почвой для компостирования листового опада дуба не приводило к активизации процессов минерализации органического вещества, $K_{мин.}$ в данном варианте снизился в 1,9 и 11,2 раза, соответственно, по сравнению контрольным показателем. Это, возможно, обусловлено биохимическим составом листьев дуба, оказавшим негативное влияние на функционирование олигонитрофильных микроорганизмов и усваивающих минеральные формы азота и вызвавшим сокращение их численности (рис. 17).

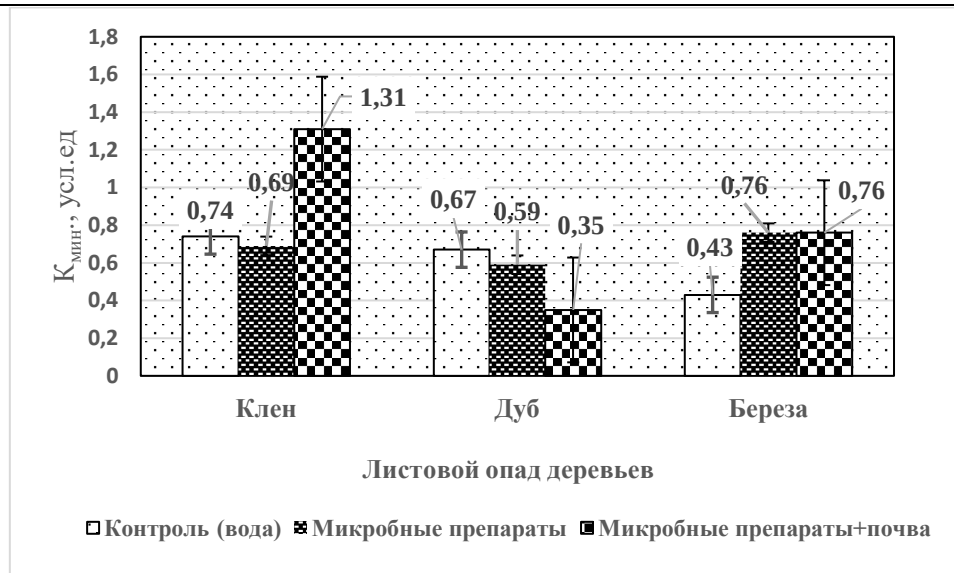


Рис. 17. Активность минерализационных процессов при компостировании листового опада деревьев разных пород

Таким образом, полученные данные свидетельствуют о том, что такие факторы как порода деревьев и биопрепараты оказывают существенное влияние на процессы аммонификации в компостируемой массе.

Заключение. В результате проведенных исследований установлено, что применение биопрепаратов и биопрепаратов с почвой при компостировании листового опада деревьев разных пород способствовало:

- увеличению влажности компостируемого листового опада, в среднем - на 49,0 % (биопрепараты) и 28,0 % (биопрепараты с почвой) по сравнению с контролем;
- подкислению компостируемой растительной массы из листьев клена на 8% (биопрепараты) и 11% (биопрепараты с почвой); из листьев дуба - 19 % (биопрепараты) и 9,8%, соответственно;
- повышению биогенности компостов из листьев клена на 37 (биопрепараты) и 109,0 % (биопрепараты с почвой), из листьев дуба на 37,0 % (биопрепараты с почвой), из листьев березы на 110,0 % (биопрепараты);
- изменению структуры микробоценоза компостируемого субстрата: увеличению численности микроорганизмов, усваивающих минеральные формы азота и аммонифицирующих, их долевое участие в компостах из листьев клена составило 38,0 (биопрепараты) и 29,1% (биопрепараты с почвой) и 33,38 (биопрепараты) и 48,15% (биопрепараты с почвой), из листьев дуба - 5,0 (биопрепараты) и 86,2% (биопрепараты с почвой) и 15,4 (биопрепараты) и 43,7% (биопрепараты с почвой), из листьев березы - 30,9(биопрепараты) и 39,0 % (биопрепараты с почвой) и 31,0(биопрепараты) и 4,0% (биопрепараты с почвой), соответственно;
- увеличению численности углеродоксилирующих микроорганизмов при компостировании листового опада клена на 18% (биопрепараты с почвой), дуба - в 14,5 раз (биопрепараты с почвой), березы - на 56 % (биопрепараты) по сравнению с контролем (вода);

- активизации микробиологической трансформации органического вещества при использовании биопрепаратов при компостировании листьев клена на 29 %, листьев дуба - в 86,7 раз и березы - на 33% по сравнению с контролем.

- ускорению процессов минерализации органического вещества на 74 (в компосте из листьев березы, $K_{мин.}$ составил 0,75 усл. ед., что превысило контрольный показатель в 1,8 раза) и 77 % (биопрепараты с почвой, в компосте из листьев клена). Совместное применение биопрепаратов с почвой для компостирования листового опада клена способствовало ускорению процессов минерализации органического вещества ($K_{мин.}$ составил 1,31 усл. ед.).

Таким образом, установлено, что активность процесса микробиологической трансформации и минерализации органического вещества компостируемой растительной массы зависит от породы деревьев и вида обработки (биопрепараты, биопрепараты совместно с почвой), которые оказывают значимое положительное влияние на эти процессы, ускоряя их и обеспечивая утилизацию растительных отходов и получение органического, доступного для растений, удобрения.

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ECONOMIC SCIENCES

LEGAL MECHANISMS FOR PROTECTING FOREIGN INVESTMENTS IN MINING PROJECTS

Abdykalykov A.

master's degree, IIT Chicago Kent College of Law, USA

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Abstract

This article examines the role of legal mechanisms for protecting foreign investments in mining projects. It analyzes regulations aimed at ensuring the stability and predictability of capital investments in an environment of heightened political, legal, and economic risks. The study explores international and national instruments, such as arbitration mechanisms, bilateral agreements, and specialized laws (e.g., FIRRMA in the USA), which establish a stable legal foundation for attracting investments and safeguarding investor interests. The importance of these mechanisms in reducing uncertainty in strategic sectors and maintaining a balance between the national interests of host countries and the needs of foreign companies is emphasized.

Keywords: legal mechanisms, foreign investments, mining projects, international agreements, arbitration, investment risks.

Introduction

The mining industry is one of the most capital-intensive and strategically significant sectors of the global economy. Amid globalization and rapid technological advancements, international companies actively seek opportunities to expand operations beyond their home countries. Foreign investments in mineral extraction play an important role in developing resource projects, allowing countries with abundant mineral resources but limited financial and technological capacity to attract necessary capital and innovation. At the same time, the mining sector represents a high-risk area for foreign investors, encompassing political, legal, economic, and environmental threats.

Investing in the mining sector faces numerous challenges, creating a need for reliable legal instruments capable of ensuring investment protection against political instability, legal uncertainty, and social conflicts. The legal framework for protecting foreign investments, encompassing both international and national mechanisms, must safeguard the rights and interests of investors while promoting sustainable development in host countries.

The purpose of this article is to analyze legal mechanisms for protecting foreign investments in the

mining industry. Examining international and national legal instruments, as well as the specifics of their application in different countries, enables an understanding of the main approaches to securing foreign capital and assessing their effectiveness in the face of global challenges.

Main part. Types of risks for foreign investors in the mining sector

The mining industry is a sector engaged in the extraction and primary processing of natural resources. It encompasses exploration, development, and operation of mineral deposits, playing a crucial role in supporting the global industrial and energy infrastructure.

The mining sector ranks among the most lucrative industries in the world economy. As reported by Statista, in 2023, the net earnings of the leading 40 firms in this industry reached around \$90 billion, indicating ongoing interest from global investors in this area. By the conclusion of 2024, it is projected that production in the mining sector will achieve 15,8 million tons, with a compound annual growth rate (CAGR) of 2,04% anticipated from 2024 through 2029 [1]. The top nations in mineral extraction – China, the USA, and Russia – are the primary investment hubs and raw material suppliers for the worldwide economy (fig. 1).

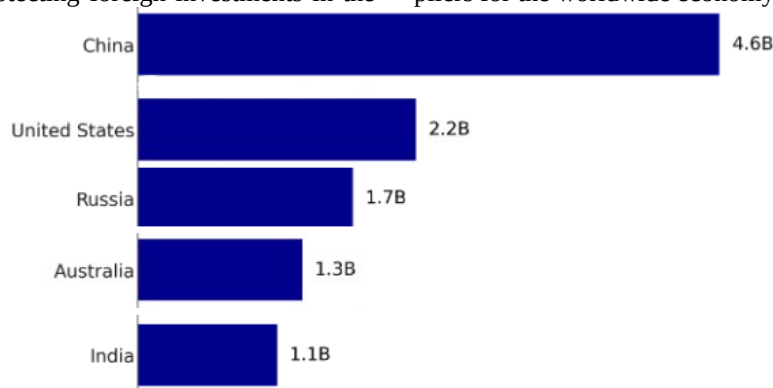


Figure 1. Volume of mineral extraction in different countries in 2024

Foreign investments in the mining sector are characterized by high returns. However, they also involve significant risks that can greatly affect the stability and profitability of projects. These challenges are often associated with the unique characteristics of the industry, including the substantial investment volume, long-term

nature of projects, and high dependency on the legal and economic environment of the host country. In this context, several key categories of risks stand out that foreign investors must consider when making decisions (table 1).

Table 1.

Main types of risks for foreign investors in the mining sector [2, 3]

Type of risk	Description
Political risks	Nationalization: risk of forced seizure of assets from private companies by the state. Change of government: potential shifts in priorities and political views affecting the investment climate. Legislative changes: new laws that may worsen conditions for foreign investors, including the introduction of new restrictions or taxes.
Legal and regulatory risks	Difficulties in obtaining permits: delays or denial of licenses and permits necessary for starting or continuing operations. Tax regime changes: adjustments in tax rates or tax conditions, which may increase investor costs.
Environmental and social risks	Strengthening of environmental requirements: tightening of environmental protection norms, which can increase compliance costs. Risk of conflicts with local communities: potential for social protests related to the negative impact on the environment or the living conditions of local populations.
Economic risks	Currency changes: currency volatility that may result in revenue and spending losses. Inflation: a rise in production expenses, leading to a drop in real income. Price fluctuations of resources: variations in prices on the international market, which impact profitability within the mining industry.

The table illustrates that foreign investor in the mining industry encounter numerous risks, many of which are directly affected by elements outside the companies' control. Political and legal risks are significant, as they stem from the actions of government authorities empowered to unilaterally alter regulations affecting the operations of foreign companies.

International mechanisms for protecting foreign investments

Due to the capital-heavy and high-risk characteristics of the mining industry, investment protection measures are crucial tools for reducing the political, legal, economic, and regulatory risks encountered by foreign enterprises. The primary global tools for safeguarding investments encompass international treaties and agreements, arbitration systems, and specific guarantees aimed at shielding against political risks.

A notable international accord is the **Energy Charter Treaty (ECT)**, which oversees transnational collaboration in the energy field [4]. Agreed upon in 1994, this agreement mandates that member countries guarantee equitable treatment for foreign investors and offers investors the choice to pursue international arbitration when their rights are infringed. In 2024, the EU opted to exit the ECT for various main reasons linked to its inconsistency with the EU's contemporary climate objectives and energy strategy. The ECT was perceived as a hindrance to the European Green Deal and the pledges of the Paris Agreement, as it still safeguarded investments in fossil fuels, which opposed the EU's initiatives to shift towards renewable energy sources. By leaving the ECT, the EU can sidestep possible legal challenges and conflicts tied to safeguarding investments in fossil fuels. Ongoing involvement in the treaty might have resulted in legal actions from energy firms pursuing compensation for efforts to decrease fossil fuel consumption.

The USA did not sign the ECT as it preferred to retain sovereignty in energy policy and avoid international obligations that could restrict its flexibility in managing domestic resources. The ECT was initially intended to create a legal framework for energy relations in Europe and Asia, where the USA saw no significant strategic interests requiring its involvement.

In 2024, multiple international accords were established, including the **Clean Economy Agreement** under the Indo-Pacific Economic Framework for Prosperity (IPEF), signed by countries in the Indo-Pacific region, such as the USA, with the goal of facilitating a shift towards a green economy [5]. The primary objectives of this agreement are to promote sustainable development, lower greenhouse gas emissions, and encourage green technologies by establishing favorable conditions for trade and investment in clean energy and sustainable resource management.

The emphasis from the USA is on safeguarding private investors' interests, advancing eco-friendly technologies, and enhancing global collaboration in sustainable development, particularly in key areas like mining. The accord offers legal safeguards such as arbitration and promotes the creation of sustainable supply chains, research and development (R&D), emerging markets for renewable energy, and improved energy security. This method is in line with USA domestic policies focused on cutting emissions and attaining sustainable economic growth objectives.

Besides multilateral agreements, **Bilateral Investment Treaties (BIT)** are significant as well. These treaties are created between two countries to set up a legal framework for protecting investors from one country within the borders of the other [6]. BIT typically includes provisions to protect against expropriation, ensure fair and equitable treatment, and permit foreign investors to pursue international arbitration in case of conflicts. BIT play a crucial role for investors

in the mining sector as they create a reliable legal structure and offer protection against erratic government behaviors.

For instance, the BIT between USA and the Republic of Rwanda acts as a regulation governing investment criteria for foreign firms in the USA, particularly in the mining industry [7]. This BIT incorporates measures to safeguard against unjust treatment of investors. It stipulates «national treatment», ensuring that investors are treated no less favorably than local companies in comparable situations. It also encompasses the «Most-Favored Nation» (MFN) principle, which guarantees that American investors enjoy the same rights as investors from other nations. A central provision of the BIT is safeguarding against expropriation or nationalization without immediate, equitable, and efficient compensation. This is particularly important in capital-heavy industries such as mining, where investors are susceptible to shifts in political and regulatory environments. The BIT states that any expropriation must be warranted by public interest, be non-discriminatory, and include fair compensation.

The BIT also guarantees the free transfer of profits, dividends, and capital related to investments. This provision is particularly significant for American companies in the mining sector, as it allows them to repatriate profits and return capital without obstacles, which is crucial for an industry with variable profitability, like mining. The agreement also provides for compliance with environmental protection standards and labor rights, aligning with USA policy to promote sustainable investments abroad. American mining companies are required to meet established environmental standards and protect workers' rights in line with international norms.

International arbitration mechanisms

A key component of legal safeguards for foreign investors, especially in the capital-heavy and risky mining industry, is the utilization of international arbitration methods. These mechanisms offer an impartial venue for settling conflicts between investors and governments, enabling cases to be managed beyond domestic courts. One of the leading arbitration organizations for managing investment disputes is the **International Centre for Settlement of Investment Disputes (ICSID)**, created under the World Bank in 1965. ICSID allows investors to pursue arbitration in disputes with states, and its rulings are acknowledged and enforceable by the majority of member nations. This renders ICSID particularly appealing for foreign firms engaged in the mining industry, where political and regulatory uncertainties are significant.

For instance, ICSID dealt with the case of **Commerce Group Corp. and San Sebastian Gold Mines, Inc. v. Republic of El Salvador**, which included claims from USA gold mining firms. The companies claimed that El Salvador breached their investment rights as outlined in the bilateral investment treaty between the USA and El Salvador. The claimants requested compensation for their losses, contending that the Salvadoran government improperly canceled their mining licenses, leading to the halt of their operations.

El Salvador, for its part, contended that the license revocations were warranted for environmental reasons and essential to safeguard the local ecosystem. The tribunal rejected the claims, highlighting that the claimants did not demonstrate a violation of the investment treaty [8].

A significant arbitration mechanism is the **United Nations Commission on International Trade Law (UNCITRAL)**, created in 1966 to formulate standards and norms in international arbitration and trade. UNCITRAL offers model arbitration rules that are commonly utilized to settle investment disputes, particularly when parties opt against employing specialized systems like ICSID. Arbitration following UNCITRAL guidelines enables investors to settle disputes in an impartial jurisdiction, guaranteeing clear and equitable circumstances for resolving conflicts.

An example of an American mining company involved in arbitration under UNCITRAL rules is **Glamis Gold Ltd** [9]. The firm commenced arbitration against the USA, asserting that government actions infringing upon its rights under the North American Free Trade Agreement (NAFTA). The firm claimed that the new environmental and cultural regulations implemented by California greatly diminished the worth of its gold mining investment. The arbitration tribunal decided in favor of the USA, determining that the actions taken by the USA were warranted, non-discriminatory, and intended to preserve the environment and cultural heritage instead of violating the rights of the foreign investor. Moreover, Glamis Gold was unable to demonstrate that its hopes for regulatory stability were rational, considering the delicate nature of environmental and cultural matters.

While the **Multilateral Investment Guarantee Agency (MIGA)** is not an arbitration body, its operations greatly influence the protection of investor security. MIGA offers coverage for political risks, including nationalization, currency transfer limitations, and political violence, lowering the risk exposure for international investors. This type of insurance is especially sought after in the mining industry, where political unrest and regulatory shifts can greatly impact the financial feasibility of projects, particularly in nations with unpredictable legal frameworks. In the 2024 fiscal year, MIGA provided \$8,2 billion in new guarantees for 40 initiatives in different economic sectors.

Therefore, international arbitration systems are vital in sustaining confidence in a nation's investment environment by assuring investors that their rights will be safeguarded and their interests acknowledged, irrespective of the political circumstances or regulatory shifts in the host nation.

National legal mechanisms for protecting foreign investments: the USA experience

The regulatory system in the USA is based on a combination of measures to control access to strategic resources and protect investor rights. One of the key laws governing foreign investments is the **Foreign Investment Risk Review Modernization Act (FIRRMA)**, adopted in 2018. Under this law, the powers of the Committee on Foreign Investment in the USA (CFIUS) were significantly expanded: the committee can review transactions in strategic sectors, including

mining, to assess their potential impact on national security. For foreign companies wishing to invest in the extraction of rare earth elements, minerals, and other critical resources, obtaining CFIUS approval has become a mandatory procedure, especially if the investor gains access to important technologies or infrastructure. It is important to note that CFIUS primarily focuses on transactions that may affect USA national security, including access to sensitive technologies and infrastructure.

In addition to FIRRMA, the **International Emergency Economic Powers Act (IEEPA)** is in effect, granting the USA president the authority to impose restrictions on investments from countries deemed a potential threat. For the mining industry, which is involved in extracting strategic and rare earth metals, IEEPA can be used to protect the country's economic interests from foreign influence by regulating the level of foreign company participation in this sector and imposing sanctions if necessary.

Furthermore, the USA has strengthened control over foreign investments in infrastructure supporting mineral extraction, including the transportation, processing, and storage of extracted resources. Amendments to federal laws on critical infrastructure protection require foreign investors to obtain permits to operate in sectors such as energy and mineral processing. These measures are particularly relevant for foreign investors in the mining industry, as they provide legal protection against potential risks and ensure that national interests regarding natural resources are safeguarded.

Thus, the USA legal system protects investments while simultaneously restricting foreign companies' access to strategically important assets and resources. As a result, a stable and transparent investment climate is created, ensuring the protection of both state and investor interests in the mining sector.

Conclusion

Legal mechanisms for protecting foreign investments in mining projects play a critically important role in ensuring the security and predictability of capital investments in an environment of high political, legal, and economic risks. International and national instruments, such as arbitration mechanisms, bilateral agreements, and specialized laws (such as FIRRMA in the USA), establish a stable legal foundation that encourages investment and safeguards investor interests.

These mechanisms help reduce uncertainty for companies operating in strategically important sectors, such as the mining industry, supporting a balance between the national interests of host countries and the needs of foreign investors.

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FACTORS AFFECTING THE FINANCIAL STABILITY OF SMALL BUSINESSES

Aymurzaeva G.

Independent researcher of Tashkent State University of Economics

<https://doi.org/10.5281/zenodo.14577658>**Abstract**

In today's market conditions, the financial stability of small businesses (SBs) is a key factor in their sustainable functioning and development. This work examines the main factors influencing the financial stability of small enterprises. These include access to finance, level of government support, financial literacy of entrepreneurs, economic situation and competitive environment, as well as innovation activities. The analysis shows that lack of access to finance and low levels of financial literacy significantly limit the capabilities of small businesses. At the same time, effective government support programs and active innovation contribute to increased sustainability and competitiveness.

Keywords: factor, financial stability, small business, economic stability, competitive environment.

Introduction

Small businesses play a key role in the economic development of Uzbekistan. They provide jobs, promote entrepreneurship and innovation, and contribute to the country's GDP. However, the financial stability of small businesses is often subject to various challenges, which can hinder their effective functioning and growth.

Beck and Demirgüç-Kunt in their work "Small and Medium Enterprises: Access to Finance as a Growth Constraint" examine the impact of access to finance on the development of small and medium-sized enterprises (SMEs). The article emphasizes that the financial stability of small businesses largely depends on their ability to obtain the necessary financial resources. The authors note that many small businesses face restrictions in access to credit, which can significantly limit their growth and development¹. Abor and Biekpe also note that various sources of finance, such as bank

loans and venture capital, have a significant impact on the financial stability of small businesses². Mazzarol and Reboud point out that government support programs can significantly improve small businesses' access to financial resources³. Ismail emphasizes that effective government programs can boost entrepreneurs' confidence and contribute to their financial sustainability⁴. Karadag argues that the level of financial literacy directly affects the success of financial management in a small business⁵. Nieman and Nieuwenhuizen emphasize that entrepreneurs with a high level of financial literacy are more successful in managing their businesses and minimizing financial risks⁶. Kraus and Brtiz argue that small businesses that actively innovate have greater financial strength⁷.

Understanding the factors affecting the financial stability of small businesses in Uzbekistan is important for developing effective measures to support this sector of the economy.

Table 1.

1. Factors Affecting the Financial Stability of Small Businesses⁸

Name	Concept
External factors	
Economic situation in the country	The state of the national economy is a key external factor determining the financial stability of small businesses. Economic growth, inflation, the exchange rate of the national currency, the availability of credit resources - all these macroeconomic indicators directly affect the financial position of small businesses. During periods of economic instability and recession, small businesses are most vulnerable, facing a drop in demand, a decrease in income, an increase in costs and limited access to financing.
Public Policy and Regulatory Environment	State policy towards small businesses, as well as the legal framework governing the activities of this sector, have a significant impact on its financial stability. A favorable business environment, effective mechanisms of state support, accessible tax incentives

¹ Beck, T. and Demirgüç-Kunt, A. (2006) Small and Medium-Size Enterprises Access to Finance as a Growth Constraint. *Journal of Banking and Finance*, 30, 2931-2943. - References - Scientific Research Publishing.

² Abor, J., & Biekpe, N. (2006). How Are SMEs Financing Themselves? Evidence from Ghana. *Journal of African Business*, 7(1), 91-102.

³ Mazzarol, T., & Reboud, S. (2006). The Role of Government in Supporting Small Business: A Comparative Study of Australia and France. *International Small Business Journal*, 24(6), 453-471.

⁴ Ismail, M. (2018). The Impact of Financial Literacy on the Financial Stability of Small and Medium Enterprises. *International Journal of Economics and Financial Issues*, 8(3), 23-35.

⁵ World Bank. (2020). *Doing Business 2020: Comparing Business Regulation in 190 Economies*. Washington, DC: World Bank Group.

⁶ Nieman, G., & Nieuwenhuizen, C. (2009). *Entrepreneurship: A South African Perspective*. Van Schaik Publishers.

⁷ Kraus, S., & Brtiz, A. (2016). The Impact of Innovation on the Financial Performance of Small Firms: A Study of the Manufacturing Sector. *International Journal of Innovation Management*, 20(5), 1650041.

⁸ Prepared by author.

	and preferential lending - all this helps to strengthen the financial position of small businesses. In turn, excessive regulation, high tax burden, bureaucratic barriers and insufficient protection of property rights can significantly worsen the financial condition of small businesses.
Competitive environment	The level of competition in the markets in which small businesses operate is also an important external factor affecting their financial stability. High levels of competition, including from large players, force small businesses to reduce their profits, resort to lower prices, and look for ways to reduce costs. This, in turn, has a negative impact on their financial position. On the other hand, moderate competition that promotes innovation and increased efficiency can have a positive impact on the financial stability of small businesses.
Access to financial resources	Access to financial resources, such as bank loans, subsidies, investments and other sources of financing, is one of the key conditions determining the financial stability of small businesses. Limited and high cost of borrowed funds, lack of own financial resources, as well as complex procedures for obtaining financing can significantly hinder the development and sustainability of small businesses.
Infrastructure and business services	The development of infrastructure, including transport, logistics, energy, information and communication, as well as the availability of necessary business services, such as consulting, accounting, legal services, directly affect the efficiency of small businesses and their financial stability. The lack or low quality of these elements of the business environment leads to increased costs and a decrease in the competitiveness of small businesses.
Internal factors	
Management efficiency	Management efficiency, including strategic planning, business processes, financial control and management decision-making, is a key internal factor determining the financial stability of a small business. Competent financial management, cost optimization, reasonable pricing, cash flow management and risk management - all these aspects directly affect the financial position of a small business.
Entrepreneurial and managerial competencies of owners/managers	The level of entrepreneurial and managerial competencies of small business owners and managers is also an important internal factor influencing the financial stability of the enterprise. Knowledge and skills in financial management, marketing, business planning, personnel management and other key aspects of activity allow small businesses to more effectively manage their finances and adapt to changing market conditions.
Diversification of activities	Diversification of a small business's product/market portfolio can be an important factor in its financial stability. Distribution of risks between different areas of activity, development of new markets and product niches allows to reduce dependence on fluctuations in demand and other external factors, thereby strengthening the financial position of a small business.
Innovation and adaptability	The ability of small businesses to innovate and quickly adapt to changing market conditions is also an important internal factor that determines their financial stability. The development and implementation of new products, technologies, business models and methods of organizing activities allow small businesses to improve their competitiveness, expand their customer base and increase revenues, which has a positive effect on their financial condition.
Financial discipline	Compliance with financial discipline, including timely settlements with suppliers and clients, management of accounts receivable and payable, timely fulfillment of tax and other obligations, is another key internal factor affecting the financial stability of small businesses. Violation of financial discipline is fraught with fines, penalties, loss of business reputation and, ultimately, deterioration of the financial position of the enterprise.

Foreign experience of research.

An analysis of factors affecting the financial stability of small businesses in different countries shows that government support, access to financing and the level of financial literacy are key aspects. Each country has its own unique approaches to supporting small businesses, which allows them to adapt to changing economic conditions.

The main factors influencing financial stability in the United States of America are access to venture capital and government support programs. The Small Business Administration (SBA) program offers loan guarantees, which reduces risks for banks and increases the

availability of financing for small businesses. The financial literacy of entrepreneurs also plays an important role in the effective management of resources. In Germany, small and medium-sized enterprises (SMEs) are known as "Mittelstand". Their financial stability is ensured through access to specialized banking products and microfinance programs. Government support includes subsidies and tax incentives. Another important factor is a high degree of innovative activity and a skilled workforce, which contributes to increased competitiveness.

In China, small businesses are supported through various government initiatives, including tax incentives

and subsidies. The financial stability of small businesses also depends on access to online lending, which is becoming increasingly popular. Important factors include rapid technological advances and changing consumer preferences, which allow small businesses to adapt to the market. In India, small businesses face problems accessing finance. Government programs such as the Micro Units Development and Refinance Agency (MUDRA) aim to improve financial conditions for small businesses. An important factor is also the level of financial literacy of entrepreneurs, which affects their ability to manage debt and assets. In Brazil, small businesses are supported through government support and microfinance programs. Key factors affecting financial stability are the economic situation in the country, access to credit, and the level of competition. Financial literacy programs help entrepreneurs manage their finances more effectively.

Analysis and results of research.

The financial stability of small businesses in Uzbekistan is critical to the country's economic growth and development. In the context of economic reforms and global changes, small entrepreneurs face various factors that can both contribute to and hinder their financial stability.

The main factors influencing financial stability are access to financing. The analysis showed that access to financing remains one of the main factors influencing the financial stability of small businesses. Most entrepreneurs face high interest rates and difficult lending conditions. According to surveys, 65% of small businesses have difficulty obtaining financial resources. It should be noted that government support aimed at supporting small businesses plays a significant role. However, not all entrepreneurs are aware of available subsidies and grants. Only 30% of respondents used government support, which indicates the need to improve awareness.

The level of financial literacy among entrepreneurs also significantly affects financial stability. About 55% of respondents admitted to an insufficient level of knowledge on financial issues, which makes it difficult for them to manage debts and assets. The last factor, economic instability and inflation, have a negative impact on small businesses. According to statistics, in 2023, the inflation rate in Uzbekistan was 10-11%, which increases financial risks for small businesses.

The financial stability of small businesses in Uzbekistan depends on many factors, including access to finance, the level of government support, and financial literacy. Recommendations based on the research findings can help improve the financial conditions for small businesses and promote their sustainable development in the future.

Conclusion.

The financial stability of small businesses in Uzbekistan is determined by a set of external and internal factors. External factors, such as the economic situation in the country, government policy, competitive environment, access to financing and infrastructure development, create a general business environment in which small businesses operate. Internal factors, in-

cluding management efficiency, entrepreneurial competencies, diversification, innovation and financial discipline, reflect the ability of small businesses themselves to withstand external challenges and ensure their financial stability.

Strengthening the financial sustainability of small businesses in Uzbekistan requires a comprehensive approach that combines government support measures with the development of internal management and financial competencies of entrepreneurs themselves. Improving the regulatory framework, expanding access to financial resources, developing business infrastructure and providing consulting support to small businesses should help improve their financial situation and ensure long-term financial stability.

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DIGITAL TRANSFORMATION STRATEGIES FOR PURCHASING AND LOGISTICS MANAGEMENT IN AUTOMOTIVE TRANSPORT COMPANIES**Jian Liu,***Kharkiv national automobile and highway university, Kharkiv, 61002, st. Yaroslava Mudrogo, 25***Kudriavtseva O.***Kharkiv national automobile and highway university, Kharkiv, 61002, st. Yaroslava Mudrogo, 25*<https://doi.org/10.5281/zenodo.14577660>**Abstract**

With the rapid development of information technology, digital transformation has become a key path for the procurement logistics management of automobile transportation enterprises. This study deeply analyzes the background and current situation of the digital transformation of procurement logistics management in automobile transportation enterprises, and reveals the challenges faced by the traditional mode in information transmission, supplier management, inventory control and other aspects. Explain the core technologies of digital transformation, such as big data, Internet of Things, artificial intelligence and blockchain in all aspects of procurement logistics. Accurate demand prediction and supplier evaluation and screening through big data analysis; Internet of Things facilitates transportation process visualization and intelligent monitoring of devices; artificial intelligence optimizes purchasing decision and intelligent scheduling; blockchain ensures the security and traceability of transaction information. Further explore the significant benefits of digital transformation, including reducing procurement costs, improving supply chain transparency, enhancing risk response capabilities, and improving customer satisfaction, etc. At the same time, put forward enterprises in the process of promoting digital transformation to focus on the key strategy, such as building perfect data management system, strengthening the construction of digital talent team, promote enterprise internal between various departments and digital collaboration with external partners, etc., for the successful procurement logistics management digital transformation to provide comprehensive help it stand out in the market competition in the digital era and achieve sustainable development

Keywords: digitalisation, motor transport, procurement logistics, transformation

INTRODUCTION

Under the background of the rapid development of globalization and information technology, digital technology is reshaping the pattern of various industries with unprecedented depth and breadth. As an important link in the supply chain system, the procurement and logistics management of automobile transportation enterprises is faced with an increasingly complex market environment, diversified customer demands and fierce industry competition pressure. The traditional procurement logistics management mode has gradually revealed many limitations, and it is difficult to adapt to the rapidly changing market rhythm and the requirements of efficient operation.

With the booming of emerging digital technologies such as the Internet of Things, big data, artificial intelligence and blockchain, it provides strong technical support and innovation opportunities for the reform of procurement logistics management of automobile transportation enterprises. Digital transformation is no longer an optional choice, but the only way for enterprises to seek survival and development and enhance their core competitiveness. Through digital transformation, automobile transport enterprises can break the barriers of information, realize the whole process of purchasing logistics real-time information sharing and accurate coordination, from accurate prediction of procurement demand, supplier intelligent screening and management, efficient execution of purchase orders, transportation distribution optimization scheduling to the precise control of inventory and cost of fine management of various aspects, such as a comprehensive optimization and upgrade.

This study focuses on the automobile transport enterprise purchasing logistics management of digital transformation strategy, further discusses how to make full use of the advantages of digital technology, build the purchasing logistics management system of the new era, analyze the challenges in the process of transformation and put forward the corresponding measures, aims to realize the transformation of automobile transport enterprises in digital purchasing logistics management innovation provide prospective and operational theoretical guidance and practical reference, help enterprises in the complex and changeable market environment to achieve sustainable quality development, but also provide useful reference for the digital transformation of related industry research and supplement.

1. Enterprise status quo

Under the context of the acceleration of global economic integration and the rapid development of science and technology, the business environment of automobile transportation enterprises has undergone profound changes. On the one hand, the market demand is highly personalized and diversified, and consumers have put forward more stringent requirements for the delivery speed, quality and after-sales service of automobile products. This makes the automobile transportation enterprises must build a more agile and efficient operation mode in the procurement logistics link, to ensure that raw materials and parts can be timely and accurately supplied to the production line, so as to ensure the timely delivery of the vehicle.

On the other hand, the widespread popularization and deep application of digital technology is reshaping

the entire supply chain system. In the field of procurement logistics, the lag of information transmission, the extensive supplier management and the imprecision of inventory control have become more and more prominent. For example, purchasing departments and suppliers often rely on traditional communication methods such as telephone, fax or E-mail, resulting in delayed information update and long order processing cycle. At the same time, the evaluation of suppliers is mostly

based on limited historical transaction data and subjective experience, and it is difficult to comprehensively and objectively measure their comprehensive strength and potential risks. Moreover, inventory management lacks accurate data analysis support, and often appears inventory overstock or out of stock, which takes up a large amount of capital and affects the continuity of production.'

Table 1

Data application of big Data technology in the procurement and logistics management of automobile transportation enterprises

Data sources	Data content	analytic procedure	Application effect
Internal purchase order history data	Purchase date, product category, quantity, supplier, etc	Association-rule mining, and time-series analysis	Forecast the purchase demand trend, optimize the procurement plan, and reduce the inventory cost
Market price data	All kinds of raw material price fluctuation trend, regional differences, etc	Regression analysis, and trend analysis	Determine the best purchase time and control the purchase cost
Supplier performance data	Delivery on-time rate, product quality qualified rate, after-sales service response time, etc	Cluster analysis, and factor analysis	Evaluate the comprehensive ability of suppliers and select high-quality suppliers

At present, although some automobile transportation enterprises have begun to realize the importance of digital transformation and try to introduce some information tools, it is still in the initial stage overall. The digital application of most enterprises is relatively scattered, and it has not yet formed a complete digital ecosystem. The data circulation between various business systems is not smooth, and there is the phenomenon of information island, which cannot give full play to the synergistic potential of digital technology. In addition, enterprises still face many challenges in the professional talent reserve, technical infrastructure construction and organizational structure adjustment needed for the digital transformation, which seriously restricts the speed and implementation effect of the digital transformation of procurement logistics management.

2. literature review

In the aspect of the research on the drivers of digital transformation, scholars generally believe that the intensification of market competition pressure is one of the key factors. For example, Li Ziyao and Shi Wenqiang pointed out that the rapid change of consumer demand and the competition of peer enterprises in the supply chain efficiency force the automobile transportation enterprises to seek digital means to optimize the procurement logistics process, in order to achieve rapid response and cost control [1]. Technological progress is also an important driving force. Gong Wenwen and Liu Xiaofeng emphasize the maturity of the Internet of Things, big data analysis and other technologies, which provides the possibility for enterprises to obtain and process massive data in the procurement logistics link, thus laying a foundation for accurate decision-making [2].

On the application of digital technology in procurement logistics management, a large number of literature has been discussed in depth. In terms of supplier management, Zhao Yanwei proposed to use big data to analyze suppliers historical transaction data, production capacity, delivery punctuality and other multi-dimensional information, which can build a more scientific supplier evaluation model, help automobile transportation enterprises to select high-quality and stable partners, and reduce the risk of supply interruption [3]. The application of Internet of Things technology in inventory management has also attracted much attention. Janes research shows that by deploying sensors in warehouses and transportation vehicles, enterprises can monitor the inventory level and cargo status in real time, realize the dynamic management of inventory, avoid the occurrence of excessive inventory or out of stock, and improve the capital turnover rate [4].

In terms of the impact of digital transformation on enterprise performance, the research results show a positive trend. Through empirical research, Bai Xiayu found that the digital transformation of procurement logistics management of automobile transportation enterprises can significantly reduce the procurement cost, mainly because the accurate demand forecast reduces the unnecessary procurement expenditure, and the optimized transportation route reduces the logistics cost [5]. At the same time, digital transformation can also improve the transparency and coordination of the supply chain, Li Pengda pointed out that this will help enterprises to better cope with market fluctuations and risks, and enhance their market competitiveness and customer satisfaction [6].

However, the digital transformation has not been smooth sailing. Liu Ying pointed out that enterprises

are faced with the challenge of data security and privacy protection in the process of transformation. Because the procurement logistics involves a large number of enterprise sensitive information, such as supplier price, contract terms, etc., once the leakage will cause serious losses to enterprises [7]. In addition, Xu stressed that organizational culture and personnel quality are also an important factor restricting the success of digital transformation. The traditional enterprise organizational structure and employee thinking mode may be difficult to adapt to the requirements of digital management, and corresponding reform and training [8] are needed.

To sum up, the existing literature has studied the digital transformation of procurement logistics management of automobile transportation enterprises from different perspectives, covering the driving factors, technology application, performance impact and challenges faced. However, there are still some research gaps, such as few differentiation studies on the digital transformation strategies of automobile transportation enterprises with different scales and business characteristics, and how to build a more perfect evaluation index system for digital transformation. Future research can further focus on these aspects to provide more targeted and systematic theoretical and practical guidance for the digital transformation of procurement logistics management of automobile transportation enterprises.

3. Digital transformation strategy

In the process of digital transformation of procurement logistics management of automobile transportation enterprises, core technologies such as big data, Internet of Things, artificial intelligence and blockchain play an indispensable role, and show a unique application mechanism in each link.

Big data technology is like a treasure information, in the purchasing link, enterprises can collect and analyze the history of procurement data, market price fluctuation data, supplier capacity data, through data mining and analysis algorithm, accurate forecast demand quantity of raw materials and parts, time node and price movements, to develop scientific and reasonable procurement plan, avoid blind purchase and inventory backlog. At the same time, big data is used to conduct comprehensive evaluation of suppliers, consider the product quality indicators such as stability, delivery on-time rate, after-sales service response speed and so on, and select the best supplier combination to improve the procurement quality and efficiency.

The Internet of Things technology deeply connects the physical world to the digital world. In the process of logistics transportation, through the installation of sensors in transport vehicles, cargo packaging and warehouse facilities, to realize the real-time monitoring and data collection of cargo location, transport vehicle

status (such as speed, fuel consumption, load, etc.), warehouse inventory environment (temperature, humidity, inventory quantity, etc.). These data are transmitted to the enterprise management system in real time, so that the enterprise can grasp the dynamic transportation information of goods and handle the abnormal situation in transportation. For example, maintenance and rescue can be arranged in advance to ensure the timely delivery of goods; the real-time update of warehouse inventory data can facilitate accurate replenishment and inventory allocation, and improve the utilization rate of storage space and inventory turnover rate.

Artificial intelligence technology infuses intelligent decision-making ability into purchasing logistics management. In terms of procurement decision, artificial intelligence algorithm can automatically screen suppliers, generate purchase orders, and optimize the purchase batch and quantity according to the procurement objectives, cost constraints and quantity requirements set by enterprises, so as to realize the automation and optimization of procurement decision. In the link of logistics and distribution, the path planning algorithm based on artificial intelligence can comprehensively consider multiple factors such as traffic conditions, transportation costs and customer demand time, to plan the optimal distribution route for transport vehicles, improve transportation efficiency and reduce transportation costs. In addition, artificial intelligence can also be applied to customer demand prediction. Through the learning and analysis of market trends, sales data, customer behavior and other information, the changes in customer demand can be predicted in advance to provide a basis for the pre-preparation of procurement logistics.

Blockchain technology focuses on solving the trust and information security problems in procurement logistics. In the transaction process between suppliers and enterprises, the distributed ledger technology of blockchain can record the detailed information of each transaction, including order details, goods delivery vouchers, payment records, etc. These information cannot be tampered with and traceable, ensuring the authenticity and reliability of transaction data and effectively preventing fraud. In terms of supply chain synergy, block chain can realize enterprises and suppliers, logistics partners data sharing and interaction, all parties can be within the scope of authorization to view relevant information, improve the transparency of supply chain and collaborative efficiency, such as suppliers can according to the production plan information on block chain production schedule and raw material supply, logistics enterprises can arrange according to the delivery information distribution resources in advance.

Table 2

Comparison of procurement and logistics costs before and after digital transformation			
Cost project	Before the transformation (unit: ten thousand yuan)	After the transformation (unit: ten thousand yuan)	amplitude of variation
Procurement cost (including raw materials, spare parts, etc.)	1200	1000	-16.7% (decreased)
Inventory cost (storage expense, capital occupation cost, etc.)	350	200	-42.9% (decreased)
Transportation costs (vehicle transportation costs, fuel consumption, etc.)	450	350	-22.2% (decreased)
Total procurement and logistics cost	2000	1550	-22.5% (reduced)

Table 3

Comparison of supplier management related indicators before and after digital transformation			
metric	Before the transformation	After the transformation	Change situation
Number of suppliers	80	50	Reduce it by 37.5%, optimize the supplier structure, and concentrate the cooperation resources
Proportion of high-quality suppliers (80 points or above in comprehensive evaluation)	30%	50%	Increase by 20 percentage points, improve procurement quality and stability
Supplier delivery punctuality rate	80%	95%	Increase it by 15 percentage points to ensure the continuity of production
Qualified rate of the suppliers product quality	90%	98%	Increase by 8 percentage points, reduce the defective product rate and after-sales cost

Table 4

Comparison of inventory management indicators before and after digital transformation			
metric	Before the transformation	After the transformation	Change situation
Inventory turnover rate (second / year)	4	6	Increase it by 50%, and speed up the speed of capital withdrawal
Inventory accuracy (proportion of actual inventory to system recorded inventory)	85%	98%	Increase by 13 percentage points, reduce the inventory difference and shortage risk
out of stock rate	10%	3%	Reduce it by 7 percentage points, and improve customer satisfaction

Table 5

Comparison of logistics and transportation efficiency indicators before and after digital transformation			
metric	Before the transformation	After the transformation	Change situation
Vehicle average full-load rate	70%	85%	Increase by 15 percentage points, and improve the vehicle utilization rate
Timely completion rate of transportation tasks	85%	95%	Increase by 10 percentage points to ensure the delivery of goods on time
Average shipping time (from delivery to receipt)	36 Hours	30 Hours	Shorten by 6 hours, improve the logistics response speed

Table 6

Comparison of indicators related to enterprise operation efficiency before and after digital transformation

metric	Before the transformation	After the transformation	Change situation
Purchase Order processing cycle (from order to order confirmation)	48 Hours	24 Hours	Shorten it by 24 hours and speed up the procurement process
Data processing and decision making time (data acquisition to decision making time)	72 Hours	48 Hours	Shorten 24 hours, improve the timeliness and scientific decision-making
Internal score collaboration collaboration score (100)	75	90	Increase by 15 points, enhance the enterprise internal synergistic effect

4. Conclusion

The digital transformation of procurement logistics management of automobile transportation enterprises has become an unstoppable trend, and it is a key strategic measure for enterprises to enhance their core competitiveness and achieve sustainable development in the fiercely competitive market environment.

Through in-depth analysis of the application mechanism of core technologies such as big data, Internet of Things, artificial intelligence and blockchain relying on the digital transformation in all links of procurement logistics, we can see that the effective integration of these technologies can comprehensively optimize the procurement logistics process of enterprises. Big data enables accurate decision-making and supplier optimization management; Internet of Things ensures real-time monitoring and efficient operation of logistics transportation and warehousing; artificial intelligence provides intelligent decision-making and efficient distribution capabilities; blockchain ensures transaction trust and supply chain information security and transparency. Therefore, it brings significant benefits to enterprises, including the effective reduction of procurement costs, the great improvement of the overall transparency and coordination of the supply chain, the significant enhancement of risk response ability and the steady improvement of customer satisfaction.

However, enterprises still have to meet many challenges in the process of promoting digital transformation. Building a perfect data governance system is the foundation to ensure the accuracy, integrity and security of data, break the phenomenon of data island, and realize the efficient circulation and sharing of data. It is very important to strengthen the construction of digital talent team, and to cultivate compound talents who both understand automobile transportation business and have digital technology expertise, so as to meet the needs of talents in digital transformation, including technology research and development, system maintenance and data analysis. Promoting digital collaboration between internal departments and with external partners is the key to break the barriers between traditional organizational structure and business processes, and form an efficient and collaborative digital ecosystem.

In short, automobile transport enterprises only firmly on the purchasing logistics management digital transformation, actively cope to the challenges in the process of transformation and implement effective strategies, to be in the wave of digital, to realize the efficient operation of purchasing logistics link, and promote the overall enterprise operating efficiency of

steady, steady development, for the digital change of automobile transport industry model, also for the digital transformation of related industry to provide useful reference and enlightenment.

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**THE INFLUENCE OF DIGITAL MARKETING ON TOURISM BRANDING STRATEGY
(CASE STUDY ON “CENGKLIK RESERVOIR” ATTRACTION, BOYOLALI, CENTRAL JAVA,
INDONESIA)**

Dodi Cahyono,

Student

Tunas Pembangunan University, Indonesia

Kurniawati Darmaningrum,

Assistant Professor

Tunas Pembangunan University, Indonesia

Syahri Alhusin

Tunas Pembangunan University, Indonesia

<https://doi.org/10.5281/zenodo.14577664>

Abstract

The purpose of this study was: 1) To test and measure the partial and simultaneous influence of service quality, product quality, and promotion on customer loyalty. (2) To find out the most dominant factor influencing customer loyalty.

This study was conducted on customers using the online shopping site shopee in Purwodadi.. Given that the population distribution is unknown, according to Cooper and Schindler (2019) the number of samples taken was 96 respondents. With purposive sampling.

The results of the study found that there was a partial and simultaneous influence of service quality, product quality, and promotion on customer loyalty. Service quality is the most dominant factor influencing customer loyalty in Purwodadi.

Customer loyalty can be explained by service quality, product quality, and promotion by 92.0%. While the remaining 7.30% is influenced by other variables outside the variables studied in this study..

Keywords: service quality, product quality, promotion, customer loyalty, Multiple linear regression.

INTRODUCTION

The business world, especially e-commerce, has undergone a major transformation as a result of advances in information and communication technology (Aryani et al., 2020). Shopee is a popular e-commerce platform in Indonesia, and with its various features, it has succeeded in attracting consumers in Purwodadi and other areas to make online transactions. Ease of shopping, a variety of product choices, and various promotional programs offered are a special attraction for users. However, amidst increasingly fierce competition in the e-commerce world, customer loyalty is one of the key factors for a company's success. Loyal customers tend to make repeat purchases, recommend the platform to others, and do not easily switch to competitors. Therefore, companies like Shopee need to continue to improve the quality of service, product quality, and promotional strategies in order to maintain and increase customer loyalty.

However, amidst the increasingly tight competition in the e-commerce world, customer loyalty is one of the key factors for a company's success. Loyal customers tend to make repeat purchases, recommend the platform to others, and are less likely to switch to competitors. Therefore, companies like Shopee need to continue to improve the quality of service, product quality, and promotional strategies in order to maintain and increase customer loyalty.

Good service quality will create a positive experience for customers, while adequate product quality will meet their expectations of the goods purchased. In addition, attractive promotions can encourage customers

to shop more often. The combination of these three factors is expected to be able to form strong customer loyalty, especially in the city of Purwodadi which has a growing market potential.

Although Shopee has made various efforts to improve the quality of services, products, and promotions, it is still uncertain how much influence these factors have on customer loyalty, especially in the Purwodadi area. Therefore, this study is important to be conducted in order to measure and analyze the influence of service quality, product quality, and promotions on Shopee customer loyalty in Purwodadi. The results of this study are expected to provide useful insights for Shopee managers in formulating more effective business strategies in maintaining and increasing customer loyalty.

The objectives of this study were: 1) To test and measure the partial and simultaneous influence of service quality, product quality, and promotion on customer loyalty. (2) To determine the most dominant factor influencing customer loyalty.

Based on the above phenomena and background, the researcher is interested in examining consumer satisfaction to be studied in order to determine the level of customer loyalty. Therefore, it is necessary to conduct research related to the problem of the Influence of Service Quality, Product Quality and Promotion on Customer Loyalty to Users of the Shopee Online Shopping Site in Purwodadi.

THEORETICAL BASIS FRAMEWORK OF THINKING AND HYPOTHESIS

A. Theoretical Basis

1. Customer Loyalty

Post-purchase behavior of a product is determined by satisfaction or dissatisfaction with a product as the end of the sales process. The concept of customer loyalty is more associated with behavior than attitude. One of the positive attitudes of consumers can be shown through loyalty to the company's products and recommending the product to other consumers, while negative attitudes are shown through negative words (word of mouth) to other consumers and moving to other companies. Loyalty is something that arises without coercion but arises by itself. The definition of loyalty is the formation of attitudes and behavioral patterns of a consumer towards purchasing and using products resulting from their previous experiences (Griffin, 2016).

According to Oliver, Richard L. (2016) Customer loyalty is a deeply held commitment to rebuy or repatronize a preferred product or service consistently in the future, despite situational influences and marketing efforts having the potential to cause switching behavior. Loyalty can be defined as a customer's deep commitment to re-patronize or re-purchase a preferred product or service as a consistent attitude in the future, despite situational influences and marketing efforts having the potential to cause switching behavior.

According to Hasan (2018), Customer loyalty is defined as a person who buys, especially those who buy regularly and repeatedly. A customer is someone who continuously and repeatedly comes to the same place to satisfy his desires by having a product or getting a service and paying for the product or service. Meanwhile, according to Tjiptono (2019), customer loyalty is a customer's commitment to a brand, store, supplier based on a very positive attitude reflected in consistent repeat purchases.

Based on the understanding above, it can be concluded that consumer loyalty to a product is related to the positive attitude that the consumer has towards the product by consistently making repeat purchases.

a. Characteristics of Customer Loyalty

Customer loyalty is a reliable measure to predict sales growth and customer loyalty can also be defined based on consistent purchasing behavior (Griffin, 2016). The following are the characteristics of consumer loyalty:

1) Make regular repeat purchases

Consumers make continuous purchases on a particular product. Example: Harley Davidson motorcycle lovers will buy a new Harley motorcycle if there is a new Harley Davidson model, not only buying but they also spend extra money to change it according to their wishes.

2) Purchase across product and service lines

Consumers not only buy services and main products but consumers also buy product and service lines from the same company. Example: consumers not only buy Harley Davidson motorcycles, but they also buy accessories from Harley Davidson to beautify their motorcycles.

3) Refer to others (Refers other)

Where consumers communicate by word of mouth regarding the product. Example: a Harley Davidson consumer who has been using the motorcycle for a long time, tells about the greatness and advantages of the motorcycle, then after that his friend is interested in buying a Harley Davidson motorcycle because he heard the story.

4) Demonstrates an immunity to the full of the competition

Consumers refuse to use alternative products or services offered by competitors. Example: Harley Davidson motorcycle enthusiasts refuse to use other motorcycles, and they also tend to refuse to know that there are other types of motorcycles.

Loyal customers are an asset for a company, this can be seen based on the characteristics they have. Therefore, consumer loyalty is a reliable measure to predict future growth for a company.

According to Tjiptono (2019) explains that loyalty encompasses two important components, namely loyalty as behavior and loyalty as attitude. The combination of these two components will produce four possible loyalty situations, namely: no loyalty, spurious loyalty, latent loyalty, and loyalty "Tjiptono (2019) explains the four possible loyalty situations as follows:

1) No Loyalty

This can happen when the customer's attitude and repeat purchase behavior are both weak, then loyalty is not formed.

2) Spurious Loyalty

This condition is characterized by non-attitude influences on behavior, such as subjective norms and situational factors. This situation can also be called inertia, where consumers find it difficult to distinguish between brands in a product category with a low level of involvement. So that repeat purchases are made based on situational considerations, such as familiarity (due to strategic product placement on display shelves, outlet locations in shopping centers).

3) Latent Loyalty

The latent loyalty situation is reflected when a strong attitude is accompanied by a weak repeat purchase pattern. This situation, which is of great concern to marketers, is caused by the influence of non-attitude factors that are equally strong or even tend to be stronger than attitude factors in determining repeat purchases.

4) Loyalty

This situation is the ideal situation that marketers hope for the most. Where consumers have a positive attitude towards a product or producer and are accompanied by a consistent repeat purchase pattern.

b. Types of Consumer Loyalty

According to Griffin (2016), there are four types of consumer loyalty, namely:

1) No Loyalty

For various reasons, some consumers do not develop loyalty to a particular product or service. This means that consumers will never become loyal consumers, they only contribute a little to a company. In general, companies should avoid a group that falls into the category of no loyalty to be used as a target market because they will never become loyal consumers.

2) Weak Loyalty (inertia loyalty)

A weak relationship combined with high repeat purchases will result in weak loyalty. Consumers who have this attitude usually buy based on habit. The basis used for purchasing a product is usually because they are used to it or because they always use the product. This kind of loyalty usually occurs in products that are often used, but it does not rule out the possibility of consumers who have weak loyalty changing by getting closer to the consumer through a product that is better than competitors, for example by improving the quality of the product and adding other facilities.

3) Latent Loyalty

A relatively high level of preference combined with a low level of repeat purchases indicates hidden loyalty. The influence of situations and attitudes that determine repeat purchases. Companies can overcome this hidden loyalty by understanding the situational factors that contribute to hidden loyalty.

4) Premium Loyalty

Premium loyalty is a type of loyalty that occurs when a high level of interest goes hand in hand with repeat purchase activities. This kind of loyalty is what companies really hope for. At a high level of preference, consumers will be proud to discover and use the product and will happily share knowledge from their experiences with friends, family, or other consumers.

c. Customer Loyalty Indicators

Indicators of customer loyalty according to Kotler & Keller (2021) are Repeat Purchase (loyalty to product purchases); Retention (Resistance to negative influences regarding the company); referrals (referring to the total existence of the company).

2. Quality of Service

Quality conventionally describes the direct characteristics of a product, such as performance, reliability, ease of use, aesthetics and so on. While the strategic definition of quality is anything that is able to meet the needs of customers.

Quality is full customer satisfaction. A product is said to be of quality if it can provide full satisfaction to consumers, namely in accordance with what consumers expect from a product (Feigenbaum, 2016).

Quality is "a dynamic condition associated with products, services, people, processes, and environments that meet or exceed expectations." (Tjiptono, 2019). In ISO 8402 (Quality Vocabulary), quality is defined as the totality of characteristics of a product that supports its ability to satisfy specified or established needs, quality is often interpreted as customer satisfaction. The definition of a product that can be in the form of (tangible) or a combination of both. Three categories of products that can be defined here, namely:

a. Goods, for example: cars, telephones, etc.

b. Software, for example: computer programs, financial reports, procedures, instructions in the ISO 9000 financial system, etc.

c. Services, for example: education, banking, etc.

In order to appear in a competitive atmosphere, organizations must strive to improve the quality of their services as a strategy to win the competition. Quality

must start from customer needs and end with customer perception. Thus, products are designed, produced and services are provided to meet customer desires. Because quality refers to something that determines customer satisfaction, a product produced can only be said to be of quality if it is in accordance with customer desires, can be utilized properly, in addition to being produced (produced) in a good and correct manner (Dharmmesta, 2014).

The concept of service quality can also be understood through "consumer behavior", which is a behavior played by consumers in searching for, buying, using and evaluating a service product that is expected to satisfy their needs (Schiffman & Kanuk, 2016).

Consumer decisions to consume or not consume a good/service are influenced by various factors, including their perception of service quality. This statement shows a strong interaction between "consumer satisfaction" and "service quality".

Quality as follows, namely: "Standards that must be achieved by a person/group/institution/organization regarding the quality of human resources, quality of work methods, processes and work results or products in the form of goods and services. Quality means satisfying those served, both internally and externally, in the sense of optimal fulfillment of customer/community demands/requirements" (Sani, 2021). Customers believe that the service provider's operations are trustworthy and provide value or value that is commensurate with their sacrifice.

a. Service Quality Theory

Service quality as put forward by Lovelock (2016) in his book "Product Plus". What is put forward is an interesting idea about how a product when added with service will produce a power that provides benefits to the organization in gaining profit and even to face competition.

There are 8 service supplements that can be explained as follows. (1). Information, namely the process of a quality service starting from the products and services required by customers. Providing information channels that directly provide convenience in order to answer the customer's desires is important. (2). Consultation, after obtaining the desired information, customers require consultation regarding technical, administrative, and cost issues. For this reason, an organization must prepare the means regarding consultation materials, consultation locations, employees/officers who serve, and time for free consultation. (3). Ordertaking, customer assessment at this point is emphasized on the quality of service which refers to the ease of filling out applications and administration that is not complicated, flexible, low cost, and light requirements. (4). Hospitality, customers who deal directly will give an assessment of the friendly and polite attitude of employees, a comfortable waiting room and other adequate facilities. (5). Caretaking, different variations in customer backgrounds will demand different services. (6). Exception, some customers sometimes want exceptions to the quality of service. (7). Billing, the vulnerable point is in the payment administration. This means that the service must pay attention to matters relating to payment administration, both regarding the transaction form filling

list, payment mechanisms and the accuracy of bill calculations. (8). Payment, at the end of the service, payment facilities must be provided based on customer wishes, such as bank transfers, credit cards, direct debits to customer accounts.

b. Factors Affecting Service Quality

Public services to the community will be able to run as expected, if the supporting factors are adequate and can be used effectively and efficiently. There are several factors that support the running of a service well, namely: (1). Awareness factor of officials and officers involved in public services; (2). Regulatory factors that are the basis for service work; (3). Organizational factors which are tools and systems that enable the running of service activity mechanisms; (4). Organizational factors which are tools and systems that enable the running of service activity mechanisms; (5). Officer skill factors; (6). Facilities factors in carrying out service tasks. These six factors have different roles but influence each other and together will realize the implementation of optimal services, both in the form of verbal services, written services or services in the form of movements/actions with or without writing. There are seven factors that influence organizational performance. The seven factors include: values and culture; work processes and business systems; individual and team capacity; rewards and recognition; and management processes and systems. There are 6 factors in implementing continuous quality improvement (Tjiptono, 2019). The six factors include: leadership, education, planning, review, communication, and awards and recognition. From the explanations above, conclusions can be drawn about the factors that influence service quality, namely:

1) Organization

Service organizations are basically no different from organizations in general, but there are slight differences in their application, because the target of service is specifically aimed at humans who have multi-complex characters and desires. The service organization referred to here is organizing service functions both in the form of structures and mechanisms that will play a role in the quality and smoothness of service. Organization is a mechanism, so there needs to be supporting facilities to facilitate the mechanism. These supporting facilities are systems, procedures, and methods. "organization is a mechanism or structure that enables living to work effectively together".

2) Leadership

In relation to quality service management, leadership is the ability to inspire others to be willing and have total responsibility for efforts to achieve or exceed organizational goals. From the definition of leadership above, the basic concept is related to its application in quality service management, namely to inspire or inspire others by providing inspiration.

Improvement of public services in Indonesia is highly dependent on the role of government agency leaders (top-down approach). Organizations that have credible leaders with high integrity and a vision for the future can be role models and innovators for public service reform. Meanwhile, Joseph M. Juran stated that

leadership that leads to quality includes three managerial functions, namely planning, controlling, and improving quality (Tjiptono, 2019, p. 160). The company's quality strategy must be an initiative and commitment from top management. Top management must lead the company to improve its quality performance. Without leadership from top management, efforts to improve quality will have little impact on the company. In the perspective of integrated service quality management, leadership is based on the philosophy that continuous improvement of work methods and processes will improve quality. Such leadership will have several characteristics as follows (1). Visible, committed, and knowledgeable, namely good leadership develops a focus on quality aspects, involves everyone in education and training. In addition, it also develops routine relationships with employees, customers and suppliers; (2). Missionary spirit, namely good leaders try to promote quality aspects outside the organization, either through suppliers, distributors, or customers; (3). Aggressive targets, namely good leadership leads to incremental improvements, not just process improvements, but also seeks different processes; (4). Strong driver where the goals to be achieved in improvement activities are clearly defined in terms of customer satisfaction and quality; (5). Communication of values, where good leadership makes cultural changes towards an effective quality culture. This is done by compiling a clear and consistent communication system through written policies, missions, guidelines, and other statements regarding quality values; (6). Organization, namely where the structure is a flat structure which allows for greater authority for lower levels. Each employee is empowered and involved in inter-departmental improvement teams; (7). Contact with customers where customers have access to contact top managers and senior managers of the company.

3) Ability and Skills

In the service sector, what stands out and is most quickly felt by those who receive the service is the skill of the implementer. They are the ones who carry the "flag" regarding the impression of the good or bad service. With adequate skills and abilities, the implementation of tasks/work can be done well, quickly, and fulfill the desires of all parties, both management itself and the community.

One of the most fundamental elements of quality service management is continuous employee development through education and training.

Education is related to increasing general knowledge and understanding of our environment as a whole. While training is an effort to increase the knowledge and skills of an employee to do a particular job". Education and training have the same goal, namely implicit understanding. Through understanding, employees are enabled to become innovators, initiative takers, and make them effective and efficient in doing their jobs.

4) Awards and Recognition

Awards and recognition are important aspects in implementing a quality strategy. Every employee who performs well needs to be given an award and their

achievements recognized. Thus, it can increase motivation, work morale, pride and a sense of ownership of each person in the organization which can ultimately make a great contribution to the agency and customers served.

To provide satisfaction to employees for the success of the performance that has been achieved is by providing compensation. Compensation given to employees greatly influences the level of job satisfaction, and work motivation and work results. Research on individual behavior in organizations shows that rewards are the most important factor for people. Because the most important thing for most people, the issue of rewards has the power to influence their membership behavior and their achievements.

Improving work performance is also influenced by motivational theories that lead to the satisfaction of needs and other related factors. This assumes that an effective organization is an organization that is able to motivate members of the organization through various means such as fulfilling their needs for money, status, success, and working conditions. Human resources are the most vital organizational assets, as internal customers who determine the final quality of a product/service. One concept for improving service quality is human resource empowerment.

3. Product Quality

a. Definition of Product Quality

According to Kotler and Keller (2021) that product quality is a product's ability to perform its functions, this ability includes durability, reliability, accuracy, which is obtained by the product as a whole. Companies must always improve the quality of their products or services because improving product quality can make customers feel satisfied with the products or services provided and will influence customers to repurchase the product. According to Tjiptono (2019) that the conventional definition of quality is performance as a direct description of a product, reliability, ease of use, aesthetics and so on. In a strategic sense, quality is everything that can provide consumer needs according to what consumers want. According to Arumsari (2012) that product quality is the factors contained in an item or result that causes the item or result to match the purpose of the item being produced. According to Ernawati (2019) that product quality is an important factor that influences each customer's decision in buying a product. The better the quality of the product, the more consumers will be interested in buying the product.

So it can be concluded that product quality is a product's ability to meet every consumer need according to the needs and desires of consumers.

So it can be concluded that product quality is a product's ability to fulfill every consumer need according to the consumer's needs and desires.

b. Product Quality Indicators

There are several benchmarks for product quality according to Kotler and Keller (2021), consisting of

1) Form, namely a product can include size, or structure.

2) Features, namely completing the basic functions of the product.

3) Adjustment, namely adjusting to consumer desires.

4) Work quality, namely the most important dimension when a company implements a model and provides high quality.

5) Quality of conformity, namely a product that meets the promised specifications

6) Durability, namely the size or life of a product under normal or stressful conditions

7) Reliability, namely allowing no product failures

8) Ease of repair, namely ease when the product does not work

9) Style, namely the appearance and feel of the product

10) Design, namely influencing the appearance or function of the product based on needs.

c. Product Quality Dimensions

According to Tjiptono (2019), this product quality dimension includes 8 dimensions consisting of:

1) Performance results

Is the main operational characteristic of the core product purchased performance of the product that provides benefits to consumers who consume it so that consumers can benefit from the product that has been consumed. For each product or service, the performance dimension can be different depending on the functional value promised by the company. In the food business, the performance dimension can be seen from the delicious taste.

2) Additional Features or Features

That is the secondary or complementary characteristics of this product additional product features can also be used as distinctive features that distinguish it from similar competing products. The distinctive features offered can also affect the level of consumer satisfaction with a product.

3) Reliability

That is the reliability of a product is a measure of the small possibility that a product will not be damaged or fail. Damage to the level of risk of product damage, determines the level of consumer satisfaction obtained from a product. The greater the risk accepted by consumers for the product, the lower the level of satisfaction obtained by consumers.

4) Conformance to Specification

That is the conformity of product performance and quality with the standards desired by the manufacturer in accordance with company planning, meaning that the majority of products are in accordance with customer desires. Basically, every product has predetermined standards or specifications. The characteristics of the operational design meet previously established standards.

5) Durability

That is related to how long the product can be used and can be defined as a measure of the expected operating age of the product under normal conditions

6) Serviceability

That includes speed, competence, comfort, easy to repair and satisfactory complaint handling. It can be defined that if there is damage or failure to the product, then it can be interpreted that if there is a product that fails or is damaged, the readiness to repair the product is relied on so that consumers do not feel disadvantaged

7) Aesthetics

That is the attractiveness of the product to the five senses can be seen from the physical form, color, model or design, taste, aroma and others. So consumers will be attracted to a product when they see the initial appearance.

8) Perceived Quality

That is the consumer's perception of the product quality or the superiority of the product. If they do not understand the characteristics of the product they are buying, consumers will perceive it in terms of price, brand and country of manufacture.

According to Badri (2016), there are six specifications of product quality dimensions that are relevant to customers as follows:

1) Performance (the most important thing for consumers is whether the quality of the product reflects the actual condition or whether the service is provided in the right way.

2) Range or type of features (in addition to the main function of a product and service consumers are often interested in the special features of the product.

3) Reliability and durability, namely the reliability of the product in normal use and how long the product can be used until repairs are needed.

4) Maintainability and Serviceability, namely the ease of operating the product and the ease of repair or availability of replacement components.

5) Sensory Characteristics, namely taste, appeal, appearance, smell, taste, and several other factors may be important aspects of quality.

6) Ethical profile and image that quality is a big part of the customer's impression of the product.

4. Promotion

a. Definition of Promotion

Promotion certainly cannot be separated from the communication process, because communication is the basis for developing promotional activities (Dharmesta & Irawan, 2014). Effective communication can change behavior or strengthen previously changed behavior (Dharmesta & Irawan, 2014). The adoption process is closely related to effective communication. stated that the adoption process is carried out by individuals through several stages: awareness, interest, evaluation, decision and confirmation.

In making a purchase, consumers are sensitive to news or promotions about an object they are targeting, this sensitivity cannot be separated from the desire and need of consumers to have or enjoy the services offered by the producer. Therefore, every producer establishes a business that cannot be separated from the name that will be used as part of its marketing strategy and one of them is Brand (image), which from the brand can attract consumers to meet the needs and desires of consumers.

Promotion is an effort to inform or offer products or services that aim to attract potential consumers to

buy or consume them, so that it is expected to increase sales volume (Kotler & Keller, 2021). Meanwhile, according to Gitosudarmo (2019) promotion is an activity aimed at influencing consumers so that they can become familiar with the products offered by the company to them, which then they become happy and then buy the product. Furthermore, another definition according to Peter and Olson (2018) states that promotion is an activity carried out by marketers to convey information about their products and persuade consumers to buy them.

Based on the definitions above, it can be concluded that promotion is an activity to inform consumers about products and services so that they can be recognized and to persuade consumers to buy products and services.

b. Promotion Objectives

The main objective of promotion is to provide information, attract attention and then influence increased sales. According to Alma (2020), the purpose of promotion is to get attention, teach, to improve, persuade, and convince.

A promotional activity if carried out properly can influence consumers regarding where and how consumers spend their income. Promotion can bring benefits to both producers and consumers. According to Laksana (2018) there are general objectives and specific objectives of promotion, which will be explained as follows:

1) General objectives

Based on the objectives of marketing communications, namely to accelerate the response of the targeted market

2) Specific objectives

a) For consumers (consumer promotion), to encourage consumers, among others, to use more products, purchase units of products in large units, try the promoted brand, and to attract buyers of other brands that compete with the product being promoted.

b) For retailers (Trade promotion), to persuade retailers to sell new products, stock more inventory, remind buyers when it is not the season, persuade them to stock up on promoted goods and obtain new retail channels.

c) For salespeople (sales force promotion), to provide support or new products or products, to stimulate them to find new customers and encourage spring sales.

c. Promotion Aspects

Promotion variables can be measured by indicators:

1) Promotional attractiveness Consumer perception of product promotions that attract attention.

2) Media diversity Consumer perception of the diversity of media used for promotion including advertisements in print and electronic media, as well as those that provide public services.

3) Promotional effectiveness Consumer perception of the effectiveness of product promotions.

4) Advertising messages

Consumer perception of media advertisements that are in accordance with the product.

➤ Framework of Thought

The scheme/description in this research is as follows:

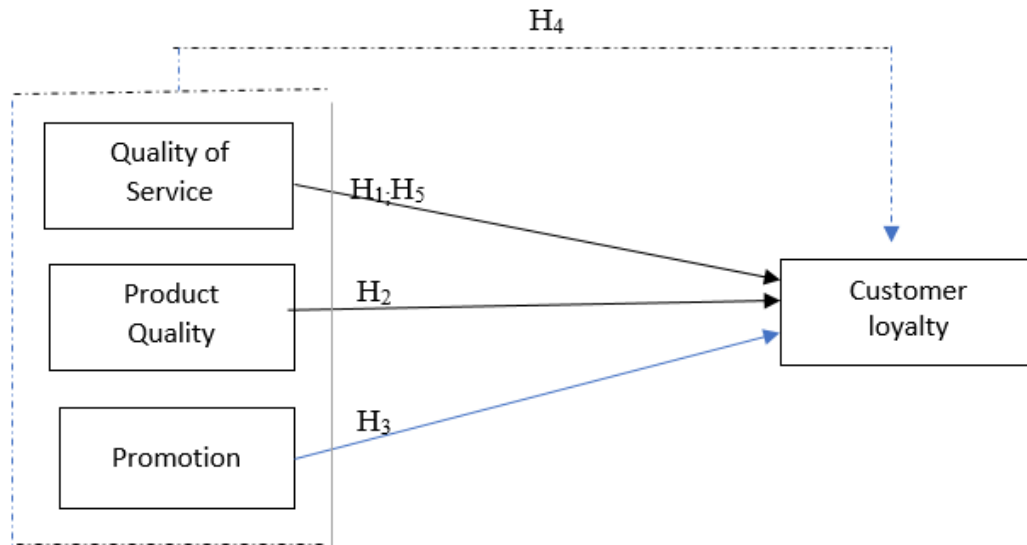


Figure 1
Thought Framework

Independent variables: service quality, product quality and promotion

Dependent variables: customer loyalty

➤ Hypothesis

In this study, the following hypotheses are formulated:

1. There is a significant influence of service quality on Customer Loyalty of Shopee Online Shopping Site Users in Purwodadi.
2. There is a significant influence of product quality on Customer Loyalty of Shopee Online Shopping Site Users in Purwodadi.
3. There is a significant influence of promotion on Customer Loyalty of Shopee Online Shopping Site Users in Purwodadi.
4. There is a significant influence together between service quality, product quality and promotion on Customer Loyalty of Shopee Online Shopping Site Users in Purwodadi.
5. Service quality has the most dominant influence on Customer Loyalty of Shopee Online Shopping Site Users in Purwodadi.

RESEARCH METHOD

A. Scope of Research

The location of this research is Purwodadi SubDistrict, Grobogan District with the research subjects being customers of the online shopping site Shopee.

B. Research Variables

The variables used in this study consist of the dependent variable (Y), namely customer loyalty. Independent variables (X), namely X1: service quality X2: product quality and promotion.

C. Data Sources

The data sources that researchers collect consist of primary data and secondary data.

1. Primary data
 2. Secondary data
- D. Population and Sample

Considering that the population distribution is unknown, according to Cooper and Schindler (2019), the number of samples taken was 96 respondents using the purposive sampling method.

E. Data Collection Techniques

1. Questionnaire.
2. Documentation and literature study.

F. Data Type

The data used in this study consists of primary data and secondary data.

H. Data Analysis Method

1. Research Instrument Test
2. Analysis Prerequisite Test/Classical Assumption Test
3. Path Regression Test
4. Discussion

I. Data Analysis Results

1. Research Instrument Test

Based on the research instrument test consisting of validity test and reliability test, it is known that each valid and reliable question item meets the requirements for further testing.

2. Analysis Prerequisite Test/Classical Assumption Test

It has passed the analysis prerequisite test therefore it is feasible to predict the next analysis.

3. Data Analysis Results

- a. Descriptive Statistics

Table 1

Results of Descriptive Statistics Test					
Statistics					
		Customer loyalty	Quality of Service	Product Quality	Promotion
N	Valid	96	96	96	96
	Missing	0	0	0	0
Mean		29,3750	39,9479	19,0417	18,9375
Median		29,0000	40,0000	19,5000	19,0000
Mode		29,00 ^a	38,00	18,00	16,00
Std. Deviation		2,67247	4,98285	3,27966	3,32712
Minimum		23,00	28,00	12,00	12,00
Maximum		35,00	50,00	25,00	25,00
Sum		2820,00	3835,00	1828,00	1818,00

a. Multiple modes exist. The smallest value is shown

Source: SPSS Processing

The number of Customer Loyalty variables (Y) has an average value of 29.37. The minimum value for this variable is at a value of 23 and the maximum value is at a value of 35. The standard deviation is 2.67. The number of service quality variables (X1) has an average value of 39.59 with a total of 96 data. The minimum value for this variable is at a value of 28 and the maximum value is at a value of 50. The standard deviation is 4.96. The number of product quality variables (X2) has an average value of 19.04 with a total of 96 data.

The minimum value for this variable is at a value of 12 and the maximum value is at a value of 25. The standard deviation is 3.28. The promotion variable has an average value of 18.94 with a total of 96 data. The minimum value for this variable is at a value of 12 and the maximum value is at a value of 25.

a. Multiple Linear Regression Test Results

Tabel 2

Regression Analysis Results					
Coefficients ^a					
Model		Unstandardized Coefficients		Standardized Coefficients	t
		B	Std. Error	Beta	
1	(Constant)	11,461	,656		17,482
	Quality of Service	,229	,037	,427	6,243
	Product Quality	,292	,063	,358	4,653
	Promotion	,170	,064	,212	2,646

a. Dependent Variable: Customer loyalty

$R^2 = 0,930$

Adjusted $R^2 = 0,927$

$F = 405,896^{**}$

Information: * $p < 0,05$, ** $p < 0,01$

Based on Table 2, the regression equation can be determined as follows:

$$Y = 11,461 + 0,229 X_1 + 0,292 X_2 + 0,170 X_3 + e$$

Table 3

Results of t-Test (Partial):					
Coefficients ^a					
Model		Standardized Coefficients		t	Sig.
		Beta			
1	(Constant)			17,482	,000
	Quality of Service		,427	6,243	,000
	Product Quality		,358	4,653	,000
	Promotion		,212	2,646	,010
a. Dependent Variable: : Customer loyalty					

a. Dependent Variable: : Customer loyalty

Table 4

F Test Results					
ANOVA ^a					
Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	630,838	3	210,279	405,896	,000 ^b
Residual	47,662	92	,518		
Total	678,500	95			

a. Dependent Variable: Customer loyalty

b. Predictors: (Constant), Promotion, Quality of Service, Product Quality

From table 4 through the results of the f test, it can be seen that the F count is 405.896 with a sig. value of 0.000 at $\alpha = 0.01$ (sig < α or 0.000 < 0.01). This shows

that the independent variables (service quality, product quality, and promotion) simultaneously (together) have a significant influence on the dependent variable (customer loyalty).

Table 5

Coefficient of Determination			
Model Summary ^b			
Model	R	R Square	Adjusted R Square
1	,964 ^a	,930	,927

a. Predictors: (Constant), promotion, Quality of Service, Product Quality

b. Dependent Variable: Customer loyalty

Adjusted R² for the magnitude of the influence of the three independent variables together on the dependent variable is 0.927. This means that 92.70% of the customer loyalty variable is influenced by the variables of service quality, product quality and promotion. While the rest, which is 7.30% is influenced by other variables outside the variables studied in this study.

c. Discussion

H1: There is a significant influence of service quality on Customer Loyalty of Shopee Online Shopping Site Users in Purwodadi.

This hypothesis aims to test whether the service quality variable has a significant effect on the customer loyalty variable. Conducted with a t-test, the results of the t-test calculation in table V.14. show that the service quality variable (X1) produces a sig. value of 0.000 at $\alpha = 0.01$ (sig. < α or 0.000 < 0.01). This shows that the service quality variable (X1) has a significant positive effect on the customer loyalty variable. This means that if the service quality is improved, customer loyalty will also increase, assuming other factors are constant.

The results of this study are supported by the research results of Suratriadi & Rawit, (2024); Purbaningrum & Damayanti, (2024) and Nalendra et al., (2022) which concluded that service quality has a positive and significant effect on customer loyalty.

H2: There is a significant influence of product quality on Customer Loyalty of Shopee Online Shopping Site Users in Purwodadi.

This hypothesis aims to test whether the product quality variable has a significant effect on the customer loyalty variable. Conducted with a t-test, the results of the t-test calculation in table V.14. show that the product quality variable (X2) produces a calculated t = 4.653 with a sig. value of 0.000 at $\alpha = 0.01$ (sig. < α or 0.000 < 0.01). This shows that the product quality variable (X2) has a significant positive effect on the customer loyalty variable. This means that if the product quality is better, customer loyalty will increase, assuming other factors are constant.

The results of this study are in line with the findings of the research results of Liana et al., (2024); Bangun et al., (2023) who found that product quality has a positive effect on customer loyalty.

H3: There is a significant influence of promotion on Customer Loyalty for Shopee Online Shopping Site Users in Purwodadi.

This hypothesis aims to test whether the promotion variable has a significant effect on the customer loyalty variable has been carried out with a t-test, the results of the t-test calculation in table V.14. show that the work discipline variable (X3) produces a sig. value of 0.010 at $\alpha = 0.05$ (sig. < α or 0.010 < 0.05). This shows that the promotion variable (X3) has a significant positive effect on the customer loyalty variable. This means that if the promotion is improved, customer loyalty will also increase, assuming other factors are constant.

The results of this study are supported by the results of the research of Hamzah & Hasanah (2023) Azizah (2024); concluded that promotion has a positive and significant effect on customer loyalty.

H4: There is a significant joint influence between service quality, product quality and promotion on Customer Loyalty for Shopee Online Shopping Site Users in Purwodadi.

It has been done with the F test, the results of the F test calculation in table V.15. It is known that the F count is 405.896 and the sig. value is 0.000 at $\alpha = 0.01$ (sig < α or 0.000 < 0.01). This shows that the independent variables (service quality, product quality and promotion) simultaneously (together) have a significant influence on the dependent variable (customer loyalty).

H5: Service quality has the most dominant influence on Customer Loyalty for Users of the Shopee Online Shopping Site in Purwodadi.

The Standardized Coefficients Beta (SC Beta) value is known that the largest SC Beta is service quality, which is 0.427. Thus, the service quality variable is

the most dominant factor in influencing the increase/decrease in customer loyalty.

The magnitude of the influence of the three variables (service quality, product quality and promotion) on customer loyalty can be seen from the adjusted R^2 value = 0.927. This means that 92.70% of customer loyalty is influenced by the variables of service quality, product quality and promotion, while the remainder, namely 7.30%, is influenced by other variables outside the variables studied in this study.

CONCLUSION AND SUGGESTIONS

A. Conclusion

1. Empirically, the service quality variable has a significant positive effect on customer loyalty of Shopee Online Shopping Site Users in Purwodadi. This means that if the service quality is improved, it will result in increased customer loyalty.

2. Empirically, the product quality variable has a significant positive effect on customer loyalty of Shopee Online Shopping Site Users in Purwodadi. This means that if the product quality is better, it will result in increased customer loyalty.

3. Empirically, the promotion variable has a significant positive effect on customer loyalty of Shopee Online Shopping Site Users in Purwodadi. This means that if promotion is improved, it will result in increased customer loyalty.

4. Variations in customer loyalty of Shopee online shopping site users in Purwodadi can be explained by variations in service quality, product quality and promotion of 0.927. This means that 92.70% of the customer loyalty variable is influenced by the service quality, product quality and promotion variables, the remaining 7.30% is influenced by other variables outside the variables studied in this study.

5. Service quality has the most dominant influence on customer loyalty of Shopee Online Shopping Site in Purwodadi. This means that if the three variables (service quality, product quality and promotion) are increased, then the most dominant quality will influence customer loyalty.

B. Suggestions

Based on the research results obtained, the suggestions that the author can provide are:

1. The research results found that service quality has an influence and is most dominant on customer loyalty, so it should maintain the quality of service that has existed so far or Shopee can continue to improve service quality by providing a better user experience, such as easy application navigation, responsive customer service, and a safe and fast transaction process. Shopee must continue to improve customer service standards by providing fast, friendly, and solution-oriented responses. Users who feel they get high-quality service tend to be more loyal to the platform.

2. Considering that product quality affects customer loyalty, Shopee must ensure that the products sold on its platform are of high quality by implementing a strict selection and supervision system for sellers and the products offered. This can be done by increasing the quality standards of products that may be marketed.

3. In the field of promotion. Shopee must continue to provide consistent and attractive promotions, such as discounts, vouchers, and cashback, to maintain user interest. These offers must be relevant and scheduled regularly to increase user loyalty.

4. Considering that service quality, product quality and promotions collectively affect customer loyalty, Shopee needs to continue to develop fast and responsive customer service, whether via chat, email or social media. By providing quick solutions to user complaints, Shopee can create a satisfying shopping experience, which will strengthen the impact of promotions and product quality.

C. Research Limitations

This study has several limitations that need to be considered. First, the research sample is limited to a particular company, so the research results may not be directly applicable to a wider population. Second, data is obtained from respondents based on their answers in the survey, so the results may be affected by respondent subjectivity and bias. Finally, data collection and analysis are carried out in a limited time period and with limited resources, this can affect the level of comprehensiveness and representativeness of the research results.

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MATHEMATICAL SCIENCES

PROBLEM OF BENDING OF A TRANSVERSELY ISOTROPIC PLATE

Gorgidze D.,

Doctor of Technical Sciences, Professor. Department of Engineering Mechanics and Construction Technical Expertise, Georgian Technical University Georgia, 0192, Tbilisi, Kostava 77

Museridze R.

Doctor of Civil Engineering, Assistant Professor, Department of Engineering Mechanics and Construction Technical Expertise, Georgian Technical University Georgia, 0192, Tbilisi, Kostava 77

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Abstract

The thermoelastic equilibrium of a transtropic plate is considered when the symmetry conditions are satisfied on the lateral faces, and special conditions are specified on the upper and lower faces. The exact solution to the problem was found using general solutions and the method of separation of variables (Fourier method).

Keywords: thick plate, thermoelasticity, elastic equilibrium, transtropy, exact solutions, method of separation of variables.

Introduction. The theory of thick plates, based on the equations of equilibrium and continuity of an elastic isotropic body, on which only surface forces act, was developed by Mitchell and discussed in detail by Love [1]. In subsequent studies, the solutions of the authors mentioned were simplified and generalized, and the necessary technical theories were developed for calculating the slabs. In this direction, the technical theories of Reisner-Bohl, B.T. Vlasov, V.Z. Vlasov, and L. Donel should be noted [2]. They work under certain conditions, but calculations of thick plates are essentially close to the corresponding three-dimensional problems. For their part, three-dimensional problems for all technical theories play the role of the highest arbiter. And therefore great importance is given to the construction of exact (analytical) solutions of three-dimensional problems, which in a certain sense are analogous to problems of thick plates.

For inhomogeneous transversely isotropic bodies bounded by coordinate surfaces of generalized cylindrical coordinates, in works [3,4], exact (analytical) solutions were obtained for boundary-contact problems of thermoelasticity.

On the lateral faces of the body, conditions of symmetric or antisymmetric continuation are specified, and on the upper and lower faces, special conditions are specified. Solutions are obtained for the case when the curvilinear coordinate parallelepiped is multilayered.

The method we use to construct the exact solution is based on a record modified by the equilibrium equations and boundary-contact conditions, as well as on the convenient use of the elastic field ingredients by decomposing them into the divergence and rotor of the displacement vector. All components of the elastic field

are expressed through u, v, w, B, K where B and K are, respectively, the analogy of the divergence and one of the components of the rotor of the displacement vector.

2. main part

In a Cartesian rectangular coordinate system, we consider a thick plate that occupies an area $\Pi = \{(x, y, z) \in R : 0 \leq x \leq x_1, 0 \leq y \leq y_1, 0 \leq z \leq z_1\}$.

The plate has the shape of a rectangular parallelepiped. Transversely isotropic (Transtropic) homogeneous plate with isotropy plane $z = \text{const}$. The plate is affected by a stationary temperature field, i.e. the temperature field does not depend on time; — there are no mass forces, then the equilibrium equations in the Cartesian rectangular coordinate system have the following form [1]

$$\begin{aligned} a) \quad & \frac{\partial \sigma_x}{\partial x} + \frac{\partial \tau_{xy}}{\partial y} + \frac{\partial \tau_{xz}}{\partial z} = 0, \\ b) \quad & \frac{\partial \tau_{yx}}{\partial x} + \frac{\partial \sigma_y}{\partial y} + \frac{\partial \tau_{yz}}{\partial z} = 0, \\ c) \quad & \frac{\partial \tau_{zx}}{\partial x} + \frac{\partial \tau_{zy}}{\partial y} + \frac{\partial \sigma_z}{\partial z} = 0. \end{aligned} \quad (1)$$

$\sigma_x, \sigma_y, \sigma_z$ -normal stresses,

$\tau_{xy} = \tau_{yx}, \tau_{xy} = \tau_{yx}, \tau_{yz} = \tau_{zy}$ -tangential stresses.

Generalized Hooke's law, also known as the physical principle for a transversally isotropic medium, is stated as follows [5]

$$\begin{aligned}
\sigma_x &= c_1 e_{xx} + (c_1 - 2c_5) e_{yy} + c_3 e_{zz} - k_{10} T = c_1 \left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} \right) - 2c_5 \frac{\partial v}{\partial y} + c_3 \frac{\partial w}{\partial z} - k_{10} T, \\
\sigma_y &= c_1 e_{yy} + (c_1 - 2c_5) e_{xx} + c_3 e_{zz} - k_{10} T = c_1 \left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} \right) - 2c_5 \frac{\partial u}{\partial x} + c_3 \frac{\partial w}{\partial z} - k_{10} T, \\
\sigma_z &= c_2 e_{zz} + c_3 (e_{yy} + e_{xx}) - k_{20} T = c_1 \frac{\partial w}{\partial z} + c_3 \left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} \right) - k_{20} T. \\
\tau_{xz} &= \tau_{zx} = c_4 e_{xz} = c_4 \left(\frac{\partial w}{\partial x} + \frac{\partial u}{\partial z} \right), \\
\tau_{yz} &= \tau_{zy} = c_4 e_{yz} = c_4 \left(\frac{\partial w}{\partial y} + \frac{\partial v}{\partial z} \right), \\
\tau_{xy} &= \tau_{yx} = c_5 e_{xy} = c_5 \left(\frac{\partial v}{\partial x} + \frac{\partial u}{\partial y} \right).
\end{aligned} \tag{2}$$

Here $e_{xx}, e_{yy}, e_{zz}, e_{xz} = e_{zx}, e_{yx} = e_{xy}, e_{xy} = e_{yx}$ - deformations; u, v, w - components of the displacement vector $\vec{U}$; $c_i (i = \overline{1, 5})$ - elastic characteristics (their expressions through technical characteristics $E_1, E_2, \nu_1, \nu_2, \mu$ see [5]); k_1, k_2 - coefficients of linear thermal expansion in the plane of isotropy and along z ; T is the temperature in an elastic body obeying the equation

$$\Delta_2 T + \frac{\lambda_1}{\lambda_2} \frac{\partial^2 T}{\partial z^2} = 0 \tag{3}$$

and the corresponding boundary conditions. λ_1, λ_2 - linear thermal conductivity coefficients in the isotropy plane and along z . $\Delta_2 = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}$.

Taking into account (1) and (2), the equilibrium equations can be written as follows[6]:

$$\begin{aligned}
a) \quad & \frac{c_3}{c_1} \frac{\partial K}{\partial z} + \frac{c_1 c_2 - c_3^2}{c_1} \frac{\partial^2 w}{\partial z^2} + \frac{\partial \tau_{zx}}{\partial x} + \frac{\partial \tau_{zy}}{\partial y} = \frac{c_3 k_{20} - c_3 k_{10}}{c_1} \frac{\partial T}{\partial z}, \\
b) \quad & \frac{\partial K}{\partial x} - \frac{\partial B}{\partial y} + \frac{\partial \tau_{zx}}{\partial z} = 0, \\
c) \quad & \frac{\partial B}{\partial x} + \frac{\partial K}{\partial y} + \frac{\partial \tau_{zy}}{\partial z} = 0, \\
d) \quad & \frac{\partial \tau_{zy}}{\partial x} - \frac{\partial \tau_{zx}}{\partial y} - \frac{c_4}{c_5} \frac{\partial B}{\partial z} = 0,
\end{aligned} \tag{4}$$

where

$$\begin{aligned}
a) \quad & K = c_1 \left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} \right) + c_3 \frac{\partial w}{\partial z} - k_{10} T, \\
b) \quad & B = c_5 \left(\frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} \right), \\
c) \quad & \tau_{zx} = c_4 \left(\frac{\partial u}{\partial z} + \frac{\partial w}{\partial x} \right), \\
d) \quad & \tau_{zy} = c_4 \left(\frac{\partial v}{\partial z} + \frac{\partial w}{\partial y} \right).
\end{aligned} \tag{5}$$

The boundary conditions that further define the class of boundary value problems under consideration have the following form:

$$\text{When } x = x_j : \begin{cases} a) \frac{\partial T}{\partial x} = 0, & u = 0, & \tau_{zx} = 0, & B = 0, \\ b) T = 0, & K = 0, & v = 0, & w = 0. \end{cases} \quad (6)$$

$$\text{When: } y = y_j : \begin{cases} a) \frac{\partial T}{\partial y} = 0, & v = 0, & \tau_{zy} = 0, & B = 0, \\ b) T = 0, & K = 0, & u = 0, & w = 0. \end{cases} \quad (7)$$

$$\text{When: } z = z_j : \begin{cases} a) \frac{\partial T}{\partial y} = F_{j1}(x, y), & b) T = F_{j2}(x, y), \\ c) \frac{\partial T}{\partial \alpha} + \Theta_j T = F_{j3}(x, y). \end{cases} \quad (8)$$

$$\text{When: } z = z_j : \begin{cases} a) \sigma_z = F_{j4}(x, y), & \tau_{zx} = F_{j5}(x, y), & \tau_{zy} = F_{j6}(x, y), \\ b) w = f_{j1}(x, y), & u = f_{j2}(x, y), & v = f_{j3}(x, y), \\ c) \sigma_z = F_{j4}(x, y), & u = f_{j2}(x, y), & v = f_{j3}(x, y), \\ d) w = f_{j1}(x, y), & \tau_{zx} = F_{j5}(x, y), & \tau_{zy} = F_{j6}(x, y). \end{cases} \quad (9)$$

The following conditions are imposed on the $F_{ip}(x, y)$ ($p = \overline{1,6}$), $f_{is}(x, y)$ ($s = \overline{1,3}$)

functions $F_{ip}(x, y) \in C^{1,q}(z_i)$, $f_{is}(x, y) \in C^{2,q}(z_i)$. $C^{i,q}(z_i)$ -class of i -times continuously differentiable functions on the surface of the plate, where the i -th derivative belongs to the Hölder class $C^{0,q}(z_i)$, $\frac{1}{2} < q < 1$. These conditions allow us to represent the functions by absolutely and uniformly convergent Fourier series [7].

The purpose of this work is to construct a hegudary solution of boundary value problems (3), (4), (5), (6), (7), (8), (9) the refore we define the concept of regularity.

The solution of the system (4),(5) defined by the functions u, v, w will be called regular if the functions u, v, w are three times continuously differentiable in the region $\bar{\Pi}$, where $\bar{\Pi}$ is the region Π together with the boundaries $x=0, x=x_1, y=0, y=y_1$, and on the surface $z=z_0$ $0=0$ and $z=z_1$ can be represented with their first and second derivatives by absolutely and uniformly convergent Fourier series in the eigenfunctions of the corresponding Sturm-Liouville problem.

For the class of boundary value problems of thermoelasticity under consideration, the general solution in the class of regular functions is represented in the form [6]:

$$\begin{aligned} u &= \frac{\partial}{\partial x} \left(\psi_2 + \frac{1}{2c_4} \psi_1 \right) + \frac{1}{c_5} \frac{\partial \psi_0}{\partial y}, \\ v &= \frac{\partial}{\partial y} \left(\psi_2 + \frac{1}{2c_4} \psi_1 \right) - \frac{1}{c_5} \frac{\partial \psi_0}{\partial x}, \\ w &= -\frac{\partial}{\partial z} \left(\psi_2 + \frac{1}{2c_4} \psi_1 \right) + \frac{1}{c_4} \frac{\partial \psi_1}{\partial z}. \end{aligned} \quad (10)$$

Here

$$\begin{aligned} a) \Delta_2 \psi_0 + \frac{c_4}{c_5} \frac{\partial^2 \psi_0}{\partial z^2} &= 0, \\ b) \Delta_2 \psi_1 + \gamma_1 \frac{\partial^2 \psi_1}{\partial z^2} - \gamma_2 \frac{\partial^2 \psi_2}{\partial z^2} - \gamma_3 T &= 0, \\ c) \Delta_2 \psi_1 + \gamma_4 \frac{\partial^2 \psi_1}{\partial z^2} + \gamma_5 \Delta_2 \psi_1 - \gamma_6 \frac{\partial^2 \psi_2}{\partial z^2} - \gamma_7 T &= 0, \end{aligned} \quad (11)$$

Where

$$\begin{aligned}\gamma_1 &= \frac{c_1 c_2 - c_3^2 - 2c_3 c_4}{2c_1 c_4}, \gamma_2 = \frac{c_1 c_2 - c_3^2}{c_1}, \gamma_3 = \frac{c_1 k_{20} - c_3 k_{10}}{c_1}, \gamma_4 = \frac{c_3 + 2c_4}{c_1}, \gamma_5 = 2c_4, \\ \gamma_6 &= \frac{2c_3 c_4}{c_1}, \gamma_7 = \frac{2c_4 k_{10}}{c_1}.\end{aligned}\quad (12)$$

As an illustration, in the domain $\Pi = \{(x, y, z) \in R : 0 \leq x \leq x_1, 0 \leq y \leq y_1, 0 \leq z \leq z_1\}$, we consider the following boundary value problem.

The plate has the shape of a rectangular parallelepiped. On the lateral faces, the conditions of antisymmetric continuation are set, i.e. on the lateral faces we have the following boundary conditions

$$\text{When } x = x_j : T = 0, u = 0, \tau_{zx} = 0, B = 0; \quad (13)$$

$$\text{When: } y = y_j : T = 0, v = 0, \tau_{zy} = 0, B = 0; \quad (14)$$

$$\text{When: } z = z_j : \sigma_z = F_{j4}(x, y), \tau_{zx} = F_{j5}(x, y), \tau_{zy} = F_{j6}(x, y). \quad (15)$$

At first glance, it seems as if the problem statement is artificial, but it is not. As Donel writes in his work, the boundary conditions () are similar to the case when the edge of a thick plate rests on short rollers []. Since its friction is quite large, it prevents the roller from moving along the axis. Regarding the conditions at the ends, we note that the external load can be represented as a superposition of symmetric and antisymmetric loads.

Let us consider an elastic field when the $B = c_5 \left(\frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} \right)$, component of the displacement rotor in the entire region is identically equal to zero. We will call such a field the field of the generalized parallel rotor of the displacement vector.

The equilibrium equations will take the following form

$$\begin{aligned}a) & \frac{c_3}{c_1} \frac{\partial K}{\partial z} + \frac{c_1 c_2 - c_3^2}{c_1} \frac{\partial^2 w}{\partial z^2} + \frac{\partial \tau_{zx}}{\partial x} + \frac{\partial \tau_{zy}}{\partial y} = \frac{c_3 k_{20} - c_3 k_{10}}{c_1} \frac{\partial T}{\partial z}, \\ b) & \frac{\partial K}{\partial x} + \frac{\partial \tau_{zx}}{\partial z} = 0, \\ c) & \frac{\partial K}{\partial y} + \frac{\partial \tau_{zy}}{\partial z} = 0, \\ d) & \frac{\partial \tau_{zy}}{\partial x} - \frac{\partial \tau_{zx}}{\partial y} = 0.\end{aligned}\quad (16)$$

Assuming that $T = \frac{\partial^2 \tilde{T}}{\partial z^2}$, $\psi_1 = \Psi_1 + \delta \psi_2$, $\psi_2 = \psi_2$, after obvious, simple transformations (meaning elementary operations on equations, in particular their linear combinations) we obtain the following system

$$\begin{aligned}\Delta_2 \Psi_1 + \bar{\gamma}_1 \frac{\partial^2 \Psi_1}{\partial z^2} &= \bar{\gamma}_3 \frac{\partial^2 \tilde{T}}{\partial z^2}, \\ \Delta_2 \psi_2 + \bar{\gamma}_4 \frac{\partial^2 \psi_2}{\partial z^2} &= \bar{\gamma}_6 \frac{\partial^2 \Psi_1}{\partial z^2} - \bar{\gamma}_7 \frac{\partial^2 \tilde{T}}{\partial z^2},\end{aligned}$$

Where

$$\delta = \sqrt{\frac{\gamma_1}{4\gamma_4}}.$$

In the case under consideration $\psi_0 \equiv 0$, and the functions Ψ_1 and ψ_2 have the following form

$$\begin{aligned}\Psi_1(x, y, z) &= \sum_{m=1}^{\infty} \sum_{n=1}^{\infty} \Psi_{1mn} e^{-p_1 z} sh(p_1 z) \cdot \sin\left(\frac{m\pi}{x_1} x\right) \sin\left(\frac{m\pi}{y_1} y\right), \\ \psi_2(x, y, z) &= \sum_{m=1}^{\infty} \sum_{n=1}^{\infty} \psi_{2mn} e^{-p_2 z} sh(p_2 z) \cdot \sin\left(\frac{m\pi}{x_1} x\right) \sin\left(\frac{m\pi}{y_1} y\right),\end{aligned}\quad (17)$$

Where $p_1 = \gamma_3^{-0.5} \cdot p(m, n) \geq 0$, $p_2 = \gamma_4^{-0.5} \cdot p(m, n) \geq 0$, $p^2 = m^2 + n^2$, $m = \frac{\pi \bar{m}}{x_1}$, $n = \frac{\pi \bar{n}}{y_1}$,

$$\bar{m}=1,2,3,\dots,\bar{n}=1,2,3,\dots.$$

for the function $\tilde{T}$ we will have

$$\tilde{T}(x, y, z) = \sum_{m=1}^{\infty} \sum_{n=1}^{\infty} \tilde{T}_{3mn} e^{-p_3 z} \operatorname{sh}(p_3 z) \cdot \sin\left(\frac{m\pi}{x_1} x\right) \sin\left(\frac{m\pi}{y_1} y\right), p_3 = \lambda^{-0.5} p_{mn}.$$

The components of the elastic field expressed through these functions have the following form

$$\begin{aligned} K &= -\gamma_3 \frac{\partial^2 \psi_2}{\partial z^2} - \frac{\gamma_3}{2\gamma_1} z \frac{\partial^2 \psi_1}{\partial z^2} - \frac{\gamma_3}{\gamma_1} z \frac{\partial^2 \psi_1}{\partial z^2}, \\ u &= 2\gamma_1 \gamma_4 \frac{\partial \psi_2}{\partial x} + \frac{\partial \psi_1}{\partial x} + \gamma_4 z \frac{\partial^2 \psi_1}{\partial x \partial z}, \\ v &= 2\gamma_1 \gamma_4 \frac{\partial \psi_2}{\partial y} + \frac{\partial \psi_1}{\partial y} + \gamma_4 z \frac{\partial^2 \psi_1}{\partial y \partial z}, \\ w &= 2\gamma_1 \gamma_4 \frac{\partial \psi_2}{\partial z} + (\gamma_4 - 1) \frac{\partial \psi_1}{\partial z} + \gamma_4 z \frac{\partial^2 \psi_1}{\partial z^2}, \end{aligned} \quad (18)$$

Using (17), (18) and (2), we can obtain expressions for $\sigma_z, \tau_{zx}, \tau_{zy}$ when $z=z_i$ and we equate to the corresponding function given on these same faces, represented by trigonometric Fourier series. As a result, to determine the coefficients Ψ_{1mn}, Ψ_{2mn} we obtain an algebraic system, the determinant of which, when $p \rightarrow \infty, \Delta_i \neq 0$.

conclusion

The problem under consideration is nothing more than the bending of a hinged thick plate caused by a tangential load.

The general solution obtained enables us to confirm this, u and v are odd functions relative to z , that is, the middle surface, in our case on the surface $z=0$ the displacements u and v are equal to zero. But this is so only in the case when antisymmetric loads act on the ends of the plate.

The following works will consider the case when antisymmetric normal loads act on the ends, as well as the boundary-contact problem for a multilayer plate.

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PEDAGOGICAL SCIENCES

THE ROLE OF INNOVATIVE TECHNOLOGIES IN THE DEVELOPMENT OF RESEARCH COMPETENCE OF PRIMARY SCHOOL STUDENTS

Turganbaeva B.,

candidate of Pedagogical Sciences,

"Shakarim University of Semey"

The Department of Pedagogy

associate professor

Semey, Kazakhstan

Zhumakanova D.

Master's degree

«7m01301-pedagogy and methods of primary education»

Shakarim University of Semey

Semey, Kazakhstan

ИННОВАЦИОННЫЕ ТЕХНОЛОГИИ В РАЗВИТИИ ИССЛЕДОВАТЕЛЬСКИХ КОМПЕТЕНЦИЙ НАЧАЛЬНЫХ ШКОЛЬНИКОВ

Тұрғанбаева Б.

п.э.к.,

«Семей қаласының Шәкәрім атындағы университеті»

КеАҚ Педагогика кафедрасының

қауымдастырылған профессоры

Семей, Қазақстан

Жұмақанова Д.

Магистрант

«7M01301 - Бастауышта оқыту педагогикасы мен әдістемесі»

Семей қаласының Шәкәрім атындағы университеті

Семей, Қазақстан

<https://doi.org/10.5281/zenodo.14577668>

Abstract

This article discusses the role of innovative technologies in the development of research competence of Primary School students. The importance of innovative tools in the educational process, the influence of students on the formation of critical thinking, creative and research skills are analyzed. Based on the opinions and experience of scientists, the effectiveness of innovative technologies in the field of education is determined. At the height of modern science and technology, a citizen who is flexible in life, has a high level of research activity and research abilities is laid in the educational process in a basic primary school.

Аннотация

Бұл мақалада инновациялық технологиялардың бастауыш сынып оқушыларының зерттеушілік құзыреттілігін дамытудағы рөлі қарастырылады. Инновациялық құралдардың білім беру процесіндегі маңыздылығы, оқушылардың сыни ойлау, шығармашылық және зерттеушілік дағдыларын қалыптастырудағы ықпалы талданады. Ғалымдардың пікірлері мен тәжірибелері негізінде инновациялық технологиялардың білім беру саласындағы тиімділігі анықталады. Қазіргі ғылым мен техниканың шарықтаған заманында өмірге икемді, зерттеу іс-әрекеті мен зерттеушілік қабілеті жоғары азамат негізгі бастауыш мектепте оқу-тәрбие үдерісінде қаланады.

Keywords: innovative technologies, Primary School, research competence, information literacy, creative thinking, interactive reading.

Кілт сөздер: инновациялық технологиялар, бастауыш сынып, зерттеушілік құзыреттілік, ақпараттық сауаттылық, шығармашылық ойлау, интерактивті оқу.

Kіріспе:

Білім беру жүйесі әлемдік деңгейде жаңа өзгерістерге бет бұрып, қазіргі заман талаптарына сай жаңарып келеді. Осы тұрғыда инновациялық технологиялардың енгізілуі білім беру процесін жандандырып, оқушылардың зерттеушілік құзыреттілігін дамытуда маңызды рөл атқарады.

Бастауыш сынып кезеңі – балалардың ғылыми ойлау қабілеттері мен зерттеушілік дағдыларын қалыптастыру үшін ең маңызды кезең. Зерттеушілік әрекеттегі оқу-танымдық материалындағы білім мазмұнының логикалық тізбектілігі талап ететіндігі, пәндік және кешенді жүйеде орын алатын білімдердің өзара қатынасы үйлесімділікпен

сәйкес болуы мен ұласымдылығын берумен сипатталады.

Негізгі бөлім:

Бастауыш сынып оқушыларына білім беру мен оқыту және тәрбиелеу үдерістері ерекше мәнге ие, себебі, келешек жеке тұлғаның толық қалыптасуы мен дамуына және оның әлеуметтік ортада өз орнын табуына, рухани болмысының жетілуіне, жалпы мәдениетінің қалыптасуының негізі бастауыштағы педагогикалық үдерістің аясында жүзеге асырылады, яғни құзырлы оқушыны қалыптастырып, дамыту.

Зерттеушілік құзыреттілік — оқушылардың ғылыми зерттеу дағдыларын, ақпаратты жинау, өңдеу және талдау қабілеттерін дамытатын маңызды компонент. Бұл құзыреттілік оқушыларға өздерінің білімдерін қолдана отырып, жаңа ақпаратты іздеу және оның негізінде шешімдер қабылдау мүмкіндігін береді. Зерттеушілік құзыреттілік, әсіресе, бастауыш сынып оқушыларында білім алу барысында маңызды рөл атқарады, себебі ол балаларды шығармашылық және сыни ойлауға, өз бетінше зерттеулер жүргізуге ынталандырады.

Зерттеушілік құзыреттіліктің басты мақсаты — оқушыларды зерттеу процесінің барлық кезеңдеріне, мәселені анықтау, гипотезалар құру, деректер жинау, нәтижелерді талдау және қорытындылар жасау сияқты дағдыларға үйрету. Бұл дағдылар тек ғылыми қызметпен ғана шектелмей, күнделікті өмірде кездесетін мәселелерді шешуде де маңызды болып табылады. Оқушылардың зерттеушілік құзыреттілігін дамыту олардың жеке қабілеттерін ашуға, сыни ойлауды қалыптастыруға және өздігінен білім алуға деген құштарлықты арттыруға мүмкіндік береді.

Сонымен қатар, зерттеушілік құзыреттілік заманауи білім беру жүйесінің маңызды құрамдас бөлігі болып табылады. Оның дамуы оқушыларды ақпаратты сыни тұрғыдан бағалауға, дәлелдерге негізделген шешімдер қабылдауға және жаңа идеялар мен шешімдер ұсынуға қабілетті тұлғалар етіп тәрбиелейді. Осының нәтижесінде зерттеушілік құзыреттілік оқушылардың тек қана академиялық емес, сондай-ақ өмірлік дағдыларын дамытуға да көмектеседі.

Жаңартылған білім беру мазмұнында зерттеушілік құзыреттілікті қалыптастыру оқушыларға білім алу тәсілдерін жаңартып, оларды белсенді зерттеу іс-әрекетіне тартуға бағытталған. Осыған байланысты мектептерде зерттеу жұмыстарын ұйымдастыру, жобалық әдістерді қолдану және оқушыларға өз бетінше зерттеулер жүргізуге мүмкіндік беру аса маңызды болып отыр. [7].

Инновациялық технологиялар — білім беру процесін жетілдіруге, оқушылардың оқу белсенділігін арттыруға арналған жаңа әдістер мен құралдар. Олар интерактивті және мультимедиялық материалдарды, цифрлық ресурстарды, сондай-ақ электронды оқу құралдарын қамтиды. Инновациялық технологиялар оқушылардың білімді меңгеруін жеңілдетіп, оқу

процесіне қызығушылығын арттырады [1, 12]. Тағы бір мәселе ол зерттеушілік құзыреттіліктің маңызы. Жалпылама тоқтала кетер болсақ зерттеушілік құзыреттілік — бұл ақпаратты іздеу, өңдеу, талдау және шешімдер қабылдау дағдыларын қамтитын кешенді қабілет. В.Ф.Сластенин зерттеушілік құзыреттіліктің маңыздылығын атап көрсетіп, оқу процесінде белсенділікті дамытуға бағытталғанын мәлімдеді [2, 45]. Бұл дағдылар бастауыш сынып оқушыларының шығармашылық, логикалық ойлау және сыни пікірлесу қабілеттерін арттыруға септігін тигізеді.

Инновациялық технологиялардың білім беру процесіндегі рөлі аса маңызды, өйткені олар оқушылардың пәнге деген қызығушылығын арттырып, білім алудағы белсенділікті қамтамасыз етеді. Осы орайда атап өткім келетіні ол:

✓ Ақпараттық сауаттылық

Оқушылар ақпаратты іздеп, оны сыни тұрғыдан бағалай білуі керек. Инновациялық технологиялар бұл дағдыларды дамытуда маңызды құрал болып табылады. Мысалы, Google Scholar, JSTOR секілді платформалар арқылы оқушылар ғылыми мақалаларды табуға және оларды талдауға үйренеді [3, 34].

✓ Топтық ынтымақтастық

Интерактивті жобалар мен ойындар оқушылардың топта жұмыс істеп, пікір алмасуына мүмкіндік береді. Бұл олардың әлеуметтік дағдыларын дамытуға ықпал етеді. Мысалы, "Teamwork" бағдарламасы оқушыларға командалық жобаларды жүзеге асыруға көмектеседі [4, 22].

Инновациялық технологиялардың бастауыш сынып оқушыларының зерттеушілік құзыреттілігін дамытудағы рөлі мен іс-тәжірибе жүзінде жүзеге асыратын болсақ төмендегі мысалдар бойынша қолданысқа ие:

• **Ақпараттық-коммуникациялық технологиялар (АКТ):** АКТ құралдарын пайдалану, оқушыларға ақпаратты жинау мен талдауда, онлайн ресурстар мен базаларды зерттеуде көмектеседі. Мысалы, интернет арқылы ғылыми зерттеулер мен мақалаларды оқып, өз зерттеулерін жүргізу мүмкіндігін алады.

• **Мультимедиялық құралдар:** визуалды және аудиовизуалды материалдарды қолдану, балалардың назарын аударады және тақырыпты терең түсінуге көмектеседі. Презентациялар, видеосабақтар, және интерактивті тақталар оқушылардың зерттеушілік қызығушылығын арттырады.

• **Жобалық оқыту:** жобалар арқылы оқушылар топпен немесе жеке зерттеу жұмыстарын жүргізіп, нақты проблемаларды шешуге тырысады. Бұл әдіс балалардың бірлескен жұмыс, уақытты басқару, және критикалық ойлау дағдыларын дамытуға ықпал етеді. Оқушылар экология тақырыбында жоба жасап, зерттеу жүргізу барысында цифрлық құралдарды пайдаланады. Олардың жобалары интерактивті презентация түрінде ұсынылуы мүмкін, бұл

балалардың ынтымақтастық дағдыларын дамытуға ықпал етеді.

• **Виртуалды және толықтырылған шындық:** виртуалды зертханалар мен толықтырылған шындық технологиялары, оқушыларға практикалық тәжірибе алу мүмкіндігін береді. Мысалы, химиялық реакцияларды виртуалды зертханада жүргізу, қауіпсіз және қызықты оқу тәжірибесін ұсынады оқушылар ғылыми эксперименттер өткізіп, алынған нәтижелерді талдайды. Мысалы, жаратылыстану сабағында өсімдіктердің өсуін бақылау арқылы олар практикалық дағдыларын жетілдіреді.

• **Эксперименттер:** бастауыш сынып оқушылары ғылыми эксперименттер өткізіп, алынған нәтижелерді талдайды. Мысалы, жаратылыстану сабағында өсімдіктердің өсуін бақылау арқылы олар практикалық дағдыларын жетілдіреді.

Ғалымдар инновациялық технологиялардың білім беру жүйесіндегі рөлін түрлі аспектілерден талдайды. Мысалы, С.Е. Шапиро зерттеушілік қабілеттілікті дамыту үшін ақпараттық-коммуникациялық технологияларды белсенді түрде қолдануды ұсынады [5, 15]. Бұл әдіс оқушылардың өз бетінше іздену, зерттеу дағдыларын арттырады.

Зерттеушілік құзыреттіліктің мәні оның тұлғалық-мотивациялық, танымдық, іс-әрекеттік сияқты құрамдас бөліктерінің өзара байланысы арқылы көрінеді.

Зерттеу қызметінің мотиві – бұл зерттеу қызметіне деген қызығушылық пен оқушы үшін

оның мағыналы болуы негізінде қалыптасатын ішкі қозғаушы күш. Зерттеу қызметінің әдіс-тәсілдері деп проблемаларды көре білу, гипотезаларды тұжырымдау, бақылау жүргізу, тәжірибе жасау және қорытындылар жасау қабілеттері түсініледі. Бұл дағдылар әрекеттердің жүйелілігін анықтауда басты рөл атқарады.

Әдебиеттерді талдау заманауи ғалымдардың зерттеу дағдыларын келесі топтарға бөліп қарастыратынын көрсетті:

- Операционалдық дағдылар
- Ұйымдастырушылық дағдылар
- Ынтымақтастық дағдылары
- Рефлексиялық дағдылар

Осылайша, зерттеу қызметінің категорияларын қарастыра отырып, бастауыш сынып оқушыларына қатысты зерттеу қызметін нақтылау қажет деп санаймыз. Бұл олардың қоршаған әлемді түсінуіне, жаңа білім мен әрекет тәсілдерін ашуына бағытталған шығармашылық әрекет. Бастауыш сынып оқушыларының зерттеу қызметі олардың құндылықтық, зияткерлік және шығармашылық әлеуетін дамытуға жағдай жасайды. Сонымен қатар, ол оқушылардың белсенділігін арттыруға, оқу материалына қызығушылығын қалыптастыруға және зерттеушілік құзыреттіліктің негіздерін тиімді дамытуға мүмкіндік береді.

Инновациялық технологияларды бастауыш сынып оқушыларының зерттеушілік құзыреттілігін дамытуда қолдануға болатыны №1-кестеде ұсынылған.

№1-кесте.

Инновациялық технологиялардың бастауыш сынып оқушыларының зерттеушілік құзыреттілігін дамытудағы рөлі.

Құралдар	Мақсаты мен қолданылуы
Google Classroom	Оқушыларды бақылау, тапсырмаларды ұйымдастыру, кері байланыс беру.
Kahoot!	Оқу материалдарын пысықтау, ойын түрінде сұрақ-жауап өткізу.
Edmodo	Оқушылардың өзара пікір алмасуына, сұрақтар қоюына және зерттеу жұмыстарын орындауына мүмкіндік береді.
Padlet	Оқушылардың зерттеу жұмыстары мен ресурстарды жинақтап, талқылауына мүмкіндік береді.
Evernote	Ақпаратты жинақтап, оны ретке келтіру үшін қолданылады.
MindMeister	Зерттеу жұмыстарының картасын құру және ойларды визуалдау үшін қолданылады.
Canva	Графикалық түрде презентациялар, плакаттар, инфографикалар жасау.
Microsoft PowerPoint / Google Slides	Зерттеу жобаларын визуалды түрде ұсыну.
Prezi	Динамикалық презентациялар жасау үшін қолданылатын құрал.
PhET Interactive Simulations	Ғылыми симуляциялар мен зерттеулер жүргізу үшін.
Virtual Lab	Оқушыларға түрлі пәндер бойынша зерттеулер жүргізу мүмкіндігін ұсынады.
Wikipedia	Ақпарат іздеу және жинау үшін бастапқы көз ретінде пайдаланылады.
Google Scholar	Ғылыми мақалалар мен зерттеу жұмыстарын іздеу үшін.
TED-Ed	Оқушыларды зерттеу тақырыптарымен таныстыру үшін видеолар мен оқу материалдарын ұсыну.
Scratch	Оқушыларға бағдарламалау негіздерін үйрету, зерттеу жобаларын жасау үшін.
Tinkercad	3D модельдер жасау арқылы зерттеу жұмыстарын жүргізу.

Кейбір педагогтар зерттеушілік құзыреттілікті жеке тұлғаның интегралды сапасы ретінде анықтайды. Бұл сапа оқу-зерттеу жұмыстарын өз бетімен орындауға, ізденіс жүргізуге және мәселелерді шешуге дайын болумен сипатталады. Әдебиеттерді талдау зерттеушілік құзыреттілік туралы түрлі пікірлердің бар екенін және бұл ұғымның көпқырлылығын көрсететін әртүрлі анықтамалар ұсынылатынын көрсетті [6].

Бастауыш мектеп оқушыларының зерттеушілік құзыреттіліктерін қалыптастыруда оқушыларды зерттеу жүргізу жұмыстарына баулу, зерттеушілік әрекетін дамыту, зерттеу ізденісін арттыру, ой-пікірінің белсенділігі мен дербестігін кеңейту, танымдық қызығушылығын арттыру – осы міндетті шешу жолында жүзеге асырылатын іс-әрекеттер.

Инновациялық технологияларды қолдануда кейбір қиындықтар туындауы мүмкін. Мұғалімдердің технологияларды меңгеру деңгейі, мектептердің техникалық жабдықтауы, оқушылардың ақпараттық сауаттылығы — осы мәселелердің барлығы білім беру процесіне әсер етеді.

Қорытынды

Инновациялық технологиялар бастауыш сынып оқушыларының зерттеушілік құзыреттілігін дамытуда ерекше рөл атқарады. Олар білім алудың тиімділігін арттырып, оқушылардың өз бетінше зерттеу жүргізу, талдау және проблемаларды шешу дағдыларын қалыптастырады. Білім беру процесінде инновациялық әдістерді белсенді пайдалану, оқушылардың шығармашылық әлеуетін ашуға және зерттеушілік мәдениетті дамытуға ықпал етеді.

Қазіргі қоғам сұранысына сай бастауыш сынып оқушыларының зерттеушілік құзыреттілігін қалыптастыруды алдындағы қатардағы орынға қоятын қазіргі педагогикалық парадигма талаптары қазіргі кездегі жаңартылған бағдарлама аясында бастауыш сынып оқушыларының зерттеушілік құзыреттілігін қалыптастырудың қажеттілігі мен осы мақсатқа жетіп, керекті міндеттерін шешу үшін ғылыми негізделген арнайы әдістемелік жүйе және практикалық қатынас құру мәселелері өзекті екені анық.

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PHILOLOGICAL SCIENCES

STUDY OF TURKIC-ORIGIN ARCHAIC LEXICAL UNITS IN THE LEXICON OF THE "JAMSHID AND KHURSHID" MONUMENT

Iskenderzade A.

*Azerbaijan National Academy of Sciences, Institute of Linguistics named after Nasimi
Baku, Azerbaijan*

<https://orcid.org/0000-0002-2068-736X>

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Abstract

The "Jamshid and Khurshid" masnavi, written in Turkish by Tacaddin Ibrahim Ahmed, stands out as an important linguistic monument due to its reflection of the language characteristics, lexicon, social life, and culture of the period in which the poet lived. Research conducted on the language of this work helps in understanding the historical development of the language and the changes in its lexical composition.

In the article, archaic Turkic words in "Jamshid and Khurshid" are examined in comparison with the language of other Turkic monuments, and traces of these archaic forms in modern Turkic languages and dialects are also explored. The research reveals that some lexical units in the lexicon of "Jamshid and Khurshid" have survived in various Turkic languages without any change in meaning, but with phonetic changes. These words are still actively used in modern Turkic languages. Some Turkic-origin lexical items in the work have gradually become archaic in modern Turkic languages, disappearing entirely from use, while others have remained in literary language but are preserved in dialects and regional speech. Some terms and expressions in the work, while used with the same phonetic variant over time, have undergone semantic changes, acquiring new meanings.

Such words demonstrate the continuity of the development of the language and its traditions, while also showing how the dynamic structure of the language is maintained. These words, entering the core lexicon of the language, adapt to the natural changes of the language in line with the social and cultural development of the society, ensuring the continuous improvement of the language.

Keywords: Oghuz Turkish, "Jamshid and Khurshid", lexicon, archaism, lexical archaisms, semantic archaisms

Introduction

Language, as the most important means of communication in society, is also a reflection of social, cultural, and historical changes. Over time, the development of society, political and economic changes, technological innovations, and the evolution of culture also influence language. One of the most visible areas of these influences is the changes occurring in the lexical structure of language. Among these changes, one of the most important is the process of words becoming passive over time, leading to the creation of archaisms.

In modern times, the vocabulary of language gradually becomes enriched with new words. At the same time, some words that were previously in use become outdated and turn into archaisms. This is a part of the natural development process of language. The term "archaism" is derived from the Greek word "archalos," meaning "ancient." Archaisms are words that are no longer relevant or do not meet the needs of the modern era during the development of language. With the progress of modern language, these words gradually become passive, no longer used in everyday life, and turn into "outdated" parts of the history of the language. The creation of archaisms reflects not only the aesthetic and functional aspects of language but also the way of thinking of culture and society. For example, when concepts and objects that once played a significant role in society lose their relevance in the modern era, the words used to express these concepts also fall out of use.

Archaisms have varying degrees: some are used only in specific historical and literary contexts, while others are words that no longer conform to the norms of modern language use, being forgotten or rarely encountered. The removal of archaisms from the linguistic repertoire also reflects the adaptation of language to modern requirements and the creation of new forms of expression for communication purposes. The process of the emergence of new words and the phasing out of old ones is part of the natural evolution of language.

However, the study of obsolete words and archaisms helps us understand not only the structure of language but also the development of society and the transformation of worldviews. For example, the passivization of "outdated" words in a society indicates changes in that period's social structures, economic conditions, and lifestyle. At the same time, the preservation of archaisms as part of literary language is a reflection of the craftsmanship traditions of that era and the richness of the language.

The study of archaisms also demonstrates how language has evolved from being merely a means of communication to becoming a cultural element. Language reflects not only communication but also the moral, ideological, and cultural life of a society. Archaisms allow for a deeper analysis of the mindset, social relations, and life philosophy of past eras.

The development of language and the emergence of archaisms is not only a change within the language itself but also a sign of the changes in society, culture,

and history. Investigating how archaisms form and sometimes give way to new words helps us understand the worldview, social, and economic conditions of a given period. This reveals that language has not only functional and communicative significance but also historical and cultural importance.

Turkish-Origin Archaisms in the Lexicon of the "Cemshid and Khurshid" Masnavi

Some Turkish-origin words in the lexicon of the 15th-century Oghuz monument, *Cemshid and Khurshid* by Tajaddin Ahmad, are still used unchanged in modern Turkish languages to this day. Some words in the lexicon, which have undergone only phonetic changes without any semantic alterations, are still actively used in various Turkish languages. Certain terms, expressions, and sentences in the language of the monument are also used in modern Turkish languages with the same meaning but in different phonetic forms. These words demonstrate the continuity of traditions within the language and its dynamic structure.

Such words often become part of the foundational and core lexicon of the language, as they both preserve the structure of the language and adapt to the natural changes of the language in line with the social and cultural development of society. Some of the Turkmen-origin lexical units in the monument, however, have gradually become archaic and disappeared from use in modern Turkish languages. Others, although no longer used in standard literary language, have been preserved in dialects and regional varieties.

The archaic words in the language of the monument can be grouped into two categories: "archaisms related to nouns" and "archaisms indicating state or action." In this article, we will examine the Turkmen-origin archaisms related to nouns in the language of *Cemshid and Khurshid*. In this context, we have grouped the archaic nouns identified in the language of the monument as follows:

a) **Lexical Archaisms:** Lexical archaisms are words and expressions that were used in a specific period of language history but have gradually fallen out of use in everyday language and the normative system of literary language over time. These archaisms are naturally words that are no longer reused or are replaced by new synonyms. Lexical archaisms play a crucial role in the development of language because their study helps in understanding both the history of the language and the development of society.

In the lexicon of *Cemshid and Khurshid*, several words that have completely disappeared from literary language, lost their common usage, and are now observed to be used only in some dialects or in various Turkic languages have been recorded. For example, the word *Altun* meaning "gold": "Qodu altun tacı giydi ahənin rud" [3, p.358]; "Ətəklərlə gühər altuna batdı" [3, p.399].

The ancient Turkish word *altun* (gold), recorded with the same semantic meaning in the "Orkhon-Yenisey," Uighur inscriptions, and the *Kutadgu Bilig* monument, has been used in Yakut as *altan* and in Chuvash as *ylttan* [26, p.357; p.27, p.179]. Analyzing the lexical layer of ancient monuments shows that the words *altun* and *qızıl* (gold) were used in parallel in these texts:

"qırq mın qızıl altun tutar ärdi qamusını nafaqa qıldı" [16, p.37]. In the language of *Cemshid and Khurshid*, this word, recorded in seven verses, has become archaic in Azerbaijani literary language.

The word *altun* was widely used in the language of Turkic monuments and classical works: "Altun başlu ban ev virgil bu oğlana" [31, p.28]; "Altun qiymətin sərraf bilür" [17, p.32]; "Qızıl, altun idi həm şadrəvani" [12, p.90].

In the vocabulary of native language monuments from the Middle Ages, this word was used intensively, often in word combinations or with suffixes to express various meanings: *altun baş* ("the golden crown placed on women's heads in ancient times"), *altunlamaq / altunlu* ("golden-plated"), *altun tas* ("a golden ornamented crown once placed on women's heads"), and so on [19, p.113-115].

It should be noted that in the language of the Yenisey inscriptions, *altunluq* is also recorded in the form of *qızılı* ("golden") [24, p.179]. The word *altunlu* ("golden") as an adjective, also used in the language of the *Kitabi-Dədə Qorqud*, appears in expressions such as *altun cida oynatmaq* and *altun aşiq oynatmaq*, where it refers to the wealth, property, and opulent lifestyle of the elite class: "Qarğu cida oynadanlar vardı gəldi / Altun cida oynadana, Ya Rəb, noldı?; Qanı xanım, altun da yaxşı atı yoq / Alnunda altun aşiq cübbəsi yoq; Altun aşiq oynar Sancıdanın bağları" [3110, p.85; p.136; p.157]. In the language of *Cemshid and Khurshid*, the word *altun* is not recorded as a compound word.

This ancient lexical unit, which still retains its meaning in modern Turkish, has been replaced with the word *qızıl* ("gold") in modern Azerbaijani literary language. It is also worth mentioning that the word *altun*, which is noted in dictionaries as an ancient Turkish word, is believed to have the same root as the Mongolian word *altan*. For example, the "Etymological Dictionary of the Turkish Language" suggests that the word *altun* might have been derived from the Mongolian word *altan*, which shares the same semantic meaning. However, G. Dörfer disagrees with this opinion and, demonstrating the replacement of closed vowels with open vowels in Yakut, convincingly proves that the form *altan* is of Turkic origin [28, p.142].

Ari (pure, clean): *Anuñ vasfi naqayisdan arıdur* [3, p.60]

In the lexicon of *Cemshid and Khurshid*, the words *arıtmaq* and *arınmaq* are used with the meaning of cleaning or becoming clean: *Arıdam divdən bən bu diyarı* [3, p.153].

This ancient lexical unit, which means "pure" or "clean," is also recorded in the Kipchak monument *Codex Cumanicus* with the meaning of "sacred, precious" as *arı tın* ("sacred, beloved"): "*Arı Tınga sövünç bolsun*" [7, p.637]. Additionally, just as in *Cemshid and Khurshid*, the lexicon of *Codex Cumanicus* also includes the words *arın* ("to become clean") and *arıt* ("to clean, to purify") [7, p.636].

The word *arı*, widely used in the examples of ancient Turkish inscriptions, classical Turkish poets, and oral folk literature, has been gradually decreasing in usage since the 17th century. However, although this word could not become part of the core vocabulary of

Azerbaijani literary language, it has preserved its historical semantics in various dialects and regional speech forms. For example, the expression "*Aydan arı sudan duru*" has been preserved with the phonovariants "*arıtdamağ*", "*arıtdamax*", "*ayırtamax*" used in regions like Aghdam, Fuzuli, Gazakh, Tovuz, Shamkir, Shahbuz, and Quba, where it carries the meaning of "to cleanse" [6, p.17]. These expressions, particularly in the Quba, Khachmaz, and Shamkir dialects, are still actively used today. Thus, the rich semantics and phonetic variants of the word *arı* have been preserved in regional dialects and have survived into modern times.

b) **Semantic Archaicisms:** Unlike lexical archaisms, this group of archaic words retains its functionality in modern languages in terms of phonetic and morphological features, but the meaning of these words diminishes or changes. This indicates that while these words no longer express their original meanings in daily usage, they preserve their historical and cultural traces. The semantic archaisms in the *Cemshid* and *Khurshid* text represent such changes.

Oğlan (child, son): *Çü oğlansun arada olmasın şərm* [3, p.305]; *Nə kim oğlan bula anda ya avrət* [3, p.335].

G. Klauson noted that the word *oğlan* was used to refer to both male and female children, while *oğul* referred specifically to "son," and *oğlan* was considered the plural form of *oğul*. He emphasized that the "-n" suffix in a few Turkic-origin words creates the plural form, and *oğla:n* was used in plural. However, over time, *oğul* came to mean "male child," *oğlan* began to refer to "male," "boy," and later, it also took on different meanings such as "guardian" and "servant" [11, p.83-84].

In the Orkhon inscriptions, the word "oğlan" was used to denote meanings such as "boy," "son," "child," and "children." The form "oğlit" was used to mean "sons" or "children." The word "oğul" meant "son," "child," or "offspring," while the variant "oğıl" was used to refer to "offspring," "child," and even "animal offspring." Additionally, the expression "qız oqıl" referred to "daughter," and "urı oqıl" was used to mean "son," while "tun oqıl" signified "first child" or "the firstborn."

This lexical unit was also used in the *Dastani-Əhməd Hərami* and *Vərqa və Gülşah* works, where it combined with the word "qız" (girl) to form the compound word "qızoğlan," meaning "virgin." In *Divanü Lüğat-it-Türk*, "oğlan" is noted with the meaning of "offspring": "Bundan alınarak küçük çocuklara uşak oğlan denir" [13, p.67]; "oğlan ulgattı = çocuk büyüdü" [13, p.263]. The word also appeared frequently in medieval Turkic texts, including *Kitabi-Dədə Qorqud*, where it was explained as "male child" or "son": "Kəsilsün oğlan əmən süd tamarım yaman sızlar" [1, p.138]. In this context, the word "oğlan" aligns more closely with the meaning of "offspring" or "child."

In modern Azerbaijani, the process of semantic narrowing has led to "oğlan" losing its broader meaning of "offspring." Today, the term is used mainly in two senses: first, to mean a male child, and second, to refer to a young man who has reached maturity but is not yet

married [8, p.514]. Thus, the general meaning of "offspring" that "oğlan" once carried has become archaic.

The word "oğlan" with slight phonetic variations continues to be used in other Turkic languages with similar meanings: in Turkish and Turkmen, it means "male child," in Gagauz, it is "oglan," in Uighur, it is "oğultay," in Uzbek, "oğlân," in Crimean Tatar, Bashkir, and Kazakh, it is "ulan," in Teleut, "ulan," in Shor, "olan," and so on.

The word *tütün* (meaning "tobacco" or "smoke") appears in "Jamshid and Khurshid" only three times, and in the context of the ancient Turkish inscriptions, it is associated with the meaning of "smoke" or "fumes": "Tütünü ahınun çıqdı asumana" [3, p.98]; "Tütün anun demidür kim bələdur" [3, p.82]. In "Jamshid and Khurshid", it is used with the semantic of "smoke, mist" as in the proverb: "Ot tütünsüz bolmas, yakut yazuksuz bolmas=alov dumansız, gənc günahsız olmaz" [13, p.400].

In ancient Turkish texts, *tütün* was used to mean "smoke," and in XII-XIV century Uighur legal documents, it is also recorded as a term related to taxes [29, p.601]. According to L.Z. Budaqov's dictionary, *tütün* in various forms such as "tütün içmək" (to smoke), "tütünləmək" (to make smoky), and "tütün çıxarmaq" (to produce smoke) is used with the meaning of "smoke," "to smoke," or "to produce smoke" [29, p.389]. Furthermore, in the Turkish language, from the XIII to the XIX century, *tütün* was frequently used to indicate "smoke" or "fumes" [9, p.1359-1360].

In modern Turkish dialects, including those of Çorum, Sivrikis, Samsun, Trabzon, Erzincan, Gaziantep, Maraş, Yozgat, Ankara, and Cyprus, the meaning "smoke" has been preserved in the term *tütün* [4, p.260-261]. In Gagauz, *tütün* is still used today with the meanings "1. tobacco, 2. cigarette, 3. to smoke tobacco" [18, p.248]. In Crimean Tatar Turkish, the word *tütün* is also preserved.

In modern Turkmen, the word *tütün* has been replaced by *temmäki*, and similarly, in Kyrgyz, Kazakh, Uzbek, and Tatar languages, it appears as *tameki* and *təməke*. In Azerbaijani literary language, *tütün* refers to "the plant from the gooseberry family whose leaves contain nicotine; the dried, finely chopped, or pulverized leaves of this plant, used for smoking, sniffing, or chewing" [8, p.385]. In Turkish, it retains the meaning of "1. plant name, 2. the dried leaves of this plant when smoked as cigarettes, 3. smoke" in literary language.

The word *yemiş* (meaning "fruit, produce, crop") appears in "Jamshid and Khurshid" with the meaning of "food" or "sustenance": "*Yemiş idi həmin anun qidası*" [3, p.168]. G. Klauson notes that this word is derived from the root -ye, but he does not provide a detailed analysis of the -miş suffix, only stating that it is an uncommon suffix [11, p.938].

In modern Azerbaijani, *yemiş* has undergone semantic narrowing and is now used primarily to mean "melon," specifically referring to the fruit. However, historically, it had a broader range of meanings. In ancient and medieval written texts, it appeared as *yemiş* or *yemiş* in different forms, encompassing meanings such as "fruit," "produce," and "crop."

In ancient Turkic inscriptions, this lexeme had a wider scope of use. For example, in "Jamshid and Khurshid" and other ancient texts, the word was used to mean "fruit," "produce," or "crop." In medieval Turkic written texts, the form *yemiş* was predominantly used to refer to "fruit." Based on these examples, it is clear that the word *qovun* (melon) was historically not limited to a specific type of fruit, such as the melon plant, but was used more broadly to refer to "fruit" in general. This reflects the semantic expansion of the term in earlier periods, before it became more specialized in modern usage.

The semantic change of the word *yemiş* is closely tied to its phonetic and morphological features in written texts. For example, in *Divanü Lüğat-it-Türk*, the variant *yemiş* is used with the meaning of "fruit" [15, p.12; 14, p.772]. This illustrates the word's semantic evolution and provides insight into the development of language. Such a process is related both to the evolution of the language and to the changing lifestyle of society.

In Old Uighur Turkic, *yemiş* was used to mean "fruit," and *yimışlik* was used to mean "orchard" or "grove." In Kipchak Turkic, the word *yemiş* referred to "fruit," while *yimışlı* meant "fruit-bearing" [10, p.297; 29, p.323]. The word continued to be actively used in medieval Turkic texts, such as in the line from *Melhame* (14th-15th century): "Nice yimışlı ağaç kıla vefat / Çok ola sayru alil hem bi-sübat" [22, p.4602].

In some dialects of modern Turkish, *yemiş*, *yimış*, or *yemşen* is used with meanings such as "nuts," "willow tree fruit," or "fig" [5, p. 4242]. This further demonstrates the evolution of the word, as its meaning expanded and shifted over time, reflecting cultural and linguistic changes.

This ancient Turkism, in its *iymiş* variant in Turkmen, is still used with the meanings "fruit" and *iymişli* meaning "orchard" [30, p. 348]. Additionally, in languages such as Kazakh and Karakalpak, *jemiş* is used to mean "fruit," while in Kyrgyz, *jemişter* (plural) is used with the same meaning. In Crimean Tatar, the *emiş* variant refers to "fruit," in Uzbek and Altai it is used with the meaning "food" or "meal," in Tuva, *çimis* refers to "feed, food," in Khakas *imes* means "seed," and in Shor *çimis* refers to "feed, seed" as well.

Semantic archaisms not only reflect the structural development of language but also serve as valuable elements that mirror the history and culture of a society. These words are important sources of information for tracking the historical development of a language, understanding the thought processes and social structures of past periods. At the same time, semantic archaisms continue to appear in folk literature, folklore, and religious texts. Analyzing the semantic archaisms in the "Jamshid and Khurshid" manuscript is significant not only from a linguistic perspective but also for cultural and historical studies. It allows for a deeper understanding of the culture, customs, and worldview of that

Conclusion

A review of the lexicon in the "Jamshid and Khurshid" manuscript shows that the Turkic-derived lexical units in the text have undergone various changes, playing an important role in the formation of the vocabulary of modern Turkic languages. The study

of the lexicon in this manuscript provides valuable insights into both the historical development of the language and the evolution of Turkic languages over different periods.

Some Turkic-derived words in the "Jamshid and Khurshid" manuscript have remained unchanged in terms of phonetics, lexicon, and semantics from the period of the manuscript to the present day, forming the core vocabulary of modern Turkic languages. This indicates the preservation and continued use of certain words throughout the history of the language. Such words are stable lexical units that continue to be used in literary language with consistent meanings.

However, some words from the "Jamshid and Khurshid" manuscript have become passive in literary language, turning into archaisms. These words have been removed from the active vocabulary of modern literary language and have become passive. Nevertheless, these words continue to be used in various dialects and regional variants, maintaining their historical semantic load.

These findings are significant for tracking the development of the language, understanding the connection between ancient and modern Turkic languages, and exploring the continuity of these words in folk literature and oral traditions. Thus, the lexicon of the "*Cemşid və Xurşid*" manuscript is an invaluable source that reflects the rich history and cultural heritage of the Turkic language.

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NEW APPROACHES TO SCIENTIFIC THEORETICAL IDEAS ABOUT THE PART OF SPEECH CALLED "PARTICLE" IN MODERN ENGLISH

Nuriyeva S.

*Doctor of Philosophy in Philological Sciences, associate professor
Azerbaijan University of Languages, Department of English Grammar*

(Orcid id: 0000-0002-8366-8019)

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Abstract

The article deals with "The Particle" that has gained status as a structural part of speech in modern English, its research, and different approaches of linguists to it. For the first time, the researcher, acting from a different position, tries to clarify the question of whether "Particle" is a structural or a free part of speech, and in this matter, the author relies on the Azerbaijani linguist O.I. Musayev's classification of parts of speech. He classifies parts of speech into notional (main), structural (functional) and free (independent) parts of speech. [O.I. Musayev, 2009, p.9] In this paper "Particle" is determined as a free part of speech, not as a structural part of speech. Besides it, unlike other grammarians, the researcher considers "The Particle" one of the ways of expressing modality. She bases on the fact that this part of speech emotionally emphasizes the word it belongs to in the sentence and expresses more modality. "The particle" is analyzed according to the following characteristics, which are the basis for the classification of parts of speech.

1. lexical-grammatical meaning
2. grammatical category
3. right-hand and left-combinability with words in a sentence
4. syntactic function
5. morphological characteristics (elements that make up the foundation)
6. its place in the word order;

In order to determine which group of parts of speech the particle belongs to, different classifications of parts of speech given by well-known scientists are addressed. As a result, for the first time in linguistics, "The Particle" is included among free speech parts.

Another main point of the article is the analysis and justification of 'The Particle' as a means of expression of the category of modality. This opinion is supported by the evidence substantiated by the researcher. The researcher notes that 'Particle' like interjections and modal words also express modality. He emphasizes that negative sentences express negative modality by means of the negative particles "no" and "not". According to him, if exclamatory sentences express exclamatory modality, negative particles are also a means of creating negative modality. In the article, referring to the opinions of linguists conducting research on "The Particle", the attitude is reported and the results are systematized.

Keywords: particle, modality, free part of speech, functional part of speech, grammatical category, grammatical function

The main purpose of writing this article is to determine whether "The Particle" is a main, structural (functional) or free part of speech. In modern linguistics, linguists, namely B.S. Khaymovich and B.I. Rorogovskaya, M.A. Ganshina, N.M. Vasilyevskaya, V.L. Kaushanskaya, R.L. Kovner, N.A. Kobrina, I.P. Ivanova, V.V. Burlakova, G.G. Pocheptsova, L.S. Barkhudarov, D.A. Shteling, O.I. Musayev and others consider "The Particle" as a structural part of speech. [8;2;7;9;13;7;11;5;10]

Hajiye E.I. considers the particle as a structural part of speech basing on the classification of parts of speech given by the Azerbaijani Germanologist Musayev O.I. His classification bases on traditional criteria, i.e., form, meaning and function. Hajiye E.I. writes about this: "O.I. Musayev's classification is more appropriate and logical to the nature of language and its function. We also recognize that there are four auxiliary parts of speech in modern English. Those parts of speech are articles, prepositions, conjunctions and adverbs. [E.I.Hajiye 2006, p.26] Unlike E.I.Hajiye, we think that according to the principles of classification

of parts of speech (based on the classification of B.S. Khaymovich and B.I. Rorogovskaya), "The Particle" should be considered a free part of speech.

In the classification given by some linguists regarding the division of parts of speech, no information is given about "The Particle". For example, E.M. Gordon and I.P. Krylova in the book "A Grammar of Present Day English" divide the parts of speech into main and structural parts of speech. The book says: "The following parts of speech are to be treated as structural words: articles, prepositions and conjunctions." (The following parts of speech are structural parts of speech: article, preposition, conjunction) Apparently, "The Particle" is not among these parts of speech [E.M. Gordon 1986, p. 10].

Azerbaijani linguists O.I.Musayev, A.R.Rzayev, E.I.Hajiye also gave "Modal words" and "The Interjection" as free of parts speech in the book "A Practical Grammar of Contemporary English". "The Particle" is given as a structural part of speech. [O.I.Musayev, 2009, p.10]

E.I. Hajiyeu accepts the classification of parts of speech given by O.I. Musayev based on traditional criteria (meaning, form and function) without making any changes in his monograph "Functional-semantic characteristics of structural parts of speech in modern English and Azerbaijani languages". In this classification, The Particle is given as one of the structural parts of speech. [E.I.Hajiyeu 2006, p. 26]

In our opinion, in order to make a more correct decision, it is necessary to choose a more acceptable classification of speech parts. Scientific-theoretical opinions about the classification of parts of speech in world linguistics are diverse and controversial. If we summarize the results obtained during the conducted research, then we will see that three important problems attract attention in the classification of parts of speech:

1. The variety of criteria used in the classification of parts of speech. For example, a word's meaning, morphological feature, syntactic function, word order position in a sentence, related words, grammatical categories, answering any question, etc. Note that not all linguists consider all of these features when classifying parts of speech.

2. Type of speech parts: main, structural and free. By the way, it should be noted that the term free speech parts was first reflected in the original classification given by the Azerbaijani linguist O.I. Musayev.

3. The number of main, auxiliary and free speech parts separately.

It goes without saying that we have to pay special attention to the above-mentioned nuances, because the opinions of linguists about "The Particle" are completely different and controversial.

In our opinion, when emphasizing whether any part of speech is the main, auxiliary or free part of speech, it is absolutely necessary to be based on correct scientific theoretical principles and provisions. Considering this point, the explanations and comments given by A.R. Rzayev in his work entitled "Collection of Lectures on Theoretical Grammar of the English Language" can be considered acceptable. According to A.R. the words having an independent communicative function as well as being independent sentence members are notional parts of speech. [Hüseynov A.R., 2015, p. 21].

It would be good if the researcher paid particular attention to the fact that the notional parts of speech have grammatical categories, because the grammatical category is the main criterion that shows that each word has a grammatical meaning, along with the grammatical form. Grammatical category is one of the main factors that distinguish the notional part of speech from that of the structural part of speech.

A.R. Rzayev evaluates structural parts of speech as follows: "Other parts are words, for example, article, preposition, conjunction etc. since they do not have an independent nominative meaning, it cannot be an independent member in a sentence. These words that exist in the language are called structural parts of speech [Rzayev A.R. 2015., p.21] . O.I. Musayev emphasizes that structural parts of speech do not have free lexical meaning and independent syntactic function. It is diffi-

cult to agree with the opinions of both linguists. For example, both linguists consider the preposition to be a structural part of speech and emphasize that it has no lexical meaning. In our opinion, each lexeme reflected in the dictionary has a lexical meaning. For example, on the table, at the table, under the table, etc. What is said about a prepositional noun phrase can also be said about another part of speech-conjunction, for example, conjunctions such as "but" and "and" or "or" that connect the parts of a complex sentence differ precisely according to their lexical meaning. For this reason, in order to distinguish the notional parts of speech from structural parts of speech, their grammatical features should be taken into account.

O. Jespersen used the term "Particle" in "The Philosophy of Grammar". He notes that adverb, preposition, conjunction and interjection are presented as four different parts of speech. This leads to their being in the same situation as nouns, adjectives, pronouns and verbs. In this case, the dissimilarities between these parts of speech are exaggerated and the similarities remain in the shadows. O. Jespersen suggests that the term "Particles" used in the past should be re-applied and include adverbs, prepositions, conjunctions and interjections. [O. Jespersen, 2006, pp. 87-90]

It turns out that the term "particles" was previously included in the order of various parts of speech in linguistics. However, we cannot agree with it, because those parts of speech are completely different in terms of meaning, function, and form, and it is impossible to attribute them to one group.

Basing on the traditional method Ilyish B.A. like Jespersen O. classifies words in terms of meaning, form and function. Khaymovich B.S. and Rorogovskaya B.I. gave fourteen parts of speech in their classification, and one of them is "The Particle". [Khaymovich B.S., 1967, p.38] Ganshina M. and Vasilievskaya N. also classified "The particle" as a structural part of speech in their classification. [Ganshina M. and Vasilievskaya N., 1964, p.12] .

Kobrina N.A. differs from other linguists by classifying the article together with the noun, but like other linguists he adds "The Particle" in the list of secondary parts of speech. [Kobrina N.A. 1985, p.5]

Barkhudarov L.S. and Shtelling D.A. also accepts "The Particle" as a secondary part of speech [Barkhudarov L.S., 1965, p. 272-273]

Musayev O.I., E.I. Hajiyeu, Huseynov A.R. present the "The Particle" as a secondary part of speech in the book "A Practical Grammar of Contemporary English", but differing from other linguists, they talk about its being homonymous with other parts of speech in the sentence and determine its position in the sentence according to the order of words. [Musayev O.I., 2009, p. 282-285] The following examples are from that book:

I **simply** don't understand you.

(The particle, emphasizes the meaning of the verb in the negative)

He did it quite **simple**.

(The adverb, expresses the manner of the action.)

Based on the above data, we can note that "The Particle" does not belong to the order of structural parts of speech. It can be considered a free part of speech.

The Particle is a part of speech that is mainly used to express an idea in an emphatic way and therefore expresses modality. It is no coincidence that Musayev O. classifies parts of speech into three groups: notional, structural and free part of speech. According to him modal words and interjection are free parts speech because they don't have grammatical categories, no syntactical function, negative left-hand and right-hand combinability with other parts of speech and they don't answer any questions. It should be mentioned that they both express modality and therefore they are considered to be the ways of expressing modality in linguistics. For this reason, Musayev O. names them free part of speech. The thing is "The Particle" has the features coinciding with the above-mentioned parts of speech. (Interjection and modal words) that is why we think we will not make a mistake if we include "The Particle" in the list of free parts of speech. For example,

He is young, **too**.

In this sentence, **too** is **a particle** and expresses affirmative modality. It comes at the end, is separated by a comma, does not become part of a sentence, does not answer a question, does not express any grammatical category, does not depend on any part of a sentence, it is free.

Note that particles can be removed from the sentence without violating the meaning of the sentence. One can find a lot of examples referring to it. [Musayev O., 2009, p.284]

Cf. **Only** you could do a thing like that. You could do a thing like that.

He **only** had six apples. He had six apples.

He **only** tapes the car. He tapes the car.

He lent the car to me **only**. He lent the car to me only.

Now let's take a look at the sentences in which "just" is used as a particle. For example,

Cf. Wasn't that **just** beautiful? Wasn't that beautiful?

The man lives **just** around the corner. The man lives round the corner.

She said **just** what she thought. She said what she thought.

In V.L. Kaushanskaya's classification of parts of speech, "The Particle" is given as a structural part of speech. [V.L. Kaushanskaya, p.13] It is interesting, based on what criteria these linguists assign "The Particle" as a structural part of speech. In the definition of structural parts of speech, V.L. Kaushanskaya emphasizes that structural parts of speech create a connection between words and sentences or emphasize the meaning of words or sentences. [V.L. Kaushanskaya, 1973, p.13] From the definition, it can be understood that "The Particle" emphasizes the meaning of words or sentences and conveys the idea expressed by the speaker to the listener in a more emotional way. [V.L. Kaushanskaya, 1973, p.219]

You can do **exactly** the same.

On Wikipedia, mutiny is described as a conspiracy among a group of people to openly oppose, change, or overthrow an authority to which they are subject, which is exactly what we are looking for, [V.L. Kaushanskaya, 1973, p.81]

The particle comes next to the word it belongs to, so it doesn't have a fixed place. For example, in the examples the particle "only" is used to emphasize the word it belongs to more prominently.

We **only** wish there was a real horse here for me to race with.

We can **only** do so much.

Only I noticed her standing in the door.

She is only thirteen years old.

We ate only the plainest food.

The particle "only" can be removed from each of these sentences, and the grammatical and lexical meaning of the sentences will not be violated. It indicates that "The particle" is a free part of speech.

Another disputable question about 'The Particle' is the different definitions given to it by various linguists. One of those definitions states: "A particle is a word that has a grammatical function but does not fit into the main parts of speech (i.e. noun, verb, adverb). Particles don't change." We also fully agree with the fact that "The Particle" is not the main part of speech and do not undergo any morphological changes. But what does the author mean by the grammatical function of "The Particle"? The researcher left this question unanswered. It is difficult to fully agree with this idea. [14]

E.I. Musayev in his monograph "Functional-semantic characteristics of structural parts of speech in modern English and Azerbaijani languages" gives the following definition of the particle: "particles don't have the function of naming, but they are used by the speaker to highlight any member of the sentence, to highlight that member, to give it additional emotional meaning." [Hacıyev E.İ. 2006, p. 82, 83] We also agree with this idea and come to the conclusion that the function of "The Particle" is to give different shades of meaning to a word or a sentence, to strengthen it.

In B.S. Khaimovich and Rogovskaya's book "A Course in English Grammar", "The Particle" is given as a part of speech expressing emphatic, one-way connection with various words, not having any grammatical category, not belonging to typical morphological features. [B.S. Khaimovich, 1967, p. 217]

It is known that since the English language has an analytical structure, the word order is the main factor in the formation of the meaning of the sentence. Changing the place of words can cause a change or distortion of the meaning. But does changing the place of particles in a sentence change the meaning of the sentence? The Particle, considered by most linguists as a "structural part of speech", is used to emotionally express the member of the sentence to which it belongs, and expresses modality to one degree or another, almost no different than exclamatory and modal words.

The speaker uses particles when he wants to express any word in a different way, in an emotional or emphatic form. For this reason, changing the place of particles does not cause a violation of the meaning in the sentence, but simply serves to increase the effectiveness of the word used next to the adverb, that is, to express it in a more emphatic way.

As a result, we can say that the place of free parts speech in the sentence is free. They have no syntactic

function in the sentence. It doesn't answer any questions. It does not have a grammatical category. Particle has all these features, emphasizes the word it belongs to, attracts the listener's attention to it, and restores modality. Particles can be removed from a sentence without affecting its meaning. All these characteristic features show that "The particle" can be included in the list of free parts of speech.

Thus, if we compare the free parts of speech- the interjection and modal words with the Particle, it turns out that all three of them have the same characteristics. Thus, "The Particle" is a free part of speech. For having the meaning of modality, we think "The Particle" should be added to the list of means of expression of the category of modality. In that case the list of ways of expressing modality will cover the followings: the category of mood of the verb, modal verbs, modal words, interjection, intonation and particle.

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PHILOSOPHICAL SCIENCES

M. HEIDEGGER VS J.-P. SARTRE: ABSURD AND MEDITATION

Marynychuk Y.

post-graduate student

Faculty of Social Sciences and International Relations

Department of Philosophy

Oles Gonchar Dnipro National University

Dnipro, Ukraine

М. ГАЙДЕГГЕР VS Ж.-П. САРТР: АБСУРД І МЕДИТАЦІЯ

Маринчук Ю.А.

аспірант 2 року навчання

факультету суспільних наук та міжнародних відносин

кафедри філософії

Дніпровський національний університет ім. Олеса Гончара

Дніпро, Україна

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Abstract

Martin Heidegger and Jean-Paul Sartre approach the question of being differently. Sartre employs the logic of traditional metaphysics and defines existentialism in key traits: existence precedes essence; human being does not have a predetermined purpose; a person defines themselves through the freedom of choice; the negative freedom of subjective will of being is not negated by any projects of self-definition; human life is absurd in its principle-less determinism, and the being of the world does not encompass the meaning of all that is. Heidegger considers it possible to bring a person closer to their essence. He views the person as a being among beings, that is, one who questions their being and believes in their being through forms of meaning. Humanism is regarded by Heidegger as part of metaphysics and the doctrine of the animalistic nature of humans, shaped by education through a certain idea of good, by which a social being of the required kind is formed. The discussion between the works "Existentialism is a Humanism" and "Letter on Humanism" is a discussion between metaphysical and ontological approaches to the question of human being.

The study focuses on an attempt to explain Martin Heidegger's criticism of existential humanism as a subjective project of social existence, in which the ego-consciousness of the human social unit does not need to engage in careful and unhurried contemplation of the nature of things, its essence, and the meaning of being. Instead, the author of the article proposes an analysis of remarks from "Letter on Humanism" developed in the context of Martin Heidegger's later reflections, related to the philosophical term *Gelassenheit*. This analysis aims to explain what is lacking in the calculative thinking of existential humanists and why the framing of things, carried out from the freedom of choice to determine a principled world in an unprincipled life, threatens human self-understanding.

Анотація

Мартін Гайдеггер та Жан-Поль Сартр по-різному ставлять питання про буття. Сартр користується логікою традиційної метафізики і визначає екзистенціалізм в ключових рисах: існування передують сутності; людське буття не має наперед визначеної мети; людина сама визначає себе завдяки свободі вибору; негативна свобода суб'єктивного воління буття не знімається жодним з проєктів визначення людиною себе; життя людини абсурдне своєю безпринциповою детермінованістю, а буття світу не включає в себе сенс всього сущого. Гайдеггер вважає можливим наблизити людину до її сутності. Він розглядає людину сущим серед сущого, тобто таким, яке задається питанням про своє буття і вірить у своє буття формами смислу. Гуманізм розглядається Гайдеггером як частина метафізики і вчення про тваринний початок людини, освоєний вихованням певною ідеєю блага, за якою отримується потрібного гатунку соціальна істота людини. Дискусія між роботами «Екзистенціалізм – це гуманізм» та «Лист про гуманізм» – є дискусією метафізичного та онтологічного підходів до питання буття людини.

Дослідження зосереджено у спробі дати пояснення критиці Мартіном Гайдеггером екзистенціального гуманізму, як суб'єктивного проєкту соціального буття, у якому его-свідомість людської соціальної одиниці не матиме потреби до уважного і неквапливого обдумування природи речей, своєї сутності і смислу буття. Натомість, зауваження з «Листа про гуманізму» автор статті пропонує розвинути у руслі більш пізніх роздумів Мартіна Гайдеггера, пов'язаних з філософським словом *Gelassenheit*, аналіз якого має пояснити, чого ж не вистачає калькулятивному мисленню екзистенціальних гуманістів і чому обрамлення речей, здійснене від свободи вибору детермінувати у безпринциповому житті безпринциповий світ, загрожує саморозумінню людини.

Keywords: humanism, existentialism, Martin Heidegger, Jean-Paul Sartre, Gelassenheit, Meister Eckhart, meditation.

Ключові слова: гуманізм, екзистенціалізм, Мартін Гайдеггер, Жан-Поль Сартр, Gelassenheit, Мейстер Екхарт, медитація.

Основний текст. Екзистенціалізм – це гуманізм?

В аналізі Мартіна Гайдеггера, який викладено у «Листі про гуманізм» (1947), екзистенціальний гуманізм запитує про буття не через метафізичне мислення (якому належить постановка основних питань, за якими криється багатство буття), а через природу людини, разом з тим поставивши питання про людське буття в освіті – як стати людиною, а не варваром? Гуманістичне виховання поставлене на те, щоб людське буття було здійснене соціальною моделлю, комуністичним соціалістичним реалізмом. Це посиляє, на думку Гайдеггера, ні до чого іншого як до калькулятивного способу мислення-інструменту для досягнення наперед визначених цілей [6]. Тобто, це мислення, яке «*characterized by human methods of approaching things*» [5]. Мається на увазі нав'язування того, чим речі є за своєю суттю так, щоб вона підходила під ціль; і зрештою виходить, що природою речей маніпулюють заради більш поверхневих бажань до яких зводиться свобода як свобода вибору. Бажанням, до яких воліє людина вона не є відкритою до усвідомлення сутності речі і смислу буття; людина очікує, відповідає за свої очікування і приймає думку, що потрібно очікувати ще чого, ще почекати, помислити вимушені думки.

Уявлення Жана-Поля Сартра про страждання, страх, недобросовісність, мазохізм, ненависть і садизм у його "Бутті та ніщо" є екзистенціальними умовами щодо того, що Бога не існує, людство покинуте у абсурдному світі (у світі, у якому буття не має сенсу всього суцього), не існує наперед встановленого принципу (сутності) існування – і саме тому людське буття можливе (ось за такою свободою від; від будь-якої детермінації; тобто, за свободою, від якої неможливо позбутися; це свобода, знаття якої немає; це приреченість на свободу і на буття винним, відповідальним за будь-які детермінації над собою). При цьому, Сартр заперечує самоцінність людини для екзистенціального дослідження: «*An Existentialist will never take man as the end, since man is still to be determined. And we have no right to believe that humanity is something to which we could set up a cult, after the manner of Auguste Comte*» [7]. Відтак, людина розглядається у своїй природі поза своєю сутністю; людина розглядається такою, що свій час життя витрачає на проектування себе і на втрату себе, коли проект змінюється; людина завжди перебуває у відношенні до себе через самоперевищення, і тому трансцендентний аспект є конститутивним суб'єктності; людина під знаком свого теперішнього Я повинна продовжувати шукати те, що їй потрібно, виходячи за межі Я, щось додаючи до Я-творчої суміші.

Натомість, Мартін Гайдеггер ще екзистенціалом Турбота у трактаті «Буття і час» показав, що

має намір наблизити людину до її сутності. А в «Листі про гуманізм» пише так: «*For this is humanism: meditating and caring, that human beings be human and not inhumane, "inhuman", that is, outside their essence*» [7]. Тож, проблема гуманізму полягає в тому, що він представляє лише шлях історичних суспільних формацій до кращого співвіднесення основного погляду (скажімо, християнського або марксистського, які розглядає Гайдеггер) з ідеєю блага, яке б виховувало чесноти душі і тіла, які потрібні для виведення тієї чи іншої людської істоти, не враховуючи її дійсні екзистенціальні потреби (від залишаються сильно чуттєві і перевищено емоційовані почуття – такі як абсурд). Тобто, питання про те, чим має бути наділена людина в своєму існуванні, щоб реалізувати свою сутність – це питання про людську природу і негативну свободу від (від певного, в цілому вільнодозволеного розуміння людської природи рухається пояснення підходу до її сутності).

Звертаючись до розвинених ідей зі складного «Листа про гуманізм», можна у більш пізніх роботах Мартіна Гайдеггера вийти на те, що він намагається сказати.

Медитація та абсурд – як можливості перетину свободи та буття.

В книзі 1959-го р., «Gelassenheit», текстуальне підґрунтя якої було закладено однойменною бесідою 1955-го р., Мартін Гайдеггер використовує філософське слово Gelassenheit, яке Брет Девіс в книзі «Martin Heidegger. Country Path Conversations» (2010) переклав як *releasement*, вивільнення, визволення; і зробив посилання на трактат Мейстера Екгарта «On Detachment», «Відстороненість» [1].

В цьому трактаті (2009) написано: «*What, then, is the essential prerequisite for the birth of Christ in my soul? It is detachment, self-abandonment*» [4]. За збіркою 1981-го року: «*...Here you should know that true detachment is nothing else than for the spirit to stand as immovable against whatever may chance to it of joy and sorrow, honour, shame and disgrace, as a mountain of lead stands before a little breath of wind. This immovable detachment brings a person into the greatest equality with God, because God has it from immovable detachment that he is God and it is from his detachment that he has his purity and his simplicity and unchangeability. You must know that to be empty of all created things is to be full of God, and to be full of created things is to be empty of God*» [3]. Тут сказано про дещо, яке є саме собою щоразу звертання до себе; звертання, яке відсторонює від усіх зайвих сутностей, окрім власної; залишає собі, віддає собі з перспективою завжди бути собою, контактувати саме з собою. Усе це в оригінальному тексті Мейстера Екгарта стосується християнського Бога: відсторонення від свавільної суб'єктивності (орієнтації на самоцінність створених, суцільних речей), дозволяє

суб'єкту відповідати буттю і бути відкритим до таємниці самоприховування буття, що дозволяє повернутися до взаємодії з ним як зі своїм буттям для того, щоб дозволити речам бути у відношенні з єдиним буттям.

Можна припустити, що Мартін Гайдеггер, якщо він звертався до цього джерела, розуміє описане Екгартом, як конституцію буття взагалі і зокрема як Dasein, коли суще відсторонюється з-посеред сущого запитанням про себе, яким викупляється у своє буття (суще завжди уже Dasein, належить собі). Заклопотавшись сутностями речей, людина може повернутись до незабутнього в своїй пам'яті.

Дослідник Скотт Нейтан в книзі «Negative Capability. Studies in the New Literature and the Religious Situation» (1969) відносить Gelassenheit до релігійної думки і пояснює як «дух доступності» і «перед що-є»: *«the spirit of disponibilité [availability] before What-Is which permits us simply to let things be in whatever may be their uncertainty and their mystery»* [11]. Від дієприкметника доконаного виду lassen – *дозволяти чомусь відбуватися*; в сенсі – *залишити щось у тому, як воно здійснює себе*; в сенсі – *непорушність, відстороненість*; або – Willenslosigkeit, *безвольність*; або emptying, *супустошення*. Одно що маєтись на увазі *дати дозвіл речам проявлятися самим по собі* (бути даними), шляхом позбавлення себе усього, що унеможлиблює чудесне втручання і відтак – шляхом перетворення суб'єкта в двох позиціях: конституція releasement from willfulness, *звільнення від свавілля*; і достатнє суб'єктивне відношення через Ruhe, *спокій, бути тихим*.

Поворот від індивідуальної і колективної волі у Гайдеггера, як уявлення місця перетину між свободою мислення та ідеями буття, засвідчує Мирослав Попович у книзі «Філософія свободи» (2018): *«В персоналістському «екзистенціальному аналізі» [тобто, в суб'єктивному проєкті буття, Dasein] Гайдеггера було слабке місце: він допускав трактування волі і вибору як колективної волі і колективного вибору і це стало також його особистим вразливим пунктом: Гайдеггер послизнувся на неконтрольованому індивідуалізмі в 1933 році, непомітно перейшовши межу між особистим і колективним Я, що виявилось в його підтримці нацистів. Через колективне Я проникає «загальний рух світу», тоталітаризм і ідейна капітуляція перед нацизмом»* [10]. І тоді *«перед людиною відкривається прірва того, що не має назви і не має смислу, — і ця таїна може бути поіменована як трансцендентність. Шлях до трансцендентності через міфологічний екстаз або через релігійно-спіритуалістичну співпричетність закритий — без участі розуму ніяке єднання людей неможливе. Тільки через розум, «філософську віру» — осмислену констатацію трансцендентного [конотації з трансцендентним відбуваються через філософські слова, екзистенціали] — можливе поєднання людей. І саме на цьому шляху можна знайти смисл історії — поєднання духовного життя народів перед лицем абсурдних ситуа-*

цій створює спільне духовне життя людства і надає історії смисл» [10]. Виходить, що Gelassenheit 1955-1959-их років – це сумарне філософське слово про non-willing, Nicht-Wollen, *не-воління, не-хотіння*. Мартін Гайдеггер вважає за потрібне, щоб дещо залишалось суворо поза волею; краще відмовитись від бажання дечого.

Тож, те, що у «Листі про гуманізм» Мартін Гайдеггер уже постає, як відсторонений від духу часу, від усього, створеного екзистенціальним гуманізмом, – у більш пізніх роботах, 1950-их рр., проявляється критикою у відношенні до осмислення сутності буття через активний інтелект. Суб'єкт мислителя є тривожним, він розділяє з собою прекрасні миттєвості неможливості досягнення безкінечної цілі розуму, яка полягає злитті пізнавальних здібностей людини та речей навколишнього світу до ідентичності, яка розкриється у подальшому прозорістю завдяки відстороненню від окремих сутностей речей і уваги до смислу буття. Зміна перспективи, як і її зміст, – це питання філософської віри [6]. У що вірить Мартін Гайдеггер?

В роботі 1966-го року «Discourse on Thinking (A translation of Gelassenheit)» Мартін Гайдеггер у розділі «Conversation On A Country Path About Thinking» пояснює, що Gelassenheit у значенні *відсторонення* здійснене сучасним мислителем – тим, що мислитель може бути одночасно дослідником, мудрецем і вченим (a Researcher, a Sage, and a Scholar) [5]. Усі вони не відмовляють собі у тому, щоб використовувати такі способи вираження філософських ідей, як діалог, поезія, оксюморон, метафори, дивний або автентичний авторський перелад. Усе це покладено на те, щоб порушити залежність від традиції філософської думки з традиції метафізики [5]. Дослідник Ієн Мур в книзі «Eckhart, Heidegger, and the Imperative of Releasement» (2019) пише, що таким чином Мартін Гайдеггер стоїть на позиції культурного екзистенціалізму (супроти гуманістичному екзистенціалізму Жана-Поля Сартра) у тому сенсі, що Гайдеггер заохочує розуміти філософські поняття (істину, буття, суще і так далі) у концепті «події», «спів-буття», тобто у здійсненні; розуміти як те, що відбувається у суперечностях спроб зіставлення свободи і смислу філософськими словами у форми смислу, якими б існувала свідомість [9]. Ієн Мур вважає, що сутність людської істоти за Гайдеггером найкраще розуміти як Gelassenheit-форму буття (відкриту форму), а це поняття – як *дозвіл бути*, в сенсі *переживати своє буття і переживати себе, врученого своєму дозволу бути собою* [9]. Відкрита істота людина – це та, яка турбується про цілісність себе від негативного (від збереження філософськими словами таємниці відношення існування і сутності), а не залишає в абсурді відсутнього принципу наперед визначеності сутності.

Можна зауважити, що під критикою Гайдеггера стосовно калькулятивного мислення гуманістичних екзистенціалістів – є уявлення про медитативне мислення, яке не є активним інтелектуальним або пасивним споглядальним. Інакше кажучи,

1947-ому р. Мартін Гайдеггер повчає тому, що таке філософське мислення.

Алейн де Бенуа в статті «Jünger, Heidegger, and Nihilism» (2010) приводить визначення Гайдеггера з його аналізу «За межею лінії» (1950) есе Ернста Юнгера «Через лінію» (1950), де Гайдеггер ідентифікує себе не як "Denker" – *мислитель, справа якого досягнення нових істин*, - а як "Erkenner" – *спостерігач, справа якого відкриття нових бачень або точок огляду* [2]. Erkenner – можна припустити сутністю суб'єкта медитативного мислення, яке, можна припустити, полягає в наступному, це «*thinking which contemplates the meaning which reigns in everything that is*» [5]. Існування суб'єкта медитативного мислення представлено в особі пастора, пастуха, який завідомо нездатний до метафізичного мислення.

До прикладу мислення, яке споглядає смисл, який панує в усьому, що є (медитативне мислення) – Гайдеггер відносить «*letting self-will go in favour of divine will*» [5]. І якщо тут сказано про відмову від власної волі у покладанні на божественну волю, то мова про деяку тілесно відчутну чуйність рефлексивної свідомості стосовно відмерлих у ній форм смислу, его-логічна ідея яких не встановлює валідні налаштування (Stimmung), наказу (Fuge, Fügung) і відстороненню-диспенсації (Gelassenheit, Geschick) екзистенційні координати людського онтологічного положення, яке б ставилось під питання своєї неприхованості, під сумнів у все ще таємниці своєї природи, сутності. Мислення, яке все ще б перевіряло чуття дистанції між існуванням та сутністю, між сущим та буттям, між смислом та свободою. Мислення, яке все ще б відбувалось у концепті події, спів-буття.

Висновки.

На що Мартін Гайдеггер у «Листі про гуманізм» вважає нездатним гуманістичний екзистенціалізм? Цей філософський напрям не пропонує поведінки мислення, який був би відмінний від напруги в опозиції між активністю і пасивністю; в опозиції, яка виражена переживанням існування в абсурді. Цей філософський напрям не пропонує усвідомленого горизонту подій іншого за доонтологічне розуміння соціального простору у концепті абсурду, у якому неможливо опанувати сенс усього сущого і на цьому досягненні заспокоїти дух.

Мартін Гайдеггер пише, що відкритим простором є той, який долучає «*each to each and each to all into an abiding, while resting in itself*» [5]. Простір, який є точним *перед тим-що-є* кожної смислової форми так, що свідомість існує ними, а не сумнівається у них; так, що дух дозволяє собі злитися з ними, бо налаштований на них, як на власний спокій. Відкритий простір свідомості означає, що суб'єкт перебуває в базовому стані очікування, відпочинку, уважного споглядання речей (має час на неквапливе осмислення головного) і дозволяє собі бути таким (філософським, дистанційованим). У проєкті Жана-Поля Сартра навпаки, більша частина залежить від обставин світу. Структура суб'єкту віри в розум за Мартіном Гайдеггером тримається на свободі від речей (дозвіл виникнути чуттю буття,

тільки про яке й варто мислити) і на відкритості до таємниці (миттєвий і постійний зв'язок з буттям), які зумовлюють такий аспект людської природи як звільнення від усього, що унеможливило рішучість щодо буття [5].

За уявленням Гайдеггера про медитативне мислення виходить непохитна відкритість до таємниці буття через звільнення завдяки свободі від речей, яка береться від уявлення про більш глибоку природу, а це уявлення – властиве природі людині і здійснюється на практиці медитативним мисленням, яке складається з актів очікування (у відмові від зайвих сутностей) і відпочинку (у негативній свободі від, у якій людина займається повторним представленням, пояснює собі актуальну форму смислу, якою існує і залишає відкритим для себе те, на що очікує) [5]. Цей роздум дозволяє припустити, що медитативне мислення – це мислення відстані; мислення, яке поступово позбавляє себе суб'єкта і об'єкта аж до набуття медитативного стану відкритості, у якому відточується зв'язок зі своєю духовною (буттєвою) присутністю у світі.

Пізній Мартін Гайдеггер представляє суб'єктом такої присутності – пастора, пастуха в провінційній місцевості. Пастор не є звичним суб'єктом філософського мислителя або смисловою формою існування свідомості у голос мовлення пастора; а провінція – не є звичною територією для артикуляції філософських ідей. Пастор навмисно є мислителем, оскільки це той мислитель, який не стверджує буття суб'єктивною проєкцією або его-свідомістю, оскільки пастор не панує на мовою або домом мови. Натомість, він випасає словесний наліт невимуснено і асоціативно модерновим чином, як-то за асоціацією мали б відношення одне до одного «поле» і «польові квіти» у «полі, засіяному польовими квітами». Хоча, для провінційного жителя польові квіти на полі є бур'яном, небажаною рослинністю. Тобто, Гайдеггер оминає мову метафізики картезіанського суб'єкта та гегелівське буття – і стверджує, що буття є саме по собі. А коли Мартін Гайдеггер посилається на історію про Геракліта з його висловом «Бо й тут присутні боги», нам ясно, що про буття потурбувалися: воно захищене негативною свободою у таємницю своєї присутності за допомогою вислову, який не виглядає ретельно обдуманим. Замість того, щоб приймати дух часу мислення (як це робить Жан-Поль Сартр стосовно комуністичного дискурсу і традиційної метафізики), Мартін Гайдеггер, який до 1947-го року уже має досвід нацистського духу часу, розкриває «Листом про гуманізм» проблему: європейське мислення має початись заново, оскільки наразі воно втрачається у викликах світу.

Певним ідеалістичним індивідуалізмом Гайдеггер пояснює сутність філософського мислення, як подяку, яка чує, прислухається (Hoeren). Само-вдячність мислення підходить до розуміння фактичності тут-буття через поняття екзистенціальної відкритості (Erschlossenheit). Природою відкритості, яку в себе занурює само-вдячний природі дух є: мовлення (Rede), розуміння (Verstehen) та розташован-

ність (Befindlichkeit) [5]. А це структура розташованої зрозумілості буття-у-світі, яка вимовляє себе, здійснюється як мовлення, це існування свідомості у голос. Умовою мовлення є не знання меж мови та її логіка (бо й дитина, яка чує мовлення дорослих, – має інтуїцію до вільного складання граматики), а змога слухати спершу думки, неначе без наперед принципової вимоги їм бути. А це методика інцептуального мислення пастора (не виражається похвально, навіть якщо виражається не метафізично обдуманно), введене у «Листі про гуманізм» висловом *es hat keine Wirkung, це не має жодного ефекту* і словом *überliefern, передавати*. Передавати філософію без цілі, почати з артикуляції живою думкою, з діалогу. Мислителі не зливаються зі світом у його обставинах, а медитують дистанції для ясного вираження по суті.

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SOCIAL SCIENCES

THE RELATIONSHIP BETWEEN EMPLOYEES AND COMPENSATION IN ENTERPRISES FROM THE PERSPECTIVE OF LABOUR INCENTIVE POLICIES

Tianlun Li,
Kudriavtseva O.

Kharkiv national automobile and highway university, Kharkiv, 61002, st. Yaroslava Mudrogo, 25
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Abstract

As a labour-intensive organisation, employee motivation and teamwork are directly related to productivity and quality, and employee incentive policy has a profound impact on their work attitude. Based on Maslow's hierarchy of needs theory, this paper analyses the impact of this policy on employee compensation using the multiplier method based on the data of A-share listed companies from 2018 to 2023. The results show that this policy significantly promotes the growth of employees' remuneration, and increases the demand for high-skilled employees by improving corporate efficiency and increasing investment in fixed assets, which in turn leads to a rise in remuneration. This study not only helps to understand the logic of the relationship between tax policy and employee compensation, provides reference for China's tax incentives to promote the transformation and upgrading of economic structure, but also provides empirical support for the application of Maslow's theory in the management of enterprises and the impact of policy from the perspective of labour incentive policy.

Keywords: labour incentive policies; employee compensation; firm performance; labour-intensive firms

INTRODUCTION

The report of the Twentieth Party Congress lists raising people's income levels as a key element in gradually achieving the goal of common prosperity for all people. In this regard, as the core component of the middle-income group, the salary increase of enterprise employees has become the key focus point for realising the goal of common prosperity. As a result of the distribution and redistribution of the total wealth of the society, the increase of the salary of the enterprise employees can not only improve the quality of life of the people and enhance the happiness of the people, but also has an unnoticeable role in promoting the cycle of

social reproduction, so the construction of the enterprise salary decision and growth mechanism in line with the stage of economic development is of great importance. However, the mechanism for determining the income of workers in China is not yet perfect, and the current salary level of workers is still relatively low, resulting in a long-term imbalance between the accumulation of capital and the consumption of the population. As a crucial micro-unit in the process of China's economic development, enterprises have created the necessary conditions for the growth of employees' remuneration while providing returns to their funders by improving their profitability and optimising their development structure.

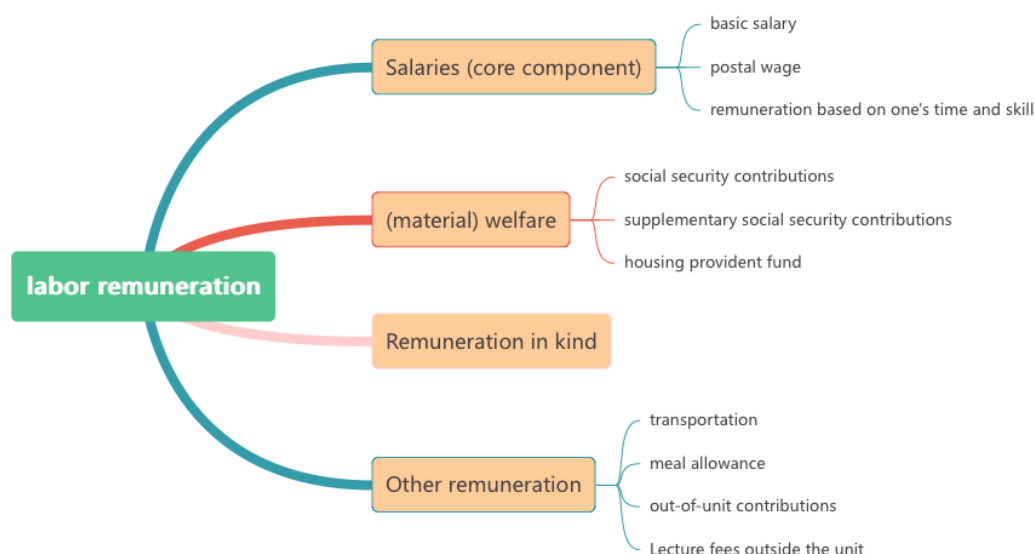


Figure 1: Labour incentive remuneration of employees in enterprises

Against the backdrop of slowing economic growth and increasing pressure for restructuring and upgrading, China's government is actively exploring labour incentives to activate enterprises and contribute to sound economic development. Employee motivation and teamwork are of great significance to the productivity and quality of enterprises, and effective labour incentive policies can fully stimulate the enthusiasm and creativity of employees.

Under the environment of slowing economic growth and rising pressure of transformation and upgrading, China's government has been actively exploring labour incentive policies to activate the vitality of enterprises and promote the stable and healthy development of the economy. Enterprise staff's enthusiasm and teamwork degree of productivity and product quality of the enterprise plays an extremely critical role, effective labour incentive policy can maximize the enthusiasm of employees and creative potential. Its role in the enterprise is mainly reflected in two dimensions: First, with the scientific and reasonable construction of incentive mechanisms, in-depth stimulation of the internal driving force of employees, prompting employees to take the initiative to commit to skills enhancement, which effectively lead to the improvement of the overall production efficiency of the enterprise; Second, is conducive to the creation of a good corporate atmosphere, and further strengthen the effect of teamwork for the sustained development of the enterprise to continue to inject a new source of vitality. After the implementation of the relevant labour incentive policy, the implementation of its effectiveness is certainly highly regarded by all walks of life, but unfortunately, most of the current research focuses only on the impact of the policy on the production efficiency of the enterprise and teamwork, but very few studies have explored in-depth the effect of its role in the promotion of the role of enterprise staff remuneration hidden effect.

As a key strategy to stimulate the potential of employees and promote the development of enterprises, labour incentive policy has a significant impact on the level of employee compensation. On the one hand, it improves the performance of employees by virtue of reasonable reward and recognition mechanism, promotes the growth of enterprise performance, increases the distributable profit, and directly contributes to the increase of employee remuneration; on the other hand, it reshapes the work and management structure of enterprises, optimises the human resource structure, and encourages enterprises to pay attention to and introduce highly skilled employees, which leads to the increase of remuneration. In this competitive world, optimising human resource structure is the key to enhance the competitiveness and operational efficiency of enterprises. Therefore, compared with other management strategies, the scientific labour incentive policy is more targeted and effective in promoting the upgrading of human resources and improving the operational efficiency of enterprises in order to achieve the improvement of employees' remuneration.

The study found that the policy effectively improves the level of employee compensation. The mechanism

lies in the following: on the one hand, the enterprise guides employees to improve their skills through the incentive policy, the skill upgrading effect increases the demand for high-skilled employees, and the skill difference effect reduces the demand for low-skilled labour, thus upgrading human resources through optimizing the employee structure and thus improving the remuneration; on the other hand, the incentive policy stimulates employees' motivation and creativity, improves the operating efficiency of the enterprise, and pushes forward the growth of the remuneration. Further heterogeneity analysis shows that the policy has a more prominent role in promoting employee compensation in non-state-owned enterprises, labour-intensive enterprises and enterprises with tight financing constraints. Relative to the existing literature, the marginal contributions of this paper are reflected in the following: first, this paper extends the impact of labour incentive policy to the field of corporate compensation. In the existing literature, the impact of labour incentive policies is mostly focused on productivity improvement and teamwork promotion, but less on the impact on corporate compensation. Secondly, from the perspective of human resource structure optimization, this paper analyzes the internal mechanism of labour incentive policies affecting enterprise employee compensation, which has important theoretical value for a more thorough understanding of the micro-logic of the economic impact of the relevant policies, and can provide useful reference for the more accurate formulation of enterprise management and economic policies.

The remainder of the paper is organised as follows: the second section is the literature review and research hypotheses, the third section partially covers the empirical research design, the fourth section analyses the empirical results, the fifth section is the robustness test, the sixth section is the mechanism test, and the last section concludes with the conclusions and insights.

1. Literature Review

1.1 Content-based and process-based motivation theories

Maslow's hierarchy of needs theory suggests that human needs range from low to high, including physiological needs, safety needs, social needs, respect needs and self-actualisation needs [1]. Accordingly, the enterprise labour incentive policy should be based on the different levels of employee needs to implement the corresponding incentive initiatives. For example, compensation and benefits can effectively meet the physiological and safety needs of employees, team building activities can help meet the social needs, and promotion and honour recognition can help meet the respect and self-actualisation needs (Maslow, 1943). Herzberg's two-factor theory suggests that health factors such as work environment and pay can only eliminate employee dissatisfaction, but only motivational factors such as achievement, recognition, and the challenge of the work itself can actually stimulate employees' motivation [2]. This undoubtedly points out the direction for enterprises to focus on the exploitation and application of motivational factors when formulating motivational policies (Herzberg, 1959). Expectancy theory emphasises that employees' motivation or effort at work (i.e.

motivational power) is the product of potency and expectation [3]. In other words, employees determine their level of effort based on their own judgement of the value of the outcome of their work and the likelihood of achieving that outcome. Therefore, corporate incentives must ensure that employees have a clear insight into the relationship between effort and reward in order to enhance the effectiveness of incentives (Vroom, 1964). Equity theory suggests that employees are not only concerned with their absolute rewards, but also with their relative rewards compared to others [4]. When employees feel fairness and reasonableness, they will maintain a high level of motivation; on the contrary, it is very likely to breed dissatisfaction and negative behaviours. Therefore, when designing incentive policies such as compensation and benefits, enterprises must fully consider the principle of fairness (Adams, 1963).

1.2 The impact of contemporary corporate employee characteristics on incentive policies

In the field of contemporary enterprise management and economic research, there are many important features and trends. On the one hand, there are profound changes in the structure and needs of the corporate workforce. New generations of employees (e.g., Millennials and Generation Z) are gradually emerging, and compared with the older generation, they attach significantly higher importance to work-life balance, personal development opportunities, corporate culture fit, and immediate feedback, so that traditional material incentives (such as high wages) are no longer effective in stimulating their motivation, and they are more inclined to a flexible work system, opportunities for training and promotion, and incentives with strong participation (Twenge et al., 2011). policies (Twenge et al., 2010; Lyons & Kuron, 2014)[5][6]. At the same time, the proportion of knowledge-based employees in the enterprise continues to rise, this type of employees rely on their own professional knowledge and skills to create value for the enterprise, they particularly value the autonomy of the work, the challenge and the continuous improvement of knowledge and skills, which requires the enterprise to build a relaxed working environment for them to provide a wealth of learning resources, to create a project-oriented incentive mechanism, and the establishment of a knowledge-based contribution to the compensation system (Drucker, 1959; Davenport, 2015)[7][8]. In addition, employees in modern enterprises are increasingly diversified in terms of gender, cultural background, education level, etc., and this diversification directly leads to the distinctive personalised characteristics of their incentive needs. For example, highly educated employees tend to be more in pursuit of academic research support or networking opportunities in their professional fields, and female employees may be more concerned about family-friendly welfare policies (e.g., parental leave, telecommuting, etc.), and firms must adopt individualised incentive schemes to meet the needs of different employee groups [9][10] (Kossek & Lobel, 1996; Eagly & Carli, 2007).

On the other hand, in the study of the relationship between industrial policy and corporate compensation, the previous relevant literature is less to combine the

two in-depth discussion, and there are different perspectives and conclusions on how industrial policy actually affects corporate compensation. Lin Yifu and Chen Binkai (2013) study the role of industrial policy on income gap from the dimension of comparative advantage [11], and the research results show that industrial policy as a national economic development strategy will have an impact on the labour market, and the industrial policy that follows the comparative advantage will help to reduce the income gap, and if the industrial policy that gives priority to the development of heavy industry is adopted, the curve of the income gap will show the inverted U-shape change trend. Li Lixing and Shen Guangjun (2015) studied the driving efficacy of industrial policy on industry performance based on the data of development zones established in 2004 - 2006 [12], and the empirical results showed that industrial policy can significantly increase sales revenue and increase employment. Wang Kemin et al. (2017) argued that the information asymmetry between the government and firms will lead to a reduction in resource allocation efficiency and over-investment in firms benefiting from industrial policy, which will not only affect the implementation of industrial policy, but will also further widen the wage gap between firms [13]. Bai Jixing and Zhou Jingkui (2018), among others, suggest that the effect of tax incentives on the wage level of state-owned enterprises and non-state-owned enterprises is not synchronised, and that state-owned enterprises, as the main beneficiaries of the policy, enjoy higher policy tilting benefits, which can increase the monopoly rents that are more considerable, and thus their employees' salary level will be higher [14].

2. Research Design

2.1 Econometric model construction

This study focuses on dissecting the effect of labour incentive policies on employee compensation in contemporary enterprises. To achieve this purpose, the following empirical model is set up:

$$\ln wage_{i,t} = \beta_0 + \beta_1 treat_i * post_t + \gamma X_{i,t} + \mu_i + \omega_t + \delta_{pt} + \varepsilon_{i,t} \quad (1)$$

In this model, i denotes a particular firm, t denotes a particular fiscal year, and p denotes the firm's region. The regression model fixes the sample firms and years, where it captures the unobserved nature of firm i that does not change over time, represents year fixed effects, and represents the interaction term between region and year. The residual term in the model is denoted by $\varepsilon_{i,t}$. If the residuals in the model are significantly positive, it means that labour incentives significantly increase the compensation of employees in the firm. Meanwhile, this study clusters the standard errors to the firm level to ensure the robustness and reliability of the estimation results.

2.2 Data sources and processing

This study selects the relevant financial data, human resource data, and enterprise management data of enterprises above scale in China for the period of 2018 - 2023 to construct panel data. In the process of data processing, the following screening steps are executed:

(1) The samples of enterprises with abnormal operating conditions (e.g., on the verge of bankruptcy or with long-term losses and no hope of reversing them)

and special industries (e.g., industries with extremely strong monopoly and subject to strict policy control) are removed;

(2) Removing data from enterprises with serious missing key data to safeguard the integrity and validity of the data;

(3) Excluding samples with large-scale organisational changes (e.g. large-scale layoffs or drastic expansions) between 2018 - 2023, so as to avoid such special events from interfering with the research results;

(4) Excluding the data of enterprises that have received large-scale government subsidies or tax breaks (which are not part of the labour incentive policy) in a specific period of time, in order to focus on the impact of labour incentive policy precisely. The data are mainly obtained from multiple sources, such as the enterprise database of the National Bureau of Statistics, statistics of industry associations, and annual reports of enterprises, etc., and are cross-checked and integrated to ensure the accuracy and authority of the data.

2.3 Explanation of Variables and Descriptive Statistics

The explanatory variable is determined as the logarithm of the total annual salary expenditure of the

enterprise divided by the total number of employees. The explanatory variable indicates that after the implementation of labour incentive policy in the enterprise, its value is 1 during the implementation of the policy, otherwise it is 0. In addition, a series of time-varying control variables are also included in this study. Enterprise operational efficiency, measured by the ratio of the enterprise's annual output to its input resources, where input resources cover fixed assets (such as plant, equipment, etc.), current assets (such as raw materials, inventory goods, etc.), labour costs (including employee wages, benefits and training costs, etc.), and R&D inputs used in the production process of the enterprise. To reflect the efficiency and effectiveness of the enterprise's resources in the production and operation process. Competition is defined by the market concentration index of the industry in which the enterprise is located; Innovation is measured by the number of annual patent applications and the proportion of R&D investment; HRQuality is weighted by the average education level of the enterprise's employees and the proportion of professional skills certificates held by the enterprise.

Table 1.

Descriptive statistics of the main variables					
variant	sample size	average value	standard deviation	minimum value	maximum values
Lnwage	20235	11.4085	0.5676	4.3473	13.1077
TreatPost	20235	0.1236	0.3292	0	1
Size	20235	22.1446	13439	15.5773	28.5199
ROA	20235	6.0427	6.0715	-15.2242	25.9974
Leverage	20235	43.6817	21.2214	4.6227	89.2738
Inincome	20235	21.4550	1.5459	11.8613	28.6927
ROE	20235	6.4701	11.9057	-55.126.5	40.6477
Topl0	20235	57.5979	15.4975	22.33	90.88

3. Benchmark regression results

Table 2 presents the results of the regression analysis for model (1). In column (1), no control variables are included and only firm fixed effects, year fixed effects, and region * year interaction terms are covered. The regression results show that the coefficient of IncentivePost is 0.0856 and is significant at 1% level of significance. This result indicates that labour incentives policies lead to a significant increase in firms' employee compensation by 8.56%.

In column (2), control variables, firm fixed effects, year fixed effects, and region * year interaction terms

are added. The regression results show that the coefficient of IncentivePost is 0.0725, which is also significant at the 1% level, implying that labour incentives significantly increase firms' employee compensation by 7.25%. At the same time, the control variables of enterprise operational efficiency (Efficiency), the degree of market competition (Competition), enterprise innovation (Innovation), human resource quality (HRQuality) all show significant correlation with the remuneration of employees in enterprises.

Table 2 .

Accelerated Fixed Assets Policy and Firm Employee Compensation: Base Regression		
	Inwage	
	(1)	(2)
	0.0783***	0.0682***
TreatPost	(0.0178)	(0.0177)
control variable		yes
μ_i	yes	yes
ω_t	yes	yes
δ_{pt}	yes	yes
observed value	20235	20235
R ²	0.7408	0.7443

In summary, the results of the double-difference (DID) model are consistent with the expectation that labour incentive policies can drive enterprises to enhance employee compensation. Therefore, the empirical results strongly support the research hypothesis H1, which fully confirms that labour incentive policy has a positive and significant role in contemporary enterprise employee compensation improvement, and provides a solid empirical basis for a deeper understanding of the relationship between enterprise employees and labour incentive policy.

4. Conclusions and Implications

Through rigorous econometric model analysis and data processing, this study has explored in depth the impact of labour incentive policies on the remuneration of employees in contemporary enterprises and reached the following conclusions:

Labour incentive policy has a significant positive contribution to corporate employee compensation. From the results of the benchmark regression, labour incentive policies significantly increase the remuneration of corporate employees by 8.56% when the control variables are not included; after the inclusion of the control variables, they still significantly increase the remuneration by 7.25%. This fully demonstrates the effectiveness of the labour incentive policy in enhancing employees' remuneration, which provides strong support for the increase in the level of employees' remuneration in enterprises, and also creates the conditions for achieving a positive interaction between the improvement of employees' personal economic situation and the development of enterprises.

The control variables included in this study, such as the operational efficiency of the enterprise, the degree of competition in the market, the innovative capacity of the enterprise and the quality of human resources, are all significantly related to employee compensation. This suggests that when enterprises formulate labour incentive policies, they need to take into account factors such as their own operation and management conditions, the competitive market environment and the characteristics of their internal human resources, so as to make them compatible with the overall strategy and operation mode of the enterprise, in order to achieve better incentive effects and promote the sustainable development of the enterprise.

From the perspective of deeper economic logic, the labour incentive policy stimulates the internal motivation of employees, encourages them to improve their skills and motivation to work, which in turn leads to the enhancement of corporate productivity, increases corporate revenue, and creates an economic basis for the growth of employees' remuneration. At the social level, this helps to improve the overall quality of life of employees, promote social consumption upgrading and stable reproduction cycle, and has a positive significance in gradually realising the common prosperity of all people.

For different types of enterprises, such as non-state-owned enterprises, which are more flexible in terms of mechanism, the labour incentive policy can focus more on incentives for innovative achievements

and expansion of the space for independent development of employees, and make use of the competitive advantages of the market to respond quickly to the changes brought by the incentive policy, so as to achieve simultaneous enhancement of employees' remuneration and corporate benefits. Labour-intensive enterprises can optimize their staffing structure, strengthen incentives for high-skilled employees, and increase their remuneration levels by improving the overall staff quality, while focusing on the balance between cost control and efficiency improvement. Enterprises with tight financing constraints, on the other hand, can design precise incentive programmes with limited resources, such as performance-oriented immediate reward mechanisms, to stimulate employee potential, improve the efficiency of capital use, and achieve the dual goals of employee compensation growth and corporate financial soundness.

The results of this study help to enrich the research field of the relationship between employees and labour incentive policies in contemporary enterprises, provide a theoretical basis and decision-making reference based on empirical data for enterprise managers to formulate scientific and reasonable labour incentive policies, and lay a foundation for further in-depth research on related issues in this field, such as how to optimize the design and implementation of labour incentive policies according to different enterprise characteristics and industry environments, to Achieve more accurate and efficient employee incentives and corporate development goals, and so on.

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TECHNICAL SCIENCES

OPTIMIZATION OF BACKUP POWER SUPPLY SYSTEMS WITH AN EMPHASIS ON THE INTEGRATION OF INTELLIGENT CONTROL SYSTEMS AND ENERGY STORAGE SYSTEMS

Kazanina I.,

*PhD, Associate Professor, Department of Electricity Supply and Renewable Energy Sources
Almaty University of Power Engineering and Communications (Almaty, Kazakhstan)*

Iman A.

*Master's student of the Department of "Electricity Supply and Renewable Energy Sources"
Almaty University of Power Engineering and Communications (Almaty, Kazakhstan)*

ОПТИМИЗАЦИЯ СИСТЕМ РЕЗЕРВНОГО ЭЛЕКТРОСНАБЖЕНИЯ С АКЦЕНТОМ НА ИНТЕГРАЦИЮ ИНТЕЛЛЕКТУАЛЬНЫХ СИСТЕМ УПРАВЛЕНИЯ И СИСТЕМ НАКОПЛЕНИЯ ЭНЕРГИИ

Казанина И.В.

*к.т.н., доцент кафедры «Электроснабжение и возобновляемые источники энергии»
Алматинский университет энергетики и связи (г.Алматы, Казахстан)*

Иман А.А.

*магистрант кафедры «Электроснабжение и возобновляемые источники энергии»
Алматинский университет энергетики и связи (г.Алматы, Казахстан)*

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Abstract

The article explores modern approaches to upgrading backup power supply systems through the integration of intelligent control systems (ICS) and energy storage systems (ESS). Analysis of traditional systems reveals their limited reliability, high operating costs, and environmental challenges. The proposed technologies, including the use of APC Smart-UPS 1500VA and ESS, significantly enhance energy efficiency, reduce maintenance expenses, minimize emissions, and extend system autonomy. Economic analysis demonstrates a payback period of 1.5 years, making this modernization strategy viable for critical infrastructure facilities.

Аннотация

В статье рассматриваются современные подходы к модернизации систем резервного электроснабжения, основанные на интеграции интеллектуальных систем управления (ИСУ) и систем накопления энергии (СНЭ). Анализ традиционных систем показывает их ограниченную надежность, высокие эксплуатационные затраты и экологические проблемы. Предложенные технологии, включая использование новых ИБП APC Smart-UPS 1500VA и СНЭ, обеспечивают значительное повышение энергоэффективности, снижение затрат на обслуживание, сокращение выбросов и увеличение времени автономной работы системы. Экономический анализ подтверждает окупаемость инвестиций в течение 1,5 лет, что делает модернизацию целесообразной для объектов критической инфраструктуры.

Введение

В современных условиях устойчивость и надежность электроснабжения становятся важнейшими требованиями для объектов критической инфраструктуры: медицинских учреждений, дата-центров, промышленных предприятий и других. Резервные системы электроснабжения (СРЭ) играют ключевую роль в предотвращении перебоев в работе таких объектов. Однако традиционные системы на базе дизель-генераторов демонстрируют ряд ограничений: высокий уровень эксплуатационных затрат, низкий КПД при частичной нагрузке и ограниченная экологическая устойчивость.

Современные технологии, включая интеллектуальные системы управления (ИСУ) и системы накопления энергии (СНЭ), предлагают перспективные решения для модернизации резервных систем. Интеграция ИСУ и СНЭ позволяет существенно повысить эффективность, адаптивность и

экологичность энергоснабжения, обеспечивая при этом значительную экономию.

Сперва рассмотрим традиционные системы резервного электроснабжения, которые базируются на проверенных временем технологиях, которые обеспечивают надежность, но требуют постоянного обслуживания и модернизации.

Основные компоненты традиционных систем

1. Трансформаторы

Трансформаторы являются основными элементами систем распределения электроэнергии, преобразуя высоковольтное напряжение в уровень, подходящий для конечных потребителей. В резервных системах используются силовые трансформаторы, которые обеспечивают подключение к основной сети или резервным источникам.

2. Дизельные генераторы (ДГУ)

ДГУ используются для обеспечения питания при

сбоях в основной сети. Они активируются автоматически в случае отключения, обеспечивая электроэнергию через определённое время, необходимое для запуска двигателя. Основные характеристики:

- Мощность генератора обычно варьируется от нескольких сотен до тысяч киловольт-ампер.
- ДГУ часто используется с автоматическими вводами резерва (АВР), что минимизирует время восстановления питания.

3. Системы управления (АВР)

Системы автоматического ввода резерва играют ключевую роль в переключении между основным и резервными источниками питания. Они обеспечивают автоматизацию процесса, что снижает риск человеческих ошибок.

4. Аккумуляторные батареи

В традиционных системах применяются аккумуляторы, обеспечивающие кратковременное питание на время запуска ДГУ. Они поддерживают критическую нагрузку до восстановления основного электроснабжения.

5. Секционирование нагрузки

В системах резервного электроснабжения важным является разделение нагрузки на критическую и некритическую. Это позволяет использовать ограниченные ресурсы резерва наиболее эффективно.

Актуальность модернизации

Современные требования к надёжности и эффективности резервных систем делают традиционные подходы менее конкурентоспособными. Добавление источников бесперебойного питания (ИБП) и интеллектуальных систем управления позволяет значительно повысить производительность и устойчивость систем. Модернизация традиционных резервных систем становится приоритетным направлением для энергоснабжения критически важных объектов.

Анализ проблем традиционных систем резервного электроснабжения

Традиционные системы резервного электроснабжения обеспечивают базовую надёжность в критически важных объектах. Однако в современных условиях эксплуатации выявляются существенные недостатки, которые требуют анализа и поиска решений для повышения эффективности, гибкости и устойчивости.

1. Провалы напряжения при переключении

При переходе с основного источника питания на резервный возникают временные провалы напряжения, которые могут повлиять на работу чувствительного оборудования:

- **Причины:** длительное время переключения автоматического ввода резерва (АВР), недостаточная мощность аккумуляторов для поддержания нагрузки.

- **Последствия:** сбои в работе серверов, медицинского оборудования, систем безопасности.

2. Длительное время запуска дизельного генератора (ДГУ)

ДГУ, как правило, активируется с задержкой в несколько секунд до минуты, что является недостатком для объектов, требующих мгновенного переключения.

- **Причины:** необходимость запуска двигателя внутреннего сгорания и выхода генератора на рабочие параметры.

- **Последствия:** временное отключение оборудования, риски потери данных и выхода техники из строя.

3. Ограниченная надёжность трансформаторов

Старение оборудования, перегрузки и несогласованность работы трансформаторов с резервными источниками приводят к снижению надёжности всей системы.

- **Причины:** эксплуатация морально устаревших трансформаторов без мониторинга их состояния.

- **Последствия:** риск аварийных отключений из-за выхода трансформаторов из строя.

4. Высокие эксплуатационные затраты

Системы резервного питания требуют значительных расходов на обслуживание:

- **Топливо для ДГУ.** Постоянная готовность генераторов к работе увеличивает затраты на закупку топлива и его хранение.

- **Обслуживание оборудования.** Регулярные проверки трансформаторов, аккумуляторов и систем управления увеличивают стоимость эксплуатации.

- **Ремонт.** Износ компонентов ведёт к дополнительным финансовым вложениям в ремонт или замену.

5. Ограниченные возможности управления нагрузкой

Отсутствие современных интеллектуальных систем управления приводит к:

- Неравномерному распределению нагрузки между источниками питания.
- Отсутствию приоритетов для критической нагрузки.
- Увеличению времени восстановления после аварий.

6. Экологические проблемы

Использование дизельных генераторов сопряжено с выделением вредных выбросов:

- Углекислый газ (CO_2).
- Оксиды азота (NO_x).
- Твёрдые частицы.

Эти выбросы ухудшают экологическую обстановку, особенно в городских районах, где расположены критически важные объекты.

7. Низкая гибкость в условиях роста нагрузки

Современные энергосистемы сталкиваются с увеличением потребляемой мощности, что не всегда учтено в традиционных схемах резервного электроснабжения:

- **Причины:** неподготовленность к интеграции новых мощностей или возобновляемых источников энергии.

• **Последствия:** снижение общей эффективности системы, необходимость срочной модернизации.

Сравнение традиционных и современных систем

Характеристика	Традиционные системы	Современные системы с ИСУ и СНЭ
Реакция на перебои	Задержка до 10 секунд	Мгновенная
Эксплуатационные расходы	Высокие (топливо, обслуживание)	Низкие (минимальное обслуживание)
Интеграция с ВИЭ	Ограничена	Полная
Экологическая устойчивость	Высокие выбросы CO ₂	Минимальные выбросы
Гибкость управления	Ограниченная	Высокая (адаптация в реальном времени)
Срок службы	Зависит от регулярного обслуживания	Более длительный при минимальных затратах

Проблемы традиционных систем резервного электроснабжения становятся серьёзным ограничением для современных объектов с высокой критичностью нагрузки. Для их устранения необходима интеграция новых технологий, таких как источники бесперебойного питания (ИБП), интеллектуальные системы управления и гибридные резервные схемы с использованием накопителей энергии. Модернизация таких систем позволит минимизировать риски, сократить эксплуатационные затраты и улучшить экологические показатели.

Интеллектуальные системы управления (ИСУ) и системы накопления энергии (СНЭ) играют важную роль в модернизации систем резервного электроснабжения. Рассмотрим их основные характеристики, функции и влияние на такие системы.

Интеллектуальные системы управления (ИСУ)

ИСУ — это программно-аппаратные комплексы, предназначенные для автоматизации и оптимизации процессов управления электроэнергией. Основные задачи ИСУ:

1. **Мониторинг:** постоянный контроль параметров энергосистемы (напряжение, ток, мощность, температура оборудования).
2. **Анализ данных:** использование алгоритмов анализа больших данных для выявления аномалий или неэффективных режимов работы.
3. **Автоматическое управление:** обеспечение быстрого реагирования на изменения в энергосистеме, таких как сбой или увеличение нагрузки.
4. **Прогнозирование:** применение методов машинного обучения и искусственного интеллекта для прогнозирования нагрузки и сбоев.
5. **Интеграция с другими системами:** взаимодействие с генерирующими установками, СНЭ и внешними энергосистемами.

Системы накопления энергии (СНЭ)

СНЭ — это устройства или комплексы, предназначенные для хранения электрической энергии с целью ее последующего использования. Основные типы СНЭ включают:

1. **Литий-ионные батареи:** компактные, с высоким КПД и длительным сроком службы.
2. **Суперконденсаторы:** используются для кратковременного хранения энергии и обеспечения высоких пусковых токов.

3. **Системы на основе водорода:** перспективное решение для длительного хранения энергии.

4. **Механические системы** (маховики, гидроаккумулирующие электростанции).

СНЭ позволяют:

- Сглаживать пиковые нагрузки.
- Обеспечивать бесперебойное питание в случае отключения основной сети.
- Хранить избыточную энергию от ВИЭ (например, солнечных или ветряных станций).

Влияние на системы резервного электроснабжения

Интеграция ИСУ и СНЭ значительно улучшает надежность, эффективность и устойчивость резервных систем:

1. Повышение надежности:

- ИСУ могут предсказывать возможные неисправности в системе, позволяя проводить профилактические работы.
- СНЭ обеспечивают мгновенное включение при отключении основной сети, минимизируя перебои.

2. Снижение эксплуатационных затрат:

- Оптимизация использования резервных генераторов, что сокращает расход топлива.
- Использование накопителей для поддержки нагрузки во время кратковременных перебоев вместо запуска ДГУ.

3. Устойчивость к нестандартным ситуациям:

- ИСУ обеспечивают гибкость управления, автоматически перенаправляя потоки энергии в случае перегрузок или отказов оборудования.

4. Интеграция ВИЭ:

- СНЭ позволяют эффективно использовать переменную генерацию от возобновляемых источников, обеспечивая их синхронизацию с резервной системой.

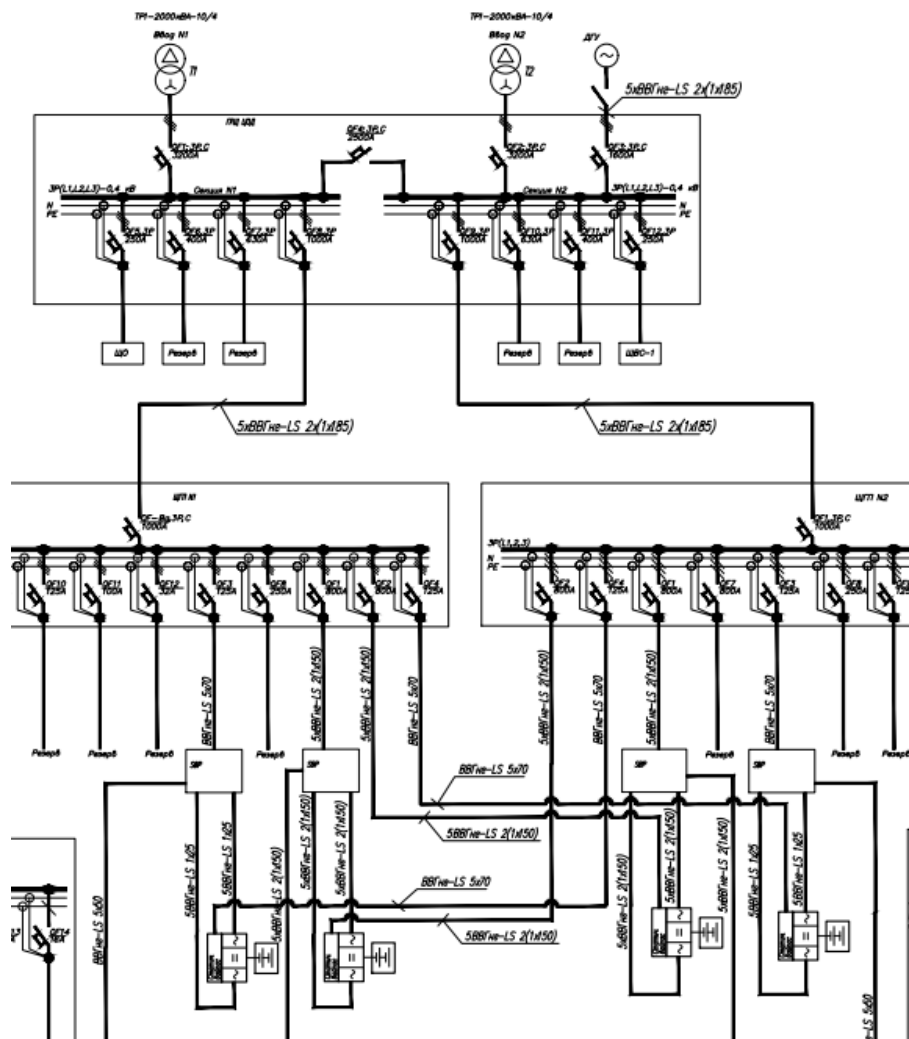
5. Экологичность:

- Снижение выбросов CO₂ благодаря более рациональному использованию энергии и снижению времени работы дизельных генераторов.

Интеграция ИСУ и СНЭ в системы резервного электроснабжения позволяет создать более умные, эффективные и экологичные решения. Эти технологии делают энергоснабжение более предсказуемым, надежным и адаптивным к новым

вызовам, таким как рост нагрузки или внедрение ВИЭ.

Практическая реализация на основе чертежа



На чертеже представлена структура системы, включающая:

- Два трансформатора, которые обеспечивают основной источник питания.
- ДГУ, используемые для резервного питания.
- СНЭ (ИБП повышенной мощности), которые стабилизируют систему и обеспечивают переходное питание до запуска ДГУ.

Описание схемы:

- Система ИСУ объединяет трансформаторы, ИБП и ДГУ в единую структуру.
- В случае отключения основного источника система автоматически активирует ДГУ через ИСУ, а мощные ИБП обеспечивают питание в переходный период.

Экономическая эффективность при модернизации с заменой ИБП и интеграцией интеллектуальных систем управления и систем накопления энергии (СНЭ)

1. Ситуация до модернизации

В исходной системе:

- **ИБП 850 ВА** — неэффективный, ограничивает нагрузку, часто выходит из строя.

- **Отсутствие интеллектуальных систем управления и СНЭ**, что приводит к нерациональному использованию энергии и недостаточной надежности системы.

- Низкая резервная емкость энергии — система не может обеспечить длительную автономную работу.

Основные проблемы:

- Высокие эксплуатационные расходы из-за неэффективности старого ИБП.
- Недостаточная надежность резервного электроснабжения.
- Потери из-за нерационального распределения энергии.

Общие затраты: около 4 500 000 ₮ в год.

2. Модернизация системы

Замена оборудования

1. Новый ИБП: APC Smart-UPS 1500VA SMT1500I

- Мощность: **1500 ВА** (повышенная поддержка нагрузки).
- Надежность и защита от скачков напряжения.

- Функция "холодного старта" и интеллектуальное управление батареями.

Стоимость: 375 758 тг до 660 203 тг.

2. Интеграция интеллектуальных систем управления

- Оптимизация распределения энергии между сетью и резервными источниками.
- Снижение времени простоя за счет автоматического управления резервной системой.

3. Внедрение систем накопления энергии (СНЭ)

- Повышение автономной работы резервной системы на **30–40%**.
- Снижение нагрузки на ИБП и основную сеть за счет накопления избыточной энергии в периоды минимального потребления.

3. Экономические преимущества после модернизации

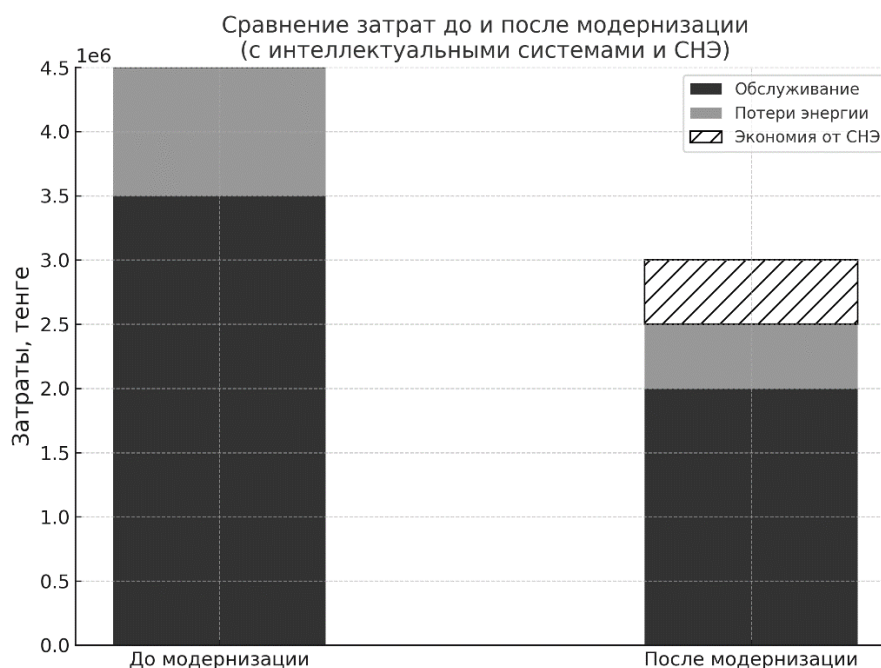
4. Расчет экономий и окупаемости

Показатель	До модернизации	После модернизации
Годовые затраты, тг	4 500 000	3 500 000
Экономия, тг в год	—	1 000 000
Инвестиции (ИБП + системы), тг	—	~1 500 000
Срок окупаемости, лет	—	1,5

Таким образом, внедрение нового ИБП и интеллектуальных систем с СНЭ позволит достичь годовой экономии **1 000 000 тг**, а срок окупаемости составит **1,5 года**.

5. График экономической эффективности

График, отражающий сравнение затрат до и после модернизации.



6. Вывод

Модернизация с заменой старого ИБП на APC Smart-UPS 1500VA и внедрением интеллектуальных систем управления с СНЭ приводит к:

- Годовой экономии **1 000 000 тг** за счет снижения затрат на обслуживание и потерь энергии.
- Сроку окупаемости **1,5 года**.
- Повышению надежности системы и автономного времени работы.

Заключение

1. Снижение эксплуатационных затрат

- Повышенная эффективность ИБП сокращает затраты на простои и замену батарей на **200 000 тг в год**.

- Интеллектуальные системы управления уменьшают нерациональное потребление энергии, экономя еще **150 000–200 000 тг ежегодно**.

- СНЭ увеличивает срок автономной работы, снижая затраты на аварийные подключения к сети.

2. Повышение надежности и резервного времени

- Автоматическое управление снижает вероятность сбоев и позволяет поддерживать стабильное электроснабжение.

- Системы накопления позволяют снизить нагрузку на оборудование и продлить срок его службы.

Модернизация систем резервного электроснабжения с внедрением интеллектуальных систем управления (ИСУ) и систем накопления энергии (СНЭ) позволяет существенно улучшить ключевые показатели надежности, экономичности и экологичности энергосистем. Анализ традиционных систем показал их значительные недостатки, включая высокие эксплуатационные затраты, задержки при переключении на резервные источники и низкую гибкость при увеличении нагрузки.

Проведённые улучшения с заменой старого источника бесперебойного питания (ИБП) на APC Smart-UPS 1500VA и интеграцией ИСУ и СНЭ показали следующие преимущества:

1. **Снижение эксплуатационных затрат** — экономия до 1 000 000 тг ежегодно.
2. **Повышение надёжности системы** — сокращение времени простоя и устранение провалов напряжения.
3. **Увеличение времени автономной работы** — благодаря накопителям энергии система эффективно поддерживает критическую нагрузку до запуска резервного генератора.
4. **Экологическая устойчивость** — минимизация выбросов за счёт оптимизации работы оборудования.

Экономическая оценка показала, что вложения в модернизацию (около 1 500 000 тг) окупаются в течение 1,5 лет, делая этот проект финансово обоснованным и перспективным для внедрения в критически важные объекты.

Таким образом, переход на интеллектуальные и энергоэффективные технологии обеспечивает вы-

сокую стабильность электроснабжения и значительное улучшение эксплуатационных характеристик современных резервных систем.

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SITUATIONAL CRISIS COMMUNICATION THEORY (SCCT) IN MARITIME CONTEXTS: CHALLENGES, STRATEGIES AND FUTURE DIRECTIONS**Koritarov T.,***Assistant Professor, PhD, Nikola Vaptsarov Naval Academy, Varna, Bulgaria*ORCID: <https://orcid.org/0000-0002-7712-8235>**Dimitrakieva S.***Professor, PhD, Technical University of Varna, Bulgaria*ORCID: <https://orcid.org/0000-0001-9639-9957><https://doi.org/10.5281/zenodo.14577680>**Abstract**

Situational Crisis Communication Theory (SCCT) is a well-established framework for strategic reputation management during crises. This paper explores the application of SCCT in the maritime sector, focusing on crisis types, response strategies, audience perception, and the role of communication technologies. The study's findings indicate that maritime organizations encounter distinctive challenges due to the wide range of potential crises, encompassing environmental disasters and operational failures. The application of SCCT principles, such as the alignment of response strategies with crisis types and the perception of organizational responsibility, is foundational to the effective management of these situations. Key insights include the importance of understanding audience perceptions and cultural contexts in shaping crisis communication strategies, as well as the integration of modern communication technologies to enhance crisis response capabilities. The research also emphasizes the need for comprehensive training programs, simulation exercises, and ethical considerations in crisis communication. Future directions for the application of SCCT in the maritime sector include integration with other theoretical frameworks, exploration of emerging technologies, and preparation for complex global challenges. The findings demonstrate that when adapted to the specific needs of the maritime industry, SCCT provides a robust framework for managing crises and maintaining stakeholder trust. This underscores the importance of continuous evaluation and improvement of crisis communication strategies to enhance organizational resilience in the face of evolving challenges.

Keywords: Situational Crisis Communication Theory (SCCT), maritime sector, stakeholder trust, reputation management, crisis response strategies, audience perception, communication technologies

1. Introduction

Situational Crisis Communication Theory (SCCT) is a well-established framework that guides strategic reputation management during crises. The maritime sector is particularly vulnerable to crises, making effective communication strategies essential for maintaining stakeholder trust and operational stability.

Previous studies have extensively explored SCCT across various industries, highlighting its effectiveness in managing public perception and mitigating reputational damage. However, there is limited research on the specific application of SCCT within the maritime industry, particularly concerning the unique challenges in this sector.

Understanding the nuances of SCCT in maritime contexts can provide valuable insights for enhancing crisis communication practices and better preparing maritime organizations for future crises. Paper's research Question: How can SCCT be effectively applied in the maritime sector to manage different types of crises and stakeholder perceptions?

This paper aims to explore the application of SCCT in the maritime industry, focusing on crisis types, response strategies, audience perception, and the role of communication technologies. The hypothesis is that tailored SCCT strategies, when effectively implemented, can significantly improve crisis response and stakeholder trust in the maritime sector.

2. Situational Crisis Communication Theory: A Framework for Strategic Reputation Management

Situational Crisis Communication Theory (SCCT) is a foundational framework within the domain of crisis management and communication, developed by W. Timothy Coombs[1]. The theory under consideration emphasizes the importance of aligning crisis response tactics with the perceived degree of accountability assigned to an organization during a crisis[1]. This coordination is imperative for the preservation of an organization's reputation and the mitigation of adverse impacts on stakeholder perceptions during times of crisis[2][3]. SCCT posits that effective crisis communication must be adapted to the distinct characteristics of each crisis. This adaptation involves the consideration of factors such as the organization's history with previous crises and the particularities of the current crisis[4][5].

One of the key features of SCCT is its emphasis on the situational context surrounding crises. The theory classifies crises into groups according to the degree of accountability assigned to the organization, which can vary from victim clusters (where the organization is viewed as a victim) to intentional clusters (where the organization is seen as responsible for the crisis)[6][7]. This classification is instrumental in assisting crisis managers in selecting appropriate response tactics, such as denial, diminishment, or rebuilding strategies, that are commensurate with the nature of the crisis and

the organization's perceived degree of responsibility[8][9]. For example, throughout the COVID-19 pandemic, organizations that successfully applied SCCT principles managed to reduce reputational harm by implementing effective communication strategies that aligned with public expectations and perceptions[10][11].

A salient attribute of SCCT is its foundation in empirical evidence, which is derived from meticulous research and case studies that demonstrate its efficacy across various contexts[2][12]. The theory offers a systematic method for crisis managers to evaluate the possible reputational risks associated with crises and to formulate strategic responses that can bolster stakeholder confidence and the organization's credibility[13][14]. A review of the extant literature suggests that organizations that proactively disclose information regarding their crisis management strategies and demonstrate a willingness to accept accountability for their actions may foster positive public perceptions and safeguard their reputation, even during periods of adversity[15][16].

Furthermore, SCCT underscores the importance of prompt and transparent communication during periods of crisis. Research has demonstrated that organizations that respond promptly and effectively to crises, while providing clear and precise information, are more likely to preserve their reputation and relationships with stakeholders[17][18]. The theory posits that social media and digital communication platforms exert a significant influence on public perceptions during times of crisis. It is therefore imperative for organizations to recalibrate their communication strategies to align with these evolving channels in order to engage with their audiences in an effective manner[19][20].

The Situational Crisis Communication Theory offers a comprehensive framework for the analysis and management of crises. Its emphasis on evaluating the situation, aligning strategic responses, substantiating findings through empirical evidence, and the significance of prompt communication underscores its relevance in contemporary crisis management methodologies. The implementation of SCCT by organizations enables them to more effectively navigate crises, safeguard their reputations, and uphold stakeholder trust.

Building upon the foundational principles of SCCT, it is essential to explore its specific applications and implications within the maritime sector. The next section will examine how SCCT principles are adapted and implemented in maritime operations. This analysis will provide valuable insights into the effectiveness of SCCT in addressing the specific needs and challenges of maritime crisis communication.

3. Crisis Communication in the Maritime Sector: An Analysis of SCCT Applications and Stakeholder Engagement

The implementation of SCCT in the context of maritime operations constitutes a multifaceted undertaking, encompassing intricacies inherent in crisis management, communication methodologies, and stakeholder engagement. This section will provide a synopsis of the fundamental components of SCCT relevant to maritime operations, including the categorization of

crises, response strategies, audience perceptions, and the significance of communication technologies.

Understanding Crisis Types in Maritime Operations

Maritime activities are susceptible to various forms of crises, encompassing environmental emergencies, such as oil spills, and operational issues, including vessel collisions and equipment failures[21][22][23]. Each crisis type imposes unique challenges and necessitates bespoke communication approaches. As stated by Coombs, crises can be classified according to the degree of responsibility assigned to the organization, which affects public perception and the strategies employed in response[24]. For instance, in circumstances where an organization is perceived as deficient in responsibility, such as during natural disasters, the recommended approach might entail accentuating the uncontrollable elements of the crisis[25]. Conversely, crises engendered by organizational negligence necessitate communication strategies that are more remorseful and oriented towards rectification[26].

The maritime industry has encountered major challenges, especially during the COVID-19 pandemic, which interrupted worldwide shipping and logistics[27][28][29]. The pandemic underscored the importance of robust crisis communication strategies that adhere to SCCT principles, as organizations managed public health challenges while ensuring operational continuity[28][30][29]. By gaining insight into the particular characteristics of the crisis, maritime organizations can more effectively customize their communication strategies to meet the concerns and expectations of stakeholders.

Crisis Response Strategies in Maritime Contexts

SCCT describes various response tactics that organizations may adopt in times of crisis, such as denial, diminishment, rebuilding, and bolstering[24]. In the context of maritime operations, the selection of a strategic approach is influenced by the nature of the crisis and the organization's perspective on its own accountability. For instance, in the event of an oil spill[21], an organization might implement a rebuilding approach by accepting responsibility, providing compensation, and pledging to restore the environment[26]. This strategy is designed to address current issues while also seeking to rebuild trust and credibility with stakeholders.

Research indicates that the efficacy of these approaches is contingent upon factors such as audience segmentation and the severity of the crisis[31]. Maritime organizations need to take into account the various stakeholders involved, such as regulatory agencies, local communities, and environmental organizations, all of whom may have unique expectations and viewpoints regarding the crisis response[32][33][34]. By utilizing a detailed strategy that takes these elements into account, maritime organizations can improve their crisis communication effectiveness and reduce possible reputational harm.

Audience Perception and Stakeholder Engagement

The manner in which the audience perceives a crisis, as well as the organization's subsequent reaction,

plays a pivotal role in shaping the overall impact of the crisis on its reputation and the trust of stakeholders[24]. SCCT underscores the pivotal role of communication that is tailored to the audience's needs, encompassing the comprehension of their emotional and cognitive responses to crises[24]. In the context of maritime operations, effective communication is paramount to ensure the consideration of diverse interests, including those of crew members, shipping companies, and the general public.

Research indicates that clear and prompt communication can greatly impact public trust and contentment during emergencies[35]. For example, throughout the COVID-19 pandemic, maritime companies that skillfully conveyed their safety protocols and operational changes were more likely to sustain the confidence of stakeholders[30]. This emphasizes the importance for maritime organizations to focus on engaging their audience and implementing feedback systems in their crisis communication plans.

The Role of Communication Technologies

In today's maritime environment, communication technologies are crucial for managing and responding to crises[36]. The incorporation of digital communication platforms enables maritime organizations to share information quickly and efficiently in times of crisis[36][37][38][39][40]. For instance, social media has evolved into a pivotal medium for instantaneous communication, enabling organizations to establish direct connections with a vast audience and expeditiously address the dissemination of false information[41].

Furthermore, the advent of enhanced maritime communication technologies, such as the VHF Data Exchange System (VDES), has been demonstrated to improve situational awareness and facilitate enhanced coordination during emergency situations[42]. The utilization of these technologies by maritime organizations has been demonstrated to enhance their ability to respond to crises and ensure the provision of accurate and timely information to stakeholders[36][38][39].

Training and Preparedness in Crisis Communication

The efficacy of crisis communication in maritime operations is contingent on the preparedness and training of personnel[43]. Organizations should allocate resources to training programs that prepare employees with the essential skills for effective communication in crisis situations[44][45][46]. This process entails a comprehensive understanding of the fundamental principles of SCCT, an acknowledgment of the significance of audience perception, and the implementation of appropriate response strategies.

Furthermore, simulation drills that emulate crisis situations can aid organizations in assessing their communication methods and identifying opportunities for enhancement[47][30][48]. By cultivating an environment that emphasizes preparedness and ongoing education, maritime institutions can enhance their capacity to rapidly recover and respond effectively during emergency situations[44][45][47].

Ethical Considerations in Crisis Communication

In the context of crisis communication, ethical considerations assume paramount importance, particularly within the maritime industry, where the consequences can be profound. Organizations must judiciously balance the need for transparency with the risk of compromising their reputation. The SCCT underscores the pivotal role of ethical communication standards, encompassing honesty, accountability, and respect for stakeholders[24]. During maritime emergencies, when the safety of the environment and human lives is threatened, the importance of ethical considerations becomes significantly heightened.

For example, in the event of an environmental catastrophe, it is crucial for organizations to focus on sharing precise information about the effects of the incident and the measures being implemented to manage it. Not doing so may result in public anger and long-term harm to the organization's reputation[26]. By following ethical communication standards, maritime organizations can cultivate trust and reliability among stakeholders, even in difficult situations.

The Impact of Cultural Context on Crisis Communication

The cultural context is essential in influencing how crisis communication strategies are developed and how audiences react. Various cultures might have distinct expectations concerning organizational responsibility and the manner of communication adopted during crises[49]. In the maritime industry, where activities frequently cross various nations and cultures, companies need to be sensitive to these differences in order to successfully connect with a wide range of stakeholders.

Research indicates that grasping cultural subtleties can improve the efficiency of crisis communication approaches[50]. For instance, certain cultures may favor straightforward communication, whereas others might require a subtler method. By tailoring their communication techniques to fit cultural norms, maritime organizations can enhance their crisis management capabilities and build positive connections with stakeholders.

Evaluating the Effectiveness of Crisis Communication Strategies

To promote ongoing enhancement of crisis communication methods, maritime organizations need to review how effective their strategies were after a crisis. This process includes gathering feedback from stakeholders, examining media reports, and assessing shifts in public perception[51]. Through comprehensive assessments, organizations can pinpoint their strengths and weaknesses in crisis communication and make educated modifications for upcoming crises.

Additionally, integrating insights gained from previous crises into training and preparedness initiatives can improve an organization's resilience and ability to adapt[30]. This ongoing cycle of assessment and enhancement is crucial for maritime organizations aiming to effectively manage the intricacies of crisis communication.

Future Directions for SCCT in Maritime Operations

As the maritime sector keeps changing, the use of SCCT must adjust to new challenges and possibilities. Upcoming studies ought to investigate the combination

of SCCT with other theoretical models, like the Crisis and Emergency Risk Communication (CERC) framework, to gain a deeper insight into crisis communication within maritime settings[52]. Furthermore, the effects of technological progress, including artificial intelligence and machine learning, on crisis communication strategies deserve additional exploration[53][54][55][47][56][57].

Moreover, as global issues such as climate change and geopolitical conflicts increasingly impact maritime activities, organizations must be prepared to address these complex crises with effective communication strategies[58][32][59]. By cultivating a keen awareness of emergent trends and challenges, maritime organizations can enhance their crisis communication methodologies and provide more effective support to their stakeholders.

A thorough examination of the theoretical foundations and practical applications of Situational Crisis Communication Theory (SCCT) in various contexts, with a particular focus on its relevance to the maritime sector, has been conducted. The paper will now synthesize these insights and draw overarching conclusions. The subsequent section will provide a synopsis of the primary findings of the analysis, evaluate the efficacy of SCCT in addressing maritime crisis communication challenges, and discuss the broader implications for crisis management strategies in this critical global industry.

4. Conclusion

This research has explored the application of Situational Crisis Communication Theory (SCCT) in the maritime sector, focusing on crisis types, response strategies, audience perception, and the role of communication technologies. The findings support the hypothesis that tailored SCCT strategies, when effectively implemented, can significantly improve crisis response and stakeholder trust in the maritime industry.

The study revealed that maritime organizations face unique challenges in crisis communication due to the diverse nature of potential crises, ranging from environmental disasters to operational failures. The application of SCCT principles, such as matching response strategies to crisis types and perceived organizational responsibility, proves crucial in managing these situations effectively.

Key insights include the importance of understanding audience perceptions and cultural contexts in shaping crisis communication strategies. The research highlighted that transparent, timely, and culturally sensitive communication can significantly influence public trust and satisfaction during crises. Moreover, the integration of modern communication technologies, particularly social media and advanced maritime communication systems, has emerged as a critical factor in enhancing crisis response capabilities.

The study also emphasized the need for comprehensive training programs and simulation exercises to prepare maritime personnel for effective crisis communication. Ethical considerations in crisis communication were identified as paramount, particularly in situations involving environmental and human safety risks.

Future directions for SCCT application in the maritime sector include the integration with other theoretical frameworks, exploration of emerging technologies like artificial intelligence, and preparation for complex global challenges such as climate change and geopolitical tensions.

In conclusion, this research demonstrates that SCCT, when adapted to the specific needs of the maritime industry, provides a robust framework for managing crises and maintaining stakeholder trust. The findings underscore the importance of continuous evaluation and improvement of crisis communication strategies to enhance organizational resilience in the face of evolving challenges in the maritime sector.

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POLYMER BASED COMPOSITE MATERIALS REINFORCED BY HIGH-STRENGTH CARBON FIBERS WEFT KNITTED FABRICS**Bezsmertna V.,***PhD, senior scientist,**Department of Hydrogen Materials Science and Carbon Nanostructures,
Frantsevich Institute for Problems of Materials Science
of National Academy of Sciences of Ukraine, Kyiv***Mazna O.***Candidate of Technical Sciences (Ph. D.) leading scientist,**Department of Hydrogen Materials Science and Carbon Nanostructures,
Frantsevich Institute for Problems of Materials Science
of National Academy of Sciences of Ukraine, Kyiv***Obodiev I.,***Chief technologist,**Department of Hydrogen Materials Science and Carbon Nanostructures,
Frantsevich Institute for Problems of Materials Science
of National Academy of Sciences of Ukraine, Kyiv***Khokhlova N.***Chief technologist,**Department of Hydrogen Materials Science and Carbon Nanostructures,
Frantsevich Institute for Problems of Materials Science
of National Academy of Sciences of Ukraine, Kyiv*<https://doi.org/10.5281/zenodo.14577684>**Abstract**

The new weft knitted fabrics containing high-strength carbon fibers from PAN precursors for the reinforcing of polymer based composite materials (PCM) are proposed. The higher level of mechanical properties of PCM reinforced by the proposed carbon fiber filler is achieved by increasing the relative content of high-strength and high-modulus carbon fibers in weft knitted fabrics by the using of warp threads with the lowest linear density. The tensile strength of PCM reinforced by the proposed weft knitted fabrics containing up to 95% of high-strength carbon fibers Toho Tenax HTA 40 E13 3K (800 tex) with a polyamide thread (5x2 tex) was 1.1 GPa at a composite density of 1,6 g/cm³.

Keywords: polymer composite materials, carbon fibers, knitted structures, combined weft knitted fabrics, strength.

Introduction

Construction and functional polymer composite materials (PCM) reinforced by the various types of textile materials (fabrics, tapes, weft fabrics) made from aramid, glass, and carbon fibers are widely used. Plain or twill weave fabrics and unidirectional tapes produced from high-strength and high-modulus carbon fibers traditionally used as reinforcing fillers for construction PCM. High-strength and high-modulus carbon fibers from PAN precursors are characterized by the high level of physical and mechanical properties, but their textile processing is very complicated, because such kind of thread consists of a large number of highly brittle elementary fibers, susceptible to damage during the processing. Furthermore, such high-strength and high modulus fibers and threads lose their primary properties during textile processing. Therefore, the development of new types of reinforcing fillers is promising for better implementation of the properties of carbon fibers in fillers and improving the properties of polymer composites reinforced by such fillers.

However, the problem of the use of reinforcing fibrous fillers for structural PCMs, in particular a knitted and weft knitted structures, taking into account changes in their properties during the production of composites

has not been sufficiently studied. New production technologies for reinforcing fillers based on various types of carbon fibers ensure the wide possibilities for creating of carbon and hybrid fibrous fillers for PCMs and developing the products based on them with specified characteristics. The specific properties of carbon fibers (CF) and fillers from these fibers for composite materials (CM) allow to solve a number of complex materials science problems such as the creation of structural CMs and multifunctional products with given service parameters. CMs reinforced by the complex weft knitted fillers can simultaneously be structural (high-modulus, high-strength), conductive, radio-absorbing, corrosion-resistant, etc. The potential of the carbon fibers in composite materials is far from exhausted. The development of polymer based composite materials reinforced by the high-strength and high-modulus carbon fibers for aircraft structures is an urgent scientific and practical problem. So, for the best implementation of the properties of both carbon fibers and the improvement of the properties of the plastics reinforced by carbon fibers, the development of new types of fibrous reinforcing filler from high-strength and high-modulus carbon fibers from PAN precursors is very promising.

The physical, mechanical, and fatigue characteristics of polymer-based composites reinforced by carbon fiber are higher than corresponding values for the polymer-based composites reinforced by the glass fibers, allowing their use in critical aircraft structures. Using carbon fibers for the reinforcement of plastics also significantly reduces weight of details in comparison with glass fibers and metal alloys, in particular aluminum spars in helicopter propeller blades. However, the use of carbon fibers is limited by the high cost of threads and the lack of their production in Ukraine. At the same time, the use of carbon fibers in industrial production is increasing and requires the study for the methods of manufacturing both carbon fibers and fibrous fillers for PCMs and the possibility of improving their characteristics. Due to the high brittleness of carbon fibers from PAN precursors and the ability to be damaged during textile processing, there is a need to develop new technologies for the production of fibrous fillers for various structures. The use of the knitted technology of weft knitting (rib with weft), developed in the IPMS NASU, allows the creation of a unidirectional structure from straight high-strength and high-modulus carbon threads and optimization of the structure of carbon fiber filler to improve the physical and mechanical properties under the mechanical loads. The surface specific gravity of the fibrous knitted filler in unidirectional PCM can be adjusted smoothly and in a wide range, using threads and bundles of different linear densities and changing the step of their distribution in the weft knitted fabric by using knitting equipment of different classes (gates).

To increase the strength of polymer composites reinforced by the complex carbon fiber filler, it is necessary to study ways for the increasing of the relative content of high-strength carbon fibers in the filler.

During structural PCMs production it is necessary to ensure not only a given orientation of the fibers and also their fixation in a corresponding position by manufacturing preforms (fixed packages of layers of carbon fabrics).

It is advisable to vacuum the filler blank before impregnation with a binder to create conditions for filling with a binder not only the space between individual threads but also the gaps between the elementary fibers of the carbon threads of the reinforcing filler with simultaneous removal of air located in the pores between the elementary fibers.

Hot pressing and vacuum molding can be used for the production of PCMs reinforced by the carbon fiber filler of weft knitted structure.

Thematic literature analysis

Unlike woven fabrics, the problem of using knitted structures as a reinforcing fibrous filler has not been sufficiently studied. Warp-knitted fabrics made of low-tex threads are more often used. In such knitwear, a separate thread is fed to each needle, so such process requires a significant amount of raw materials (thread spools).

The practice of manufacturing knitted fillers for PCM on flat knitting equipment is known and described [1–3]. In [4] the possibilities of manufacturing hybrid

fabrics from glass and polypropylene threads for producing a 2D polymer composite with a thermoplastic matrix is presented. The authors developed several different weaves that have weft threads in their structure. However, the processing of high-strength carbon fibers from PAN using the above-described weaves is not good since the roving structure is practically not subject to bending and does not allow the thread to take the shape of a loop. The method of weft knitwear production using a flat knitting machine of the Stoll CMS 400 class 5 [5] allows the processing of high-tex threads for warp threads and laying the weft thread. However, in such fabric production, each weft thread is laid independently along the loop columns, and the number of filling threads must correspond to the number of weft threads. The use of knitted fillers for composite materials containing carbon threads in their structure has recently become increasingly widespread [6–8]. Using various weaves and warp knitting equipment allows to process carbon threads by "braiding" the weft thread [9]. As a result, it was found that the type of weave has a significant effect on the elastic and tear properties of such knitted fabrics. The strength limit of tricot weave fabrics is higher than corresponding values for the chain weave fabrics, in particular, it is of 14% higher for glass roving and of 21% higher for carbon roving. A similar gradation was observed for the Young's modulus: the increasing of 11% and 25% were obtained for glass and carbon, respectively. The processing of carbon threads on a modernized circular knitting machine from Mayer and Cie (www.mayercie.com) for producing high-strength weft knitwear is proposed in [10]. During the loop formation process, a carbon thread is laid between two layers of Dyneema or polyester. The main advantage of this equipment is the high productivity. However, it should be noted that knitwear from circular knitting machines is characterized by the only specified width, in this case 26 inches (66 cm). If we need knitwear of a smaller or larger width, it is necessary to select a machine with a smaller or larger cylinder diameter, respectively. It requires the purchase of additional equipment and production space. Changing the knitting width is necessary during the processing of a thread with a smooth surface since the structure of the fabric is damaged during cutting, and the knitwear loses its strength properties. Changing the required specified width is easily adjusted on flat-knitting machines. In [11], the production of weft knitwear on flat-knitting machines is described. A single satin weave is used as the main weave. However, using these fabrics as a fibrous reinforcing filler for structural polymer composites does not provide the necessary strength characteristics since the weave is single, so the front and back sides can withstand different loads.

Materials and Methods

The "rib with weft" method of weft knitting enables the processing of fragile threads or large-diameter threads that cannot be formed into a loop in conventional knitwear. In this paper, we propose the production of a double-weft weave on flat knitting machines, allowing an equal load to be taken from both the front and back sides. Together with the possibility of textile

processing of high-strength carbon, glass, aramid, etc. threads, the developed technology for weft knitted fabrics production requires from 1 to 4 spools of thread regardless of the width of the fabric.

Such weft knitted fabrics can be used as unidirectional fillers where more than 85% of the fibers are located in one direction. PAN carbon fibers are used as a weft thread, and high-strength glass or chemical fibers are used as a base. Due to such distribution of the fibers, the composite polymer material is characterized by the anisotropy of physical and mechanical properties in the direction of preferred loads.

The main principle of rib with weft knitwear manufacturing is to lay the basis of straight weft threads in

each loop row (Figure 1). In such knitwear, one of the threads forms the basis of the main weave, and the other thread is laid between the needle beds in a straight loop, without knitting. Also, in knitwear, the weft thread is laid from one thread feed system, which allows the weft thread to be fixed clearly in the structure of the knitwear. Such fixation is more reliable and will enable the obtaining of fabric with high-performance indicators [12]. Unlike weaving, the production of weft knitted fabrics does not require complex equipment, such as looms, and in the case of carbon fabric production - precision machines with the mandatory use of multi-seat spoolers.

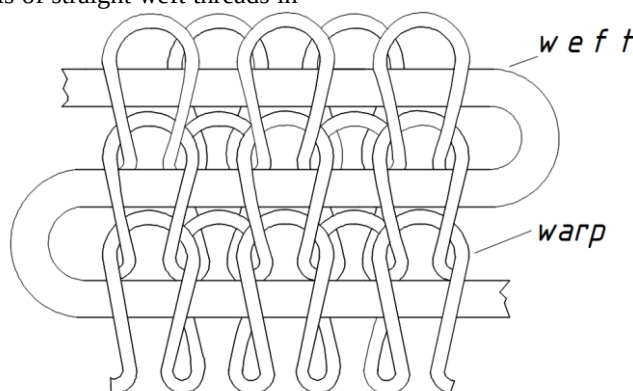


Figure 1 – The scheme of interweaving «rib with weft»

The weft knitting method, "rib with weft," allows produce carbon fabric using one bobbin of weft thread and one bobbin of warp thread. Thus, this method enables the production of carbon-knitted fabric by combining high-strength threads into unidirectional (by weft) loops of warp. For the production of weft knitted fabrics for current research a flat knitting machine with two-bed tongue needles of the PVRK-6, 6E type was used after the modernization of the feeding mechanism and tension of the weft thread. This type of equipment allows the processing of threads with a large number of elementary fibers or threads of large diameter that cannot be formed into a loop. This method can be used to obtain a combined filler and hybrid composites based on it, where the various threads are combined, for example, carbon and aramid, carbon and carbon, glass and aramid, and others.

During the selection of the type of knitted weaves for high-strength and high-modulus carbon threads from PAN precursors, the possibility of introducing them into the knitted fabric with a straight thread was taken into account, i.e., without knitting them with the needles of a knitting machine, giving them the shape of

loops. It should be noted that the surface density of the fibrous knitted filler in unidirectional PCMs can be adjusted in a wide range, using threads and bundles of different linear densities and changing the step of their distribution in the knitted fabric by using knitting equipment of various classes.

The choice of fiber material was determined by a set of physical, mechanical, and technological parameters and economic factors (fibers availability). From the technological point of view combined weft knitted fabrics are obtained by interweaving fibers of different natures and creating a knitted (loop) structure, which makes it possible to obtain materials with a wide range of service properties.

The investigated weft knitted fabrics were prepared from the following starting materials:

- 1 Carbon thread from PAN precursors 200 tex (Toho Tenax HTS40 E13 3K);
- 2 Carbon thread from GC fibers 100 tex;
- 3 High-strength light-heat-stabilized polyamide thread 10 (5x2) tex.

The properties of the starting fibers are presented in table 1.

Table 1

Properties of carbon filaments					
	Linear density, Tex	Tensile strength, MPa,	Tensile Modulus, GPa	Elongation at break, %	Number of filaments
Carbon thread from PAN precursors	200	4400	240	1,8	3000
Carbon thread from GC fibers	100	1200-1500	60	1,9	3000
High-strength light-heat-stabilized polyamide thread	5	Specific tensile load, cN/ Tex	-	23	140
		85,8			

For high-modulus carbon threads, we used the simplest forms of weaving - stockinette weave and rib 1+1. When choosing the rib weave of carbon fabric, two needle beds and two rows of base loops are used and a straight weft thread of high-strength carbon fiber from PAN precursors is laid between them. During carbon knitwear production high-strength and high-modulus (brittle) carbon thread from PAN precursor is a weft thread, and low-modulus carbon fiber is used as a base, for example, fibers based on hydrated cellulose (GC), or chemical fibers (polyamide, aramid).

The structure of weft knitted fabrics and carbon carbon composite materials CCCM reinforced by them were studied by optical microscopy.

The pre-treated layers were impregnated three times with a hot-curing epoxy binder to produce the samples. The binder used was ED-20 epoxy resin, I-MTHF anhydride hardener, and UP606/1 accelerator. The system had low viscosity and a long shelf life. The pre-impregnated carbon knitted fabric preform polymerization was carried out by vacuum molding.

The mechanical properties of polymer based composite materials reinforced by weft knitted structures of different compositions, taking into account the arrangement of high-strength carbon fibers (1D (0-0) and 2D (0-90), were determined using standard methods. The samples produced from the obtained PCMs are shown in Figure 2.

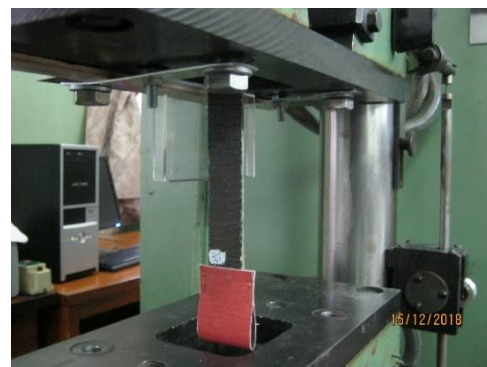
*a**b*

Figure 2 – Sample of PCM reinforced with fibrous weft knitted filler for determining of tensile strength

Results and Discussion

Samples of weft-knit fabrics were produced using high-strength carbon threads Toho Tenax HTA 40 E13 3K (200 Tex) as weft threads, and carbon threads from GC fibers (100 Tex) and high-strength light- and thermo-stabilized polyamide threads (5x2 Tex) as warp threads (Figure 3).

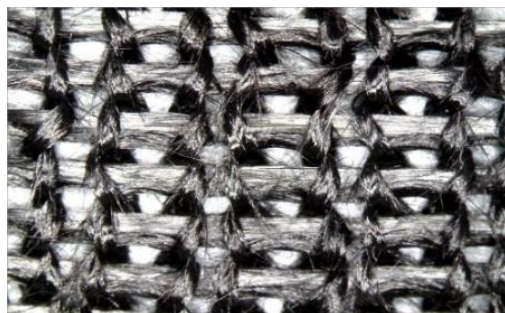
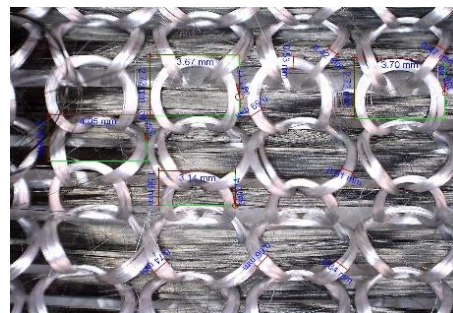
*a**b*

Figure 3 – Combined fibrous filler: *a* - Toho Tenax HTA 40 E13 3K (200 tex) - carbon thread from GC fibers 100 Tex; *b* - Toho Tenax HTA 40 E13 3K (800 tex) - polyamide thread (5x2 tex)

The results of mechanical testing of polymer composite materials (PCM) reinforced by the combined weft knitted fabrics Toho Tenax HTA 40 E13 3K (200 Tex)—carbon thread from GC fibers (100 Tex), where the content of high-strength carbon fibers was about $\approx 50\%$, showed that the values of tensile strength limit were between 408 MPa and 447 MPa. Such materials are promising for developing functional PCMs, such as conductive, shielding, etc., but the strength indicators for structural applications need to be increased.

It should be noted that during the production of the samples for mechanical tests, the layers of weft knitted fabric were impregnated with an epoxy resin (hot curing) and placed in a mold. Despite the simplicity of laying the blanks in the mold, stable polymer matrix content in the plastic and its uniform distribution was not achieved due to the manual application of the resin with a spatula. Deviations in the polymer matrix content in the carbon plastic from the optimal level for PCMs based on the epoxy resin (35%) and the high residual porosity of the sample material led to a reduction in the mechanical properties of the resulting composites.

Preliminary vacuum impregnation was used for further production of PCM samples based on carbon-containing weft knitted fabrics. It was found that, due to the features of the carbon knitted filler's volumetric structure, for high-quality impregnation of blanks, reduction of the package volume, removal of air contained between elementary fibers, and preservation of

the arrangement of the blank layers before formation, it is necessary to carry out preliminary vacuumization of the assembled package in a vacuum cabinet.

It is possible to increase the level of mechanical properties of PCM reinforced by carbon fiber filler by increasing the relative content of high-modulus carbon fiber from PAN precursor (Toho Tenax), namely by increasing the number of weft threads (tex) and using warp threads with the lowest linear density. The linear specific gravity of carbon weft threads and polyamide warp thread was calculated reach the values of relative content of high-strength carbon fibers of 75% and 95% in the knitted fabric. Increasing the relative content of high-modulus carbon fiber from PAN precursors in the fabric is achieved by increasing the number of weft threads using 2 or 3 bobbins with such carbon fiber. At the same time, thin (5x2 tex) warp threads were used while maintaining the technological and structural strength of such a carbon weft knitted fabric. The warp threads in the manufacture of filler fabrics of structural polymer composites do not carry a load, and their function is to preserve the integrity of the fabric during the production of fabric filler and its introduction into the composite.

The values of tensile strength limit for investigated materials are presented in Table 2.

Table 2

Properties of unidirectional carbon plastics reinforced with carbon weft knitted fabric

	Carbon fiber content, %	Specific gravity, g/cm ³	Tensile force at break, N	Tensile strength limit, MPa
11	75	1,39 – 1,45	54800-74380	767-987
12	95	1,40 – 1,51	88300 - 99000	1014-1157

It is necessary to pay attention to the change in the mechanisms of fracture of PCM samples depending on the reinforcement scheme. Higher values of the tensile strength for unidirectional PCM samples is corresponding to gradual (long-term) fracture. Such mechanisms

of fracture for PCM reinforced by fibrous fillers with weft knitted structure can have advantages in determining the operational characteristics, such as material fatigue strength (Fig. 3).

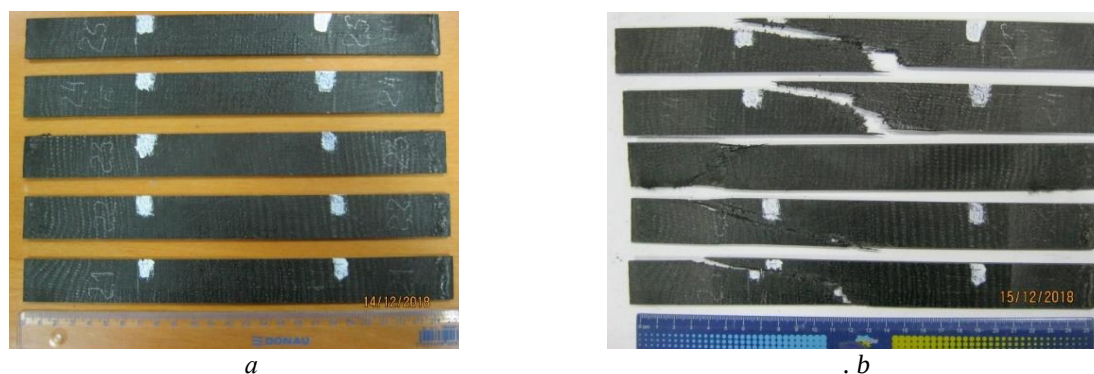


Figure 3 – PCM reinforced by the unidirectional carbon weft knitted filler:
a – before testing; b – after testing

Conclusions

A new weft knitted fabric filler (rib + weft) for reinforcing of polymer based composite materials is proposed for the creation of a unidirectional structure of straight high-strength carbon threads from PAN precursors.

The use of weft knitted fabrics (rib + weft) containing up to 95% of high-strength and high-modulus carbon threads allows to improve the physical and mechanical properties of PCMs reinforced by them and to produce the new structural PCMs. The tensile strength limit of PCMs reinforced by weft knitted filler from carbon fiber Weaves Toho Tenax HTA 40 E13 3K (800 tex) - polyamide thread (5x2 tex) was equal 1.1 GPa.

For PCMs with proposed weft knitted carbon fillers, the higher level of mechanical properties was achieved for materials with a specific gravity of 1.5-1.7 g / cm³.

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