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CONTENTS

PEDAGOGY

Abildinova G.M., Mukanova T.T., Kazhiakparova Zh.S.

Using AR effects in social networks to assess knowledge on information and communication technologies.....14

Abitayeva U.A., Sarybayeva A.Kh., Almagambetova A.A.

The effectiveness of teaching geometrical optics to future physics teachers using the GeoGebra software.....30

Abylkassymova A., Tuyakov Y., Rysbekova G.

Application of stochastic methods in professionally oriented teaching students of technical specialties.....43

Aidarkhanova K.A., Rauandina A.K.

Innovative approaches to developing dialogic speaking skills of grade 8–9 students in schools with a non-Kazakh language of instruction.....63

Akdeniz E., Bazarbayev K., Shormakova A.

Scientific and methodological foundations for using materials of the Kazakh national press of the early 20th century in teaching the history of Turkey.....77

Bashenova A.M., Tuyakbaev G.A.

Development of students' research competence through folklore and digital technologies.....93

Berdibek A.M., Kudaibergenova A.M.

Case Study technology as a means of forming professional competencies of future educational psychologists.....112

Imangaliyeva B., Torsykbaeva B., Unerbayeva Z.

Teaching the “Theory of Electrolytic Dissociation” section to students with special educational needs.....133

Iminova Yu.B.

Trends in research on preschool children’s safety behavior in Playful Learning: a bibliometric mapping.....148

Kaparova R., Yessenova M., Dyussov M.

Developing skills to find a derivative function using information technology.....171

Kengshilik A.T., Kalekeshov A.M., Abdrassulova Zh.T.

Methodological foundations for the use of artificial intelligence tools in teaching biology to students with special educational needs.....193

Kerimbaeva K.Z., Ussenbay A.U., Beysen A.K.

Effective organization of practical chemistry classes using artificial intelligence tools.....209

Kozhabayev S.E., Nysanov E.A., Abdrashova E.T.

Improving the computational thinking of future IT specialists through programming optimization problem.....226

Massalimova B.K., Dautova Z.S., Sharipkhanova A.

The role of implementing the Sustainable Development Goals using STEM projects.....240

Pernebayeva F., Kulakhmet M., Abdullaeva A.

The effectiveness of using innovative methods in teaching biology based on digital laboratories....256

Ryskulbek D.Zh., Daurenbek S.B., Dosmurzaeva A.S.

Teaching ethnocultural units to a Russian-speaking audience through artificial intelligence: working with translation mismatches.....278

Sabyrbaeva B.T., Zhensikbaeva N.Zh.

Development of students' eco-geographical culture in the context of a green economy.....300

Serikbayeva N., Belenko O., Orynbekova A.

Pedagogical decision-making based on the assessment of students' personal development and psychological well-being.....320

Shamshadinkyzy A., Kulanova S.Sh.

Teaching alash figures in higher education through storytelling and dramatization.....333

Zhumagulova Z.A., Ospanbekov Y.A., Nyssan G.

Methodology of using artificial intelligence in developing problem-solving skills of future physics teachers.....346

ECONOMICS

Ashirbayeva S.B., Yesirkepova A.M., Alzhanova A.A.

The Impact Of Climate Change On Forestry In Kazakhstan And Uzbekistan: Economic Assessment And Comparative Analysis.....360

Beisenbayeva A. K., Sultanova B. B., Turdaliyeva U.N.

Digitalization Of Accounting In Kazakhstan And Ensuring The Quality Of Accounting Information.....379

Esimkhan G.E., Rakhimberdinova M.U., Kabieva A.

Sustainable Development Of The Agro-Industrial Complex Through Innovation And Digital Technologies.....401

Gataulina G., Assanova A., Koshkarbaev K.

The Impact Of Digital Technologies On Nonperforming Loans In The Banking Sector.....418

Kaliyeva S., Umurzakova B., Tashimova U.

Key Directions For Developing A High-Quality Labor Force Market In The Context Of New Technology Adoption.....434

Konyrbekov M.Zh.

Structural And Technological Modernization Of Kazakhstan'S Industries Under Esg Transformation: Assessment Criteria.....453

Kozhakhmetova K., Rakhmatullayeva D., Ruziev K.

Esg-Investment Of Kazakhstan'S Endowment Funds: Institutional Constraints And Mechanisms To Overcome Them.....472

Kussainova D.B. , Intykbayeva S.Zh. , Guliyev F. Digital Financial Inclusion In Kazakhstan: Assessing The Efficiency Of Financial Product Use And Associated Risks.....	495
Madysheva A., Abdimoldayeva A., Mutaliyeva L. Artificial Intelligence In Managing Logistics Costs Of The Agro-Industrial Complex.....	517
Momynkulova S.M., Urkumbayeva A. R. , Yessakhmetova L. M. Innovative Development Of Kazakhstan’S Grain Sector: Trends, Challenges, And Strategic Priorities.....	533
Nurbatsin A., Lodhi R.N., Karacsony P. Gender Inequality In Access To Digital Technologies And Its Impact On Women’S Employment In Kazakhstan.....	554
Nurgaliyeva K. Esg Factors Of Structural Modernization Of Kazakhstan’S Economy: Sectoral Differences And Development Priorities.....	575
Sarkambayeva Sh.G., Turegeldinova A.T., Kumpekeyev A.K. Consumer credit behavior and personalized lending in digital banking.....	598
Skakova S.N., Davletova M.T., Gerasimenko V.V. Social Media And User-Generated Content As Factors Influencing Consumers’ Tourist Decisions In Kazakhstan.....	613
Tansykbayeva G.O., Baigireeva Zh., Nurgaliyeva Zh.E. Digital Transformation Of Remuneration Systems In Kazakhstan: Mechanisms For Improving Efficiency And Fairness.....	631
Tolepov A.Ye., Karibayeva A.M., Muslimkyzy L. The role of high tech medical technologies in improving the efficiency of the healthcare system in the Republic of Kazakhstan.....	650
Tulaganov A.B., Bigozhin R.M., Nurmagambetova A.I. Quality Assurance Activities In Universities Of The Republic Of Kazakhstan: Development Challenges.....	672
Tuleshova G., Serikbayev S., Zhangirova R. Development Of The Circular Economy Based On Marketing Models Of Sustainable Consumption And Waste Recycling.....	688
Wang Jingyan, Kanabekova M., Dzhakisheva U. Factors Driving The Accelerated Economic Development Of Cities In Kazakhstan And China: A Comparative Analysis.....	703
Zhu Jian, Kusmoldayeva Zh., Abraliyev O.A. Artificial Intelligence As A Tool For Improving The Efficiency Of Healthcare System Management In Kazakhstan.....	722

МАЗМҰНЫ

ПЕДАГОГИКА

Абильдинова Г.М., Муканова Т.Т., Кажиякпарова Ж.С.

AR-эффектілерді әлеуметтік желілер арқылы ақпараттық-коммуникациялық технологиялар бойынша білімді бағалауда қолдану.....14

Әбітасева Ұ.Ә., Сарыбаева Ә.Х., Алмағамбетова А.А.

GeoGebra бағдарламасын қолдану арқылы болашақ физика мұғалімдеріне геометриялық оптиканы оқытудың тиімділігі.....30

Әбілқасымов А., Тұяқов Е., Рысбекова Г.

Техникалық мамандықтағы студенттерді кәсіби бағдарлы оқытуда стохастикалық әдістерді қолдану.....43

Айдарханова К.А., Рауандина А.К.

Қазақ тілінде оқытпайтын мектептерде 8–9-сынып оқушыларының диалогтік сөйлеу дағдыларын қалыптастырудың инновациялық тәсілдері.....63

Акдениз Э., Базарбаев К., Шормакова А.

Хх ғасырдың басындағы қазақ ұлттық баспасөзі материалдарын Түркия тарихын оқытуда пайдаланудың ғылыми-әдістемелік негіздері.....77

Башенова Ә.М., Тұяқбаев Ғ.Ә.

Білім алушылардың зерттеушілік құзыреттілігін фольклор және цифрлық технологиялар арқылы дамыту.....93

Бердібек А.М., Қудайбергенова А.М.

Болашақ педагог-психологтардың кәсіби құзыреттіліктерін қалыптастырудағы Case Study технологиясының рөлі.....112

Иманғалиева Б., Торсықбаева Б., Өнербаева З.

«Электролиттік диссоциация теориясы» тарауын ерекше балаларға оқыту.....133

Иминова Ю.Б.

Playful learning негізінде мектеп жасына дейінгі балалардың қауіпсіз мінез-құлқын зерттеу үрдістері: библиометриялық карталау.....148

Капарова Р., Есенова М., Дюсов М.

Функцияның туындысын табу дағдыларын ақпараттық технологияларды қолдану арқылы қалыптастыру.....171

Керімбаева К.З., Үсенбай А.Ұ., Бейсен А.К.

Химия пәнінде жасанды интеллект құралдарын қолдану арқылы тәжірибелік сабақтарды тиімді ұйымдастыру.....193

Кеңшілік А.Т., Калекешов А.М., Абдрасұлова Ж.Т.

Еббқ бар оқушыларға биология пәнін оқытуда жасанды интеллект құралдарын қолданудың әдістемелік негіздері.....209

Кожабасев С.Е., Нысанов Е.А., Абдрашова Э.Т.

Оңтайландыру есептерін бағдарламалау арқылы болашақ информатиктердің есептеуіш ойлау қабілетін жетілдіру.....226

Масалимова Б.К., Даутова З.С., Шарипханова А.

STEM жобаларды қолдану арқылы тұрақты даму максаттарын жүзеге асырудың маңызы.....240

Пернебаева Ф. С., Құлахмет М., Абдуллаева А.А.

Цифрлық зертханалар негізінде биологияны оқытуда инновациялық әдістерді қолданудың тиімділігі.....256

Рысқұлбек Д.Ж., Дәуренбек С.Б., Досмурзаева А.С.

Этномәдени бірліктерді орыс аудиториясында жиі арқылы оқыту: аудармадағы сәйкессіздіктермен жұмыс.....278

Сабырбаева Б.Т., Женисқбаева Н.Ж.

Жасыл экономика жағдайында оқушылардың экологиялық-географиялық мәдениетін дамыту.....300

Серикбаева Н., Беленко О., Орынбекова А.

Оқушылардың тұлғалық дамуы мен психологиялық әл-ауқатын бағалау негізінде педагогикалық шешім қабылдау.....320

Шамшадинқызы А., Құланова С.Ш.

Жоғары оқу орындарында Алаш қайраткерлерін сторителлинг және драматизация әдістері арқылы оқыту.....333

Жұмағұлова З.А., Оспанбеков Е.А., Нысан Г.

Болашақ физика мұғалімдерінің есеп шығару дағдыларын дамытуда жасанды интеллектті қолдану әдістемесі.....346

ЭКОНОМИКА

Әшірбаева С.Б., Есіркепова А.М., Әлжанова А.А.

Климаттық өзгерістердің Қазақстан және Өзбекстан орман шаруашылығына әсері: экономикалық бағалау және салыстырмалы талдау.....360

Бейсенбаева А.К., Сұлтанова Б.Б., Тұрдалиева Ұ.Н.

Қазақстандағы бухгалтерлік есепті цифрландыру және есептік ақпараттың сапасын қамтамасыз ету.....379

Есімхан Г.Е., Рахимбердинова М.У., Қабиева Ә.

Инновациялар мен цифрлық технологиялар негізінде агроөнеркәсіптік кешеннің тұрақты дамуы.....401

Гатаулина Г., Асанова А., Қошқарбаев Қ.

Цифрлық технологиялардың банк секторындағы проблемалық берешекке әсері.....418

Қалиева С., Өмірзақова Б., Ташимова Ұ.

Жаңа технологияларды енгізу жағдайында сапалы еңбек ресурстары нарығын қалыптастырудың негізгі бағыттары.....434

Қонырбеков М.Ж.

Қазақстан өнеркәсібінің esg трансформациясы жағдайындағы құрылымдық-технологиялық жаңғыруы: бағалау өлшемдері.....453

Қожахметова Қ., Рахматуллаева Д., Рузиев К.

Esg-қазақстанның эндаументтік қорларына инвестициялар: институционалдық шектеулер және оларды еңсеру тетіктері.....472

Құсайынова Д.Б., Интықбаева С.Ж., Гулиев Ф.

Қазақстандағы цифрлық қаржылық инклюзия: қаржы өнімдерін пайдалану тиімділігін және ілеспе тәуекелдерді бағалау.....495

Мәдішева Ә., Әбдімолдаева А., Мұталиева Л.

Агроөнеркәсіптік кешеннің логистикалық шығындарын басқарудағы жасанды интеллект...517

Момынкұлова С.М., Үркімбаева А.Р., Есахметова Л.М.

Қазақстанның астық секторын инновациялық дамыту: үрдістер, проблемалар және стратегиялық басымдықтар.....533

Нұрбақин А., Лодхи Р.Н., Карачони П.

Цифрлық технологияларға қол жеткізудегі гендерлік теңсіздік және оның қазақстандағы әйелдердің жұмыспен қамтылуына әсері.....554

Нұрғалиева Қ.

Қазақстан экономикасын құрылымдық жаңғыртудың esg-факторлары: салалық айырмашылықтар мен даму басымдықтары.....575

Сарқамбаева Ш.Г., Турегелдинова А.Т., Кумпекеев А.К.

Цифрлық банкінгтегі тұтынушының кредиттік мінез-құлқы және дербестендірілген кредиттеу.....598

Скакова С.Н., Давлетова М.Т., Герасименко В.В.

Әлеуметтік желілер мен пайдаланушылар жасаған контент Қазақстандағы тұтынушылардың туристік шешімдеріне әсер ететін факторлар ретінде.....613

Тансықбаева Г.О., Байгиреева Ж., Нұрғалиева Ж.Е.

Қазақстандағы еңбекақы төлеу жүйелерінің цифрлық трансформациясы: тиімділік пен әділдікті арттыру тетіктері.....631

Төлепов Ә.Е., Карибаева А.М., Муслимқызы Л.

Қазақстан Республикасының денсаулық сақтау жүйесінің тиімділігін арттырудағы жоғары технологиялық медициналық технологиялардың рөлі.....650

Тулағанов А.Б., Бигожин Р.М., Нұрмағамбетова А.И.

Қазақстан Республикасының жоғары оқу орындарында сапаны қамтамасыз ету қызметі: даму мәселелері.....672

Түлешова Г., Серікбаев С., Жангирова Р.

Тұрақты тұтыну мен қалдықтарды қайта өңдеудің маркетингтік модельдері негізінде циркулярлық экономиканы дамыту.....688

Ван Цзинъянь, Қанабекова М., Джакишева У.

Қазақстан мен Қытай қалаларының озыңқы экономикалық даму факторлары: салыстырмалы талдау.....703

Чжу Цзянь, Құсмолдаева Ж., Әбралиев О.А.

Жасанды интеллект Қазақстанның денсаулық сақтау жүйесін басқару тиімділігін арттыру құралы ретінде.....722

СОДЕРЖАНИЕ

ПЕДАГОГИКА

Абильдинова Г.М., Муканова Т.Т., Кажиякпарова Ж.С.

Применение AR-эффектов при оценке знаний по информационно-коммуникационным технологиям через социальные сети.....14

Абитаева У.А., Сарыбаева Ә.Х., Алмагамбетова А.А.

Эффективность обучения геометрической оптике будущих учителей физики с применением программы GeoGebra.....30

Абылкасымова А., Туяков Е., Рысбекова Г.

Применение стохастических методов в профессионально ориентированном обучении студентов технических специальностей.....43

Айдарханова К.А., Рауандина А.К.

Инновационные подходы к развитию навыков диалогической речи у учащихся 8–9-х классов в школах с неказахским языком обучения.....63

Акдениз Э., Базарбаев К., Шормакоева А.

Научно-методические основы использования материалов казахской национальной прессы начала XX века в преподавании истории Турции.....77

Башенова А.М., Туякбаев Г.А.

Развитие исследовательской компетентности обучающихся посредством фольклора и цифровых технологий.....93

Бердібек А.М., Кудайбергенова А.М.

Технология Case Study как средство формирования профессиональных компетенций будущих педагогов-психологов.....112

Имангалиева Б., Торсыкбаева Б., Унербаева З.

Обучение обучающихся с особыми образовательными потребностями по разделу «Теория электролитической диссоциации».....133

Иминова Ю.Б.

Тенденции исследований безопасного поведения дошкольников в Playful Learning: библиометрическое картирование.....148

Капарова Р., Есенова М., Дюсов М.

Формирование навыков нахождения производной функции с использованием информационных технологий.....171

Кеншилик А.Т., Калекешов А.М., Абдрасулова Ж.Т.

Методические основы применения инструментов искусственного интеллекта в обучении биологии обучающихся с особыми образовательными потребностями.....193

Керимбаева К.З., Усенбай А.У., Бейсен А.К.

Организация практических занятий химии с использованием искусственного интеллекта...209

Кожабаяев С.Е., Нысанов Е.А., Абдрашова Э.Т.

Совершенствование вычислительного мышления будущих информатиков посредством программирования задач оптимизации.....226

Масалимова Б.К., Даутова З.С., Шарипханова А. Роль реализации целей устойчивого развития с помощью STEM-проектов.....	240
Пернебаева Ф. С., Кулахмет М., Абдуллаева А.А. Эффективность использования инновационных методов в обучении биологии на базе цифровых лабораторий.....	256
Рысқұлбек Д.Ж., Дэуренбек С.Б., Досмурзаева А.С. Обучение этнокультурным единицам в русскоязычной аудитории с использованием искусственного интеллекта: работа с несоответствиями при переводе.....	278
Сабырбаева Б.Т., Женискаева Н.Ж. Развитие эколого-географической культуры учащихся в условиях зелёной экономики.....	300
Серикбаева Н., Беленко О., Орынбекова А. Принятие педагогических решений на основе оценки личностного развития и психологического благополучия учащихся.....	320
Шамшадинкызы А., Куланова С.Ш. Преподавание деятельности деятелей Алаша в высших учебных заведениях посредством сторителлинга и драматизации.....	333
Жұмағұлова З.А., Оспанбеков Е.А., Нысан Г. Методика использования искусственного интеллекта в развитии навыков решения задач у будущих учителей физики.....	340

ЭКОНОМИКА

Аширбаева С.Б., Есиркепова А.М., Альжанова А.А. Влияние климатических изменений на лесное хозяйство Казахстана и Узбекистана: экономическая оценка и сравнительный анализ.....	360
Бейсенбаева А.К., Султанова Б.Б., Турдалиева У.Н. Цифровизация бухгалтерского учета в Казахстане и обеспечение качества учетной информации.....	379
Есимхан Г.Е., Рахимбердинова М.У., Кабиева А. Устойчивое развитие агропромышленного комплекса на основе инноваций и цифровых технологий.....	401
Гатаулина Г., Асанова А., Кошкарбаев К. Влияние цифровых технологий на проблемную задолженность банковского сектора.....	418
Калиева С., Умурзакова Б., Ташимова У. Ключевые направления формирования рынка качественных трудовых ресурсов в условиях внедрения новых технологий.....	434
Конырбеков М.Ж. Структурно-технологическая модернизация отраслей промышленности Казахстана в условиях esg-трансформации: критерии оценки.....	453
Кожаметова К., Рахматуллаева Д., Рузиев К. Esg-инвестирование эндаумент-фондов Казахстана: институциональные ограничения и механизмы их преодоления.....	472

Кусаинова Д.Б., Интыкбаева С.Ж., Гулиев Ф.

Цифровая финансовая инклюзия в Казахстане: оценка эффективности использования
финансовых продуктов и сопутствующих рисков.....495

Мадышева А., Абдимолдаева А., Муталиева Л.

Искусственный интеллект в управлении логистическими издержками
агропромышленного комплекса.....517

Момынкулова С.М., Уркумбаева А.Р., Есахметова Л.М.

Инновационное развитие зернового сектора Казахстана: тенденции, проблемы
и стратегические приоритеты.....533

Нурбацин А., Лодхи Р.Н., Карачони П.

Гендерное неравенство в доступе к цифровым технологиям и его влияние на занятость
женщин в Казахстане.....534

Нурғалиева К.

Esg-факторы структурной модернизации экономики Казахстана: отраслевые различия
и приоритеты развития.....575

Саркамбаева Ш.Г., Турегелдинова А.Т., Кумпекеев А.К.

Кредитное поведение потребителей и персонализированное кредитование
в цифровом банкинге.....598

Скакова С.Н., Давлетова М.Т., Герасименко В.В.

Социальные сети и пользовательский контент как факторы, влияющие
на туристические решения потребителей в Казахстане.....613

Тансыкбаева Г.О., Байгиреева Ж., Нурғалиева Ж.Е.

Цифровая трансформация систем оплаты труда в Казахстане: механизмы повышения
эффективности и справедливости.....631

Төлепов А.Е., Карибаева А.М., Муслимқызы Л.

Роль высокотехнологичных медицинских технологий в повышении эффективности
системы здравоохранения Республики Казахстан.....650

Тулаганов А.Б., Бигожин Р.М., Нурмагамбетова А.И.

Деятельность по обеспечению качества в вузах Республики Казахстан:
проблемы развития.....672

Тулешова Г., Серикбаев С., Жангирова Р.

Развитие циркулярной экономики на основе маркетинговых моделей устойчивого
потребления и переработки отходов.....688

Ван Цзинъянь, Канабекова М., Джакишева У.

Факторы опережающего экономического развития городов Казахстана и Китая:
сравнительный анализ.....703

Чжу Цзянь, Кусмолдаева Ж., Абралиев О.А.

Искусственный интеллект как инструмент повышения эффективности управления
системой здравоохранения Казахстана.....722

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DIGITAL FINANCIAL INCLUSION IN KAZAKHSTAN: ASSESSING THE EFFICIENCY OF FINANCIAL PRODUCT USE AND ASSOCIATED RISKS

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Abstract. The digitalisation of the financial sector has significantly changed the content of financial inclusion: having a bank account or a payment card is no longer a sufficient criterion for the actual inclusion of the population in the financial system. The study aims to assess the dynamics of digital financial inclusion in Kazakhstan, determine the effectiveness of digital financial products, and identify the risks associated with expanding digital channels for providing financial services. The information base consists of data from the National Bank of the Republic of Kazakhstan, the Agency of the Republic of Kazakhstan for Regulation and Development of the Financial Market, the Global Findex Database 2025, and OECD data for 2015–2025. For the regional analysis, data from 17 regions and three cities of republican significance for 2025 were used. The methodology combines dynamic and comparative analysis, the construction of the author’s Digital Financial Inclusion Index (DFII), an assessment of the efficiency of using financial products, k-means clustering, and an exploratory regression model. In 2025, the number of non-cash transactions using cards issued by Kazakhstani issuers reached 13.99 billion, and their volume amounted to 188.41 trillion tenge. Non-cash transactions accounted for 98.3% of the quantity and 87.2%

of the volume of all card transactions. At the same time, pronounced territorial heterogeneity persists. The DFII calculation showed values ranging from 25.02 to 77.60 points. Cluster analysis revealed four types of regional models of digital financial inclusion. It is also clear that high levels of digital use of financial services do not eliminate risks: in 2025, loans to the population grew to 24.8 trillion tenge, consumer loans to 16.7 trillion tenge, and the Anti-Fraud Centre registered 80,871 incidents involving transactions with signs of fraud. The results confirm the need to move from a policy of quantitative expansion of access to financial services to a model of “effective and safe financial inclusion” that takes into account the quality of product use, debt sustainability, digital literacy, and consumer protection.

Keywords: financial inclusion, digitalization, financial products, mobile banking, digital payments, financial risks, consumer lending, financial literacy, Kazakhstan, fintech

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ҚАЗАҚСТАНДАҒЫ ЦИФРЛЫҚ ҚАРЖЫЛЫҚ ИНКЛЮЗИЯ: ҚАРЖЫ ӨНІМДЕРІН ПАЙДАЛАНУ ТИІМДІЛІГІН ЖӘНЕ ІЛЕСПЕ ТӘУЕКЕЛДЕРДІ БАҒАЛАУ

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Аннотация. Қаржы секторын цифрландыру қаржы инклюзиясының мазмұнын айтарлықтай өзгертті: банктік шоттың немесе Төлем картасының болуы халықтың қаржы жүйесіне нақты енгізілуінің жеткілікті өлшемі болып табылмайды. Зерттеудің мақсаты Қазақстандағы цифрлық қаржы инклюзиясының динамикасын бағалау, цифрлық қаржы өнімдерін пайдаланудың тиімділігін анықтау және қаржы қызметтерін ұсынудың

цифрлық арналарын кеңейтумен қатар жүретін тәуекелдерді анықтау болып табылады. Ақпараттық базаны Қазақстан Республикасы Ұлттық Банкінің, Қазақстан Республикасы Қаржы нарығын реттеу және дамыту агенттігінің, Global finindex Database 2025 және OECD 2015-2025 жылдардағы деректері құрады. Өңірлік талдау үшін 2025 жылғы Республикалық маңызы бар 17 облыспен үш қала бойынша деректер пайдаланылды, қаржы өнімдерін пайдалану тиімділігін бағалау, k-means-кластерлеу және барлау регрессиялық моделі. 2025 жылы Қазақстандық эмитенттердің карталары бойынша қолма-қол ақшасыз операциялар саны 13,99 млрд-қа жеткені, ал олардың көлемі-188,41 трлн теңгеге жеткені анықталды. Қолма-қол ақшасыз операциялардың үлесі барлық карточкалық операциялардың саны бойынша 98,3% және көлемі бойынша 87,2% құрады. Сонымен бірге айқын аумақтық гетерогенділік сақталады. DFII есебі 25,02-ден 77,60-қа дейінгі мәндерді көрсетті. Кластерлік талдау аймақтық цифрлық қаржылық инклюзия модельдерінің төрт түрін анықтады. Сондай-ақ, қаржылық қызметтерді цифрлық пайдаланудың жоғары деңгейі тәуекелдерді жоймайтыны анықталды: 2025 жылы халыққа берілетін кредиттер 24,8 трлн теңгеге дейін, тұтынушылық кредиттер 16,7 трлн теңгеге дейін өсті, ал Антифрод-орталық алаяқтық белгілері бар транзакциялар бойынша 80 871 оқиғаны тіркеді. Нәтижелер қаржылық қызметтерге қолжетімділікті сандық кеңейту саясатынан өнімді пайдалану сапасын, борыштық тұрақтылықты, цифрлық сауаттылықты және тұтынушылардың қауіпсіздігін ескеретін "тиімді және қауіпсіз қаржылық инклюзия" моделіне көшу қажеттілігін растайды.

Түйін сөздер: қаржылық инклюзия, цифрландыру, қаржы өнімдері, мобильді банкинг, цифрлық төлемдер, қаржылық тәуекелдер, тұтынушылық кредиттеу, қаржылық сауаттылық, Қазақстан, финтех

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ЦИФРОВАЯ ФИНАНСОВАЯ ИНКЛЮЗИЯ В КАЗАХСТАНЕ: ОЦЕНКА ЭФФЕКТИВНОСТИ ИСПОЛЬЗОВАНИЯ ФИНАНСОВЫХ ПРОДУКТОВ И СОПУТСТВУЮЩИХ РИСКОВ

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Аннотация. Цифровизация финансового сектора существенно изменила содержание финансовой инклюзии: наличие банковского счёта или платежной карты уже не является достаточным критерием фактической включённости населения в финансовую систему. Цель исследования состоит в оценке динамики цифровой финансовой инклюзии в Казахстане, определении эффективности использования цифровых финансовых продуктов и выявлении рисков, сопровождающих расширение цифровых каналов предоставления финансовых услуг. Информационную базу составили данные Национального Банка Республики Казахстан, Агентства Республики Казахстан по регулированию и развитию финансового рынка, Global Findex Database 2025 и OECD за 2015–2025 гг. Для регионального анализа использованы данные по 17 областям и трём городам республиканского значения за 2025 г. Методология объединяет динамический и сравнительный анализ, построение авторского Digital Financial Inclusion Index (DFII), оценку эффективности использования финансовых продуктов, k-means-кластеризацию и разведочную регрессионную модель. Установлено, что в 2025 г. количество безналичных операций по картам казахстанских эмитентов достигло 13,99 млрд, а их объём - 188,41 трлн тенге. Доля безналичных операций составила 98,3% по количеству и 87,2% по объёму всех карточных операций. Одновременно сохраняется выраженная территориальная неоднородность. Расчёт DFII показал значения от 25,02 до 77,60 пункта. Кластерный анализ выявил четыре типа региональных моделей цифровой финансовой инклюзии. Установлено также, что высокий уровень цифрового использования финансовых услуг не устраняет риски: в 2025 г. кредиты населению выросли до 24,8 трлн тенге, потребительские кредиты - до 16,7 трлн тенге, а Антифрод-центр зарегистрировал 80 871 инцидент по транзакциям с признаками мошенничества. Результаты подтверждают необходимость перехода от политики количественного расширения доступа к финансовым услугам к модели «эффективной и безопасной финансовой инклюзии», учитывающей качество использования продуктов, долговую устойчивость, цифровую грамотность и защищённость потребителей.

Ключевые слова: финансовая инклюзия, цифровизация, финансовые продукты, мобильный банкинг, цифровые платежи, финансовые риски, потребительское кредитование, финансовая грамотность, Казахстан, финтех

Introduction. The digital transformation of the financial sector is reshaping access to financial services through mobile banking, digital lending, QR payments, and financial platforms. These technologies reduce transaction costs and

geographical barriers, shifting financial inclusion from formal account ownership towards effective, regular, and secure use of financial products.

International studies demonstrate that FinTech improves financial accessibility, reduces service costs, and mitigates information asymmetry (Ozili, 2018; Bazarbash, 2019; Sahay et al., 2020). However, digitalisation also creates risks associated with excessive borrowing, algorithmic discrimination, fraud, phishing, and personal data breaches (Cevik, 2024; Elekdag et al., 2024; OECD, 2025).

Kazakhstan has experienced rapid growth in digital financial services. According to Global Findex, adult account ownership increased from 42.1% in 2011 to 87.05% in 2024, while participation in digital payments rose from 46.7% in 2014 to 85.0% in 2024 (World Bank, 2025). In 2025, payment cards issued by Kazakhstani institutions facilitated 13.99 billion non-cash transactions worth KZT 188.41 trillion, compared with 12.86 billion transactions worth KZT 166.23 trillion in 2024. By January 1, 2026, 84.6 million payment cards were in circulation (National Bank of Kazakhstan).

Nevertheless, widespread digital payments do not necessarily indicate comprehensive financial inclusion. Multiple card ownership may overstate accessibility, regional differences persist, and digital finance expansion increases exposure to consumer debt and cybersecurity risks. Therefore, assess financial inclusion through accessibility, usage intensity, effectiveness, and financial security.

Existing research frequently examines account ownership, FinTech adoption, and financial risks separately, leaving insufficient understanding of how regional differences in digital usage relate to effective and secure financial participation.

The study aims to assess the level and dynamics of digital financial inclusion in Kazakhstan, evaluate the effectiveness of financial product usage, and identify emerging risks associated with digital financial services.

The scientific novelty lies in an integrated assessment framework that combines payment accessibility, usage intensity, the transition toward non-cash transactions, and associated risks. Using official 2025 statistics, the study develops a regional Digital Financial Inclusion Index, classifies all 20 regions of Kazakhstan, and conducts exploratory regression analysis of factors influencing non-cash financial activity.

Three hypotheses are examined: H1 — financial inclusion is shifting from formal card ownership towards intensive digital service usage; H2 — significant regional disparities persist despite widespread banking infrastructure; H3 — greater digital inclusion may increase consumer credit and fraud risks without necessarily improving financial well-being.

Literature review. Financial inclusion is traditionally viewed as individuals and businesses having access to useful, affordable, and suitable financial products that meet their needs. Earlier literature focused mainly on the physical infrastructure of the banking system: the number of branches, ATMs, and bank accounts. The spread of digital technologies has significantly changed this approach.

Ozili (2018) views digital finance as a mechanism for expanding financial inclusion by reducing transaction costs and increasing access to financial services. The author also emphasises that the effect of digitalisation depends on regulation quality, financial literacy, and users' ability to interact safely in the digital environment. (ScienceDirect)

Sahay et al. (2020) show that FinTech can eliminate some traditional barriers to financial inclusion, particularly geographical limitations and the high costs of servicing small transactions. At the same time, expanding digital finance requires appropriate infrastructure and a regulatory environment, since technological accessibility alone does not guarantee equal product use across population groups. (IMF)

Digital technologies are gaining particular importance in the lending sector. Bazarbash (2019) shows that big data and machine learning can potentially allow more accurate assessment of clients' creditworthiness with limited traditional credit history, thereby expanding access to credit. However, the quality of such models depends on the source data and the correctness of the risk assessment algorithms. (IMF)

Aduba et al. (2023), having studied developing economies, found evidence of a positive relationship between FinTech penetration and financial development. At the same time, the impact of the technology varies depending on the initial level of development and inclusiveness of the financial system. This means that the same digital product can produce different socio-economic effects in territories with different levels of financial infrastructure and user competencies. (ScienceDirect)

Basnayake et al. (2024) used data from 30 countries in the Asia-Pacific region to develop a multi-component index of digital financial inclusion. They identified a positive but non-linear relationship between digital inclusion and economic growth. This conclusion is important methodologically: it is advisable to measure financial inclusion using a system of indicators rather than by counting the number of bank accounts or cards. (DOI) At the same time, increasing attention is being paid to the flip side of digital financial transformation. Elekdag et al. (2024), using data from more than 10,000 financial institutions, found a link between higher FinTech activity and an increased propensity of financial intermediaries to take risks. However, the nature of this link depends on the institutional environment (IMF).

Cevik (2024), based on a cross-country sample, highlights the heterogeneity of the impact of various FinTech instruments on financial stability. In particular, digital lending and digital capital raising can have different effects, and the institutional characteristics of developing countries can significantly alter the outcome (DOI).

The systematic review by Sant'Anna and Figueiredo (2024) also confirms the dual nature of FinTech: technological innovations can expand access to financial services for previously excluded groups, but can also create new threats to financial stability and consumer protection. (ScienceDirect)

Nguyen et al. (2025) show that the impact of digital financial inclusion on

resilience to financial shocks depends on the level of financial development achieved. Consequently, the effect of expanding digital access cannot be assumed to be linear and uniform across all financial systems. (ScienceDirect) Financial literacy plays a special role in the context of digitalisation. The OECD indicates that among adults who made online purchases in the economies participating in the study, about 40% did not reach the minimum target level of digital financial literacy. The main risks include fraud, phishing, account hacking, data theft, impulsive consumption, and digital exclusion of vulnerable population groups (OECD, 2025). (OECD)

Thus, the literature allows us to identify four components of modern digital financial inclusion: access to financial services, the intensity of their use, the economic utility of financial products, and the user's ability to control the associated risks. It is precisely the combination of these components that forms the basis of the methodology of this study.

Materials and methods. The empirical basis of the study consists of administrative data from the National Bank of the Republic of Kazakhstan on the market of payment cards and electronic banking services; data from the Agency of the Republic of Kazakhstan for Regulation and Development of the Financial Market on lending and the quality of bank assets; the Global Findex Database 2025; and OECD materials on digital financial literacy and consumer protection. The main time interval is 2015–2025. However, there are limitations on comparability. The National Bank's archival statistics for 2015 are mostly monthly indicators, while subsequent periods provide complete annual series. Therefore, 2015 serves as the starting point for the transformation of payment behaviour, and the comparison of annual flows is carried out mainly for 2018–2025. In addition, after the administrative-territorial changes in 2022, the Abay, Zhetisu, and Ulytau regions were established; as a result, artificially reconstructing a ten-year regional panel could distort the results. For this reason, the regional analysis uses the unified territorial structure of 2025.

In the first stage, we apply dynamic analysis. The share of non-cash transactions is calculated based on the quantity and volume:

$$NC_t^N = \frac{N_{cashless,t}}{N_{cashless,t} + N_{cash,t}} \times 100, \quad (1)$$

$$NC_t^V = \frac{V_{cashless,t}}{V_{cashless,t} + V_{cash,t}} \times 100. \quad (2)$$

To assess regional differences, we developed the Digital Financial Inclusion Index (DFII). The index includes four components: X_1 - the share of non-cash transactions in the total volume of card transactions in the region; X_2 - the ratio of the number of used payment cards to the number of cards in circulation; X_3 - the number of POS terminals per 1,000 used cards; X_4 - the number of non-cash transactions per used card.

Each indicator was transformed using the min-max method:

$$Z_{ij} = \frac{X_{ij} - \min(X_j)}{\max(X_j) - \min(X_j)}. \quad (3)$$

The integral index takes the form:

$$DFII_i = 25(Z_{i1} + Z_{i2} + Z_{i3} + Z_{i4}), \quad (4)$$

where the index value varies from 0 to 100, equal weights are used in order not to give a priori a higher importance to a particular aspect of financial inclusion.

The effectiveness of using financial products is considered in two complementary dimensions. The first is the degree to which non-cash transactions displace cash turnover; the second is the intensity of actual use of a financial product, measured by the number of non-cash transactions per used card. This approach helps avoid interpreting a large number of issued but фактически unused cards as a high level of financial inclusion.

To identify homogeneous regional models, the k-means method is used. Before clustering, the four original DFII indicators are standardised, and the number of clusters is set to four. Clustering serves a descriptive rather than a rating function: belonging to a specific cluster indicates the type of combination of availability and use of digital products.

Additionally, an exploratory interregional regression model was built:

$$INTENSITY_i = \alpha + \beta_1 CASHLESS_i + \beta_2 ACTIVE_i + \beta_3 POS_i + \beta_4 METRO_i + \varepsilon_i, \quad (5)$$

were

INTENSITY is the standardised number of non-cash transactions per card used;

CASHLESS is the standardised share of non-cash transactions by volume;

ACTIVE is the share of used cards;

POS is the density of POS terminals;

METRO is a dummy variable for Almaty, Astana, and Shymkent.

Robust standard errors HC_3 are calculated for the coefficients.

Risk analysis is carried out separately from DFII. This is important because combining financial accessibility and financial risk into a single index may obscure processes with opposing directions. Furthermore, comparable regional data on delinquency and digital fraud at the required level of detail are lacking. Therefore, the risk block is assessed at the national level using indicators of consumer lending, loan portfolio quality, and fraudulent transactions.

Results. The analysis reveals substantial changes in Kazakhstan's financial behaviour driven by digitalisation. Financial inclusion has expanded beyond formal account ownership towards more intensive use of non-cash payments,

mobile financial services, savings, and borrowing instruments. Account ownership therefore reflects basic accessibility, while actual financial participation depends on the frequency and diversity of financial product usage.

Global Findex data confirm a transition from institutional access towards active digital financial participation. However, widespread account ownership alone does not indicate the effectiveness or regularity of financial service use.

Table 1 presents the dynamics of Kazakhstan's key financial inclusion indicators, illustrating changes in account ownership, digital payments, formal savings, and borrowing. Their comparison helps assess how expanded financial access has translated into practical financial participation and changing payment behaviour.

Table 1 — Dynamics of individual indicators of financial inclusion among the population of Kazakhstan

Indicator, % of the adult population aged 15+	2011	2014	2017	2021	2024
Ownership of a financial account	42,1	53,9	58,7	81,1	87,1
Made/received a digital payment	-	46,7	53,9	77,9	85,0
Savings in a bank/through mobile financial services	6,7	8,0	13,9	19,1	37,7
Loan from a bank/through mobile financial services	-	19,7	28,2	29,8	32,8

Note: Global Findex is conducted in waves, not annually. The 2024 data is published in the Global Findex Database 2025. Source: compiled from data by the World Bank (2025). (World Bank)

The results demonstrate substantial growth in financial inclusion and changes in Kazakhstan's financial behaviour. Between 2011 and 2024, financial account ownership increased by approximately 45 percentage points, reaching 81.1% in 2021 and 87.1% in 2024. Digital payment participation reached 85.0%, indicating a narrowing gap between formal financial access and actual digital service usage.

Financial behaviour also diversified. The share of adults saving through formal institutions increased from 8.0% in 2014 to 37.7% in 2024, while borrowing rose from 19.7% to 32.8%. These trends show simultaneous growth in digital payments, formal savings, and credit access.

However, Global Findex indicators primarily reflect financial access and selected financial practices. Assessing digital transformation requires administrative transaction data capturing actual usage intensity and the shift from cash to non-cash payments. National Bank statistics confirm this transition. In December 2015, non-cash transactions represented 32.5% of card transactions by number and 13.4% by value, comprising 9.0 million payments worth KZT 120.0 billion. Cash withdrawals reached 18.7 million transactions worth KZT 776.1 billion. By 2018–2019, the non-cash share increased from 64.7% to 76.1% by number and from 32.0% to 46.3% by value (National Bank of the Republic of Kazakhstan, 2019).

These findings indicate a structural shift from formal financial access to regular digital payment use. Table 2 presents the dynamics of non-cash transactions in Kazakhstan from 2015 to 2025.

Table 2 — The change in the role of non-cash transactions in Kazakhstan in 2015–2025

Year	Share of non-cash transactions by quantity, %	Share of non-cash transactions by volume, %
2015*	32,5	13,4
2018	64,7	32,0
2019	76,1	46,3
2020	90,6	68,0
2021	95,9	78,0
2022	97,1	82,9
2023	97,9	86,0
2024	98,1	86,6
2025	98,3	87,2

Note – for 2015, the structure of transactions for December is provided; for 2018–2025, annual indicators are given. The values for 2020–2025 were calculated by the authors based on the absolute number and volume of transactions—source: calculation based on data from the National Bank of the Republic of Kazakhstan. (ҰЛТТЫҚ Банк)

The data indicate a structural, rather than merely quantitative, transformation in Kazakhstan's payment behaviour. Between 2018 and 2025, the share of non-cash transactions in the total number of card transactions increased from 64.7% to 98.3%, and in the total volume - from 32.0% to 87.2%. This means the non-cash payment model has effectively become the dominant way to use payment cards.

The most intensive phase of the transition to non-cash payments occurred in 2020–2022. In 2020, 2.878 billion non-cash transactions worth 35.295 trillion tenge were carried out; in 2021, the number increased to 6.271 billion, and the volume to 73.123 trillion tenge. In 2022, the corresponding indicators reached 8.587 billion transactions and 103.788 trillion tenge. Thus, in just two years, the number of non-cash transactions increased almost threefold, and their total volume increased by approximately 2.9 times (National Bank of the Republic of Kazakhstan, 2022).

This trend shows that the spread of non-cash payments was accompanied not only by the вытеснение of cash withdrawal transactions but also by a significant expansion of the overall scale of card-based activity. The growth in the number of transactions reflects how often the population uses payment instruments. In contrast, the increase in their value indicates that an ever-greater share of everyday and large-scale financial transactions is moving to the digital environment.

At the same time, analysing only the relative share of non-cash payments does not allow for a full assessment of the scale of the changes that have taken place. To do so, it is necessary to consider the absolute number and volume of card transactions, since these indicators reflect the intensity of the population's involvement in the digital financial infrastructure. In this regard, Table 3 presents the dynamics of card transaction volume in Kazakhstan for 2020–2025, allowing assessment of the expansion of transactional activity during the period of the most rapid development of digital financial services.

Table 3 — Scale of card transactions in Kazakhstan, 2020–2025

Year	Non-cash transactions, billion transactions	Volume of non-cash transactions, trillion tenge	Cash withdrawals, million operations	Volume of cash withdrawals, trillion tenge
2020	2,878	35,29	297,4	16,62
2021	6,271	73,12	271,1	20,59
2022	8,587	103,79	254,3	21,36
2023	11,317	141,92	241,1	23,05
2024	12,860	166,23	242,9	25,74
2025	13,989	188,41	236,5	27,62
Founder: The National Bank of the Republic of Kazakhstan was created. (National Bank)				

In 2025, the number of non-cash transactions increased by 8.8% compared to 2024, and their volume increased by 13.3%. At the same time, the number of cash withdrawal transactions decreased by 2.6%, although their monetary value increased by 7.3%. This multidirectional trend shows that, in terms of transaction volume, everyday payment behaviour in Kazakhstan has almost completely shifted to a non-cash format. In contrast, cash transactions remain significant mainly for larger-value transactions.

Significant changes are also observed in the infrastructure for using financial products. As of January 1, 2026, 84.59 million payment cards were in circulation, up from 81.37 million a year earlier, an increase of about 4.0%. At the same time, the number of actually used cards grew at a more moderate pace - by approximately 3.4%. Remote banking services grew much faster: the number of active internet and mobile banking users rose from 25.91 million to 34.31 million, or by approximately 32.4% (National Bank of the Republic of Kazakhstan, 2026).

These indicators suggest that Kazakhstan's financial sector has entered the next stage of digitalisation. If in the initial stages the expansion of financial inclusion was primarily associated with an increase in the number of bank accounts and payment cards, then by 2025 the main source of further growth will be the increased intensity of use of remote financial services by existing customers. In other words, the growth in digital activity significantly outpaces the expansion of the card infrastructure itself.

This circumstance requires a more detailed examination of which channels the population uses to carry out non-cash transactions. An analysis of the transaction structure makes it possible to determine whether the growth of digital payments is driven primarily by traditional acquiring infrastructure or is increasingly driven by remote technologies - internet and mobile banking, mobile devices, and other digital payment methods.

In 2025, a significant portion of non-cash card transactions was generated directly through remote channels, confirming a shift not only in scale but also in the technological model of using financial products. To assess the contribution of individual payment methods, Table 4 presents the structure of non-cash card transactions by main channels.

Table 4 — Structure of non-cash card transactions by main channels in 2025

Channel	Number of operations, billion	Share by quantity, %	Volume, trillion tenge	Volume share, %
Internet/mobile banking	7,20	52,4	149,15	80,0
QR payments	3,79	27,6	19,22	10,3
POS terminals	2,76	20,1	17,91	9,6
Total	13,76	100,0	186,36	100,0

Note - the table characterises transactions according to the National Bank's relevant classification within the territory of the Republic of Kazakhstan; therefore, the total differs from the aggregate transactions on cards issued by Kazakhstani issuers in Kazakhstan and abroad.
Source: calculation based on data from the National Bank of the Republic of Kazakhstan.
(National Bank)

Internet and mobile banking account for slightly more than half of the total number of non-cash card transactions, but about 80 % of their total value. This indicates that remote banking services are used not only for everyday payments but also for conducting relatively large financial transactions. QR payments show a different pattern: their share of transactions is noticeably higher than their share of total value. This ratio reflects the predominant use of QR instruments in mass retail payments, with a relatively small average transaction amount.

The results show that the digitalisation of financial behaviour in Kazakhstan is no longer limited to simply replacing cash transactions with card-based operations. A change is taking place in the very technological architecture of access to financial services: a significant portion of payment activity is being shifted from the physical terminal infrastructure to the mobile and internet environment. As a result, digital financial inclusion is increasingly determined not by the number of payment instruments issued, but by the actual intensity of use of remote channels, the frequency of transactions, and their value.

At the same time, nationwide indicators do not show how evenly this model of digital financial behaviour is distributed across the country. High aggregated values may coexist with significant interregional differences because of uneven concentrations of population and economic activity, the level of digital infrastructure development, the availability of financial institutions, and the intensity of remote banking use. Therefore, the next stage of the analysis assesses the territorial differentiation of digital financial inclusion.

To compare the regions, four indicators were used to characterise the actual involvement of the population in the digital financial system, and based on them, an integral index of digital financial inclusion was calculated - the Digital Financial Inclusion Index (DFII). Unlike the absolute number of issued bank cards, which largely depends on the region's population and does not reflect usage intensity, the selected indicators more accurately capture real digital financial activity. This approach identifies not only regions with the most developed payment infrastructure, but also territories where the practical use of digital financial products remains relatively limited.

Table 5 presents the initial indicator values and the calculated integral DFII index for Kazakhstan's regions in 2025, enabling comparison of digital financial inclusion levels and assessment of existing territorial differentiation.

Table 5 — Indicators of digital financial inclusion for the regions of Kazakhstan, 2025

Region	Non-cash transactions by volume, %	Used cards/ cards in circulation, %	POS per 1000 used cards	Non-cash transactions per used card	DFII
Almaty city	91,05	51,17	31,37	572,02	77,60
Astana city	85,67	49,39	44,56	388,38	69,14
Almaty region	91,75	57,22	24,61	185,69	58,14
Atyrau region	85,39	50,34	33,13	286,38	53,37
Akmola region	81,81	52,02	37,21	198,03	49,67
Turkestan region	90,77	55,44	17,86	206,78	49,11
Ulytau region	79,42	56,92	26,95	224,85	45,89
Mangystau region	82,84	51,59	27,54	270,79	45,70
Aktobe region	83,04	49,49	30,84	262,62	45,41
West Kazakhstan region	83,72	49,28	29,26	241,41	43,23
Pavlodar region	77,84	51,28	33,90	217,92	41,39
Karaganda region	80,14	51,10	30,61	215,32	40,94
Kostanay region	77,59	50,36	36,15	196,83	40,51
Zhambyl region	82,11	49,41	27,44	250,05	40,11
Shymkent city	83,61	40,63	30,50	383,47	39,73
Zhetisu region	84,41	49,64	20,23	279,08	38,49
East Kazakhstan Region	77,87	48,99	32,76	197,80	35,70
Kyzylorda Region	83,29	46,48	23,33	245,59	33,14
Abay Region	78,75	50,10	24,92	209,04	31,88
North Kazakhstan Region	72,88	49,76	29,89	155,25	25,02
Note – DFII is a relative index within the set of 20 regions and is not an indicator of the population's well-being. Source: calculated by the authors based on data from the National Bank of the Republic of Kazakhstan for 2025 (National Bank)					

The range of DFII values is more than 52 points - from 25.02 to 77.60- which confirms the presence of significant spatial differentiation in digital financial inclusion, even in the context of the overall high level of payment digitalisation in the country.

The most pronounced transactional activity is characteristic of the largest cities. In Almaty, the number of non-cash transactions reaches 572 per card; in Astana, it is about 388; and in Shymkent, it is 383. These values significantly exceed those of most regions and reflect a higher intensity of use of digital financial instruments in large urban agglomerations.

At the same time, a high share of non-cash transactions is not always accompanied by a high density of physical payment infrastructure. For example,

in the Turkestan Region, non-cash transactions account for 90.77% of card transactions by volume, while the density of POS terminals is only 17.86 per 1,000 used cards. This suggests that the spread of mobile banking and QR payments partially reduces digital financial inclusion's dependence on traditional terminal infrastructure.

A similar trend is observed in the Almaty Region. Here, the share of cashless transactions is 91.75%, and the share of cards in use reaches 57.22%, but the number of transactions per card remains noticeably lower than in the largest cities. Consequently, a high level of digital inclusion can be achieved through various combinations of infrastructure and behavioural factors.

The results obtained allow us to preliminarily identify at least two models of high digital financial inclusion. The first is an infrastructure-intensive urban model, characterised by a high frequency of transactions, a developed payment infrastructure, and active use of remote financial services. The second is based on broad cashless coverage with relatively lower transaction intensity and a more limited density of physical infrastructure.

When interpreting regional differences, it is necessary to consider the specifics of card transaction statistics. The data record the location and infrastructure of the transactions and do not always fully correspond to the cardholder's place of permanent residence. The concentration of businesses, trade, financial organisations, and digital platforms in Almaty and other major cities may further increase the recorded transactional activity. In this regard, it is advisable to interpret the DFII primarily as a characteristic of the regional financial and payment ecosystem, rather than as an assessment of the population's digital activity in a specific region.

The identified heterogeneity of regional indicators shows that ranking based on the integral index alone is insufficient to reveal the internal structure of digital financial inclusion. Regions with similar DFII values may differ significantly in terms of the combination of individual components - the intensity of non-cash transactions, the share of card usage, the level of non-cash turnover, and the availability of payment infrastructure. To identify homogeneous groups of regions and determine typical models of digital financial behaviour, we also conducted a cluster analysis using four standardised indicators.

The clustering allowed us to group regions not based on a single aggregate value, but on the similarity of the full set of characteristics of digital financial activity. As a result, we identified four distinct profiles, reflecting different combinations of payment instrument use, transaction intensity, and infrastructural security.

Table 6 — Results of the cluster analysis of the regions of Kazakhstan

Cluster	Regions:	Cashless turnover, %	Card activity, %	POS per 1,000 used cards	Transactions per card
I - high cashless orientation	Almaty, Turkestan	91,26	56,33	21,23	196,23
II - high-intensity urban model	Almaty, Astana, Shymkent	86,78	47,07	35,48	447,96
III - moderate intensity with well-developed physical infrastructure	Akmola, East Kazakhstan, Karaganda, Kostanay, Pavlodar, North Kazakhstan, Ulytau	78,22	51,49	32,50	200,86
IV - transitional balanced model	Aktobe, Atyrau, Zhambyl, West Kazakhstan, Kyzylorda, Mangystau, Zhetysu, Abay	82,94	49,54	27,09	255,62
Source: authors' calculation using the k-means method based on data from the National Bank of the Republic of Kazakhstan.					

The first cluster is characterised by a very high share of non-cash monetary turnover and a high ratio of cards in use to the total number of cards in circulation. At the same time, POS infrastructure density is relatively low. This configuration of indicators suggests that high digital financial activity can be achieved not by expanding the physical network of payment acceptance points, but by using remote and mobile channels.

The second cluster unites the three largest cities in the country. Its key feature is not the maximum number of payment cards as such, but the exceptionally high transaction intensity - on average, about 448 non-cash transactions per used card. The result confirms the need to distinguish between financial access and actual digital use: the presence of a financial instrument creates the opportunity to participate in the financial system, but it does not reflect the frequency and depth of its practical application.

A relatively well-developed physical payment infrastructure characterises the third cluster, but with a lower share of non-cash turnover and lower transaction intensity. This indicates no direct correlation between the number of POS terminals and the intensity of digital financial service use. At the current level of payment system development, further mechanical expansion of the physical infrastructure is not necessarily accompanied by a proportional increase in users' digital activity.

The fourth cluster occupies an intermediate position. In the regions in this cluster, digital financial products have already become widely распространёнными. However, the frequency and structure of their use still differ from the model characteristic of the largest urban centres. This allows us to consider this cluster as a group of territories where formal access to digital financial instruments has already been established. At the same time, their practical use can still intensify.

Thus, cluster analysis confirms the heterogeneity of mechanisms for fostering digital financial inclusion across Kazakhstan. Similar final levels of digitalisation

can emerge under various combinations of financial accessibility, physical payment infrastructure, and actual transactional activity. Consequently, measures to promote financial inclusion cannot be fully standardised for all territories. In some regions, the main reserve is to increase the intensity of use of existing financial instruments; in others, it is to expand the availability of remote services; and in areas with a fairly high level of basic digitalisation, financial literacy, security, and the population's ability to effectively use more complex financial products are becoming increasingly important.

At the same time, clustering can identify typical combinations of characteristics. However, on its own, it does not show the extent to which individual characteristics of financial accessibility relate to differences in regions' actual digital activity. To test this relationship, we built a regression model as the next stage of the analysis. In this study, we use it as an exploratory analytical tool to assess whether traditional indicators of financial infrastructure accessibility can explain interregional differences in the intensity of use of digital financial products.

This approach is especially important given the previously identified discrepancy between the physical availability of payment infrastructure and actual transactional activity. If an increase in the number of cards or POS terminals does not lead to comparable growth in digital transactions, it suggests that the availability of financial instruments and the depth of their use are interrelated but not identical characteristics of financial inclusion. Regression analysis allows us to quantitatively test this assumption and determine the direction and statistical significance of the identified relationships.

Table 7 — Results of the interregional regression model

Variable	Ratio	Robastnaya st. error HC3	p-value
Constant	-0,318	0,138	0,021
Share of non-cash transactions	0,244	0,193	0,206
Share of cards used	-0,062	0,268	0,817
POS per 1,000 used cards	-0,026	0,218	0,906
Largest city (Almaty, Astana, Shymkent)	2,117	1,178	0,072

$$N = 20; R^2 = 0,789; \text{Adjusted } R^2 = 0,732.$$

The robust F-statistic of the model has $p=0.110$.

Source: authors' calculation.

The regression model explains 78.9% of regional variation in transaction intensity, although the small sample limits statistical reliability. With robust standard errors, none of the main continuous variables is significant at the 5% level. The large-city indicator has a positive coefficient ($\beta = 2.117$; $p = 0.072$), suggesting weak evidence of higher transaction intensity in major urban centres without establishing causality.

The absence of a significant independent relationship between POS terminal density and transaction intensity indicates that physical infrastructure alone cannot explain digital financial activity. Mobile banking, QR payments, digital platforms, and behavioural factors increasingly influence financial service usage. Thus, the hypothesis of a universal relationship between accessibility indicators and usage intensity is only partially supported, confirming the multidimensional nature of digital financial inclusion.

Four aspects determine the effectiveness of digital financial products. First, actual usage differs from formal availability: as of January 1, 2026, only 42.6 million of 84.6 million issued payment cards were actively used. Second, regional transaction intensity per active card varies more than threefold, even excluding Almaty, reflecting differences in financial behaviour.

Third, although non-cash transactions accounted for 98.3% of card transactions by number in 2025, their share by value was 87.2%, indicating the continued importance of cash withdrawals, particularly for larger amounts. Fourth, active internet and mobile banking users increased by 32.4%, while POS terminals decreased by 5.3% and card-accepting retail establishments increased by 6.6%. These trends reflect a shift from physical payment infrastructure towards integrated digital financial ecosystems.

Consequently, financial inclusion effectiveness should be assessed through accessibility, actual usage, transaction intensity, digital convenience, and users' ability to meet financial needs. However, expanded digital access also increases exposure to credit, behavioural, and technological risks.

Consumer lending illustrates this contradiction. In 2025, loans to individuals increased by 19.8% to KZT 24.8 trillion, compared with 22.9% growth in 2024. Consumer loans rose by 21.0% to KZT 16.7 trillion. Meanwhile, unsecured consumer lending growth slowed from 29.3% to 14.5%, and new loan issuance growth declined from 22.6% to 6.1% (Agency of the Republic of Kazakhstan for Regulation and Development of the Financial Market, 2026).

These findings highlight the dual effects of digital inclusion: improved financial accessibility alongside potential increases in household debt and financial vulnerability. Therefore, assessments should consider both financial service usage and associated risks. Table 8 summarises the main risk categories, their empirical manifestations, and implications for sustainable financial inclusion.

Table 8 — Main groups of risks in digital financial inclusion

Risk group	Empirical manifestation:	Significance for financial inclusion:
Credit	Loans to the population - 24.8 trillion tenge; consumer loans - 16.7 trillion tenge.	Credit availability can turn into excessive debt burden.
Portfolio quality risk	NPL90+ for the banking sector - 3.6% as of the beginning of 2026.	Growth in credit use requires monitoring of the ability to service debt.
Fraudulent	The Anti-Fraud Centre registered 80,871 incidents with signs of fraud.	An increase in digital turnover expands the potential attack surface.

Behavioral	Simplicity of remote payment and credit.	Impulsive spending and excessive borrowing are possible.
Digital literacy	Need to recognise phishing, social engineering, and insecure channels.	Formal access does not guarantee safe use.
Data risk	Transmission and processing of large volumes of personal information. Uneven distribution of skills and opportunities for using digital channels.	It requires a well-developed data protection system and control over algorithmic decisions.
Digital exclusion	Empirical manifestation:	Part of the population may have an account but have limited access to services.
Source: compiled by the authors based on data from the ARFR, the National Bank of the Republic of Kazakhstan, and the OECD. (Gosportal of the Republic of Kazakhstan)		

Financial fraud represents a significant risk to digital financial inclusion. As of January 1, 2026, Kazakhstan's National Bank Anti-Fraud Centre recorded 80,871 incidents involving suspected fraudulent transactions, blocked KZT 2.8 billion in suspicious operations, and facilitated the recovery of over KZT 0.5 billion for affected citizens (National Bank of the Republic of Kazakhstan, 2026). However, suspected incidents should not be equated with confirmed fraud when calculating its prevalence. These findings highlight the importance of transaction monitoring, consumer protection, and rapid response mechanisms.

Additional risks arise from insufficient digital financial literacy and uncontrolled borrowing. Although digital payments, short-term online loans, and Buy Now Pay Later services improve convenience and accessibility, they may encourage impulsive spending, excessive indebtedness, and exposure to fraud (OECD, 2025).

Therefore, effective digital financial inclusion should be assessed not only through financial accessibility and usage intensity but also through security, responsible borrowing, and economic benefits. Its fundamental objective is to improve users' financial well-being without disproportionately increasing debt burdens or financial vulnerability.

Discussion. The findings confirm that digitalisation has significantly expanded financial inclusion in Kazakhstan, consistent with Ozili (2018), Sahay et al. (2020), Aduba et al. (2023), and Basnayake et al. (2024). The country has shifted from basic financial access towards intensive digital service usage. With non-cash transactions exceeding 98% of card transactions by number and only approximately half of 84.6 million issued cards actively used, actual financial participation has become more informative than formal accessibility.

Regional disparities remain substantial. Almaty and Astana demonstrate high transaction intensity, while Almaty and Turkestan regions achieve significant non-cash activity despite relatively limited POS infrastructure. This supports the concept of digital leapfrogging, whereby mobile technologies compensate for traditional infrastructure constraints.

Exploratory regression found no statistically stable relationship between

POS terminal density and non-cash transaction frequency. Although the sample includes only 20 regions, this result reflects the growing importance of mobile and internet banking. Financial inclusion assessments should therefore consider digital connectivity, usage intensity, financial literacy, and consumer protection alongside physical infrastructure.

Digital financial expansion also generates risks, consistent with Cevik (2024), Elekdag et al. (2024), and Sant'Anna and Figueiredo (2024). Consumer lending improves access to financial resources but may increase over-indebtedness, while digital transactions create exposure to fraud and cybersecurity threats. Financial access should therefore be distinguished from financial well-being, which requires responsible product use and household financial resilience.

The study proposes an expanded conceptual framework:

$$\text{Effective DFI} = f(\text{Access, Use, Efficiency, Resilience, Safety}).$$

The components reflect product availability, actual usage, practical benefits, resilience to financial shocks, and protection against digital and financial risks. This approach moves beyond conventional indicators based on account ownership and card issuance.

Practical implications. Kazakhstan should prioritise the quality and security of financial services rather than merely increasing user numbers. Regional policies should address differences in transaction intensity, digital infrastructure, and financial competencies. Priority measures include responsible digital lending, affordability assessments, fraud prevention, cybersecurity, and digital financial literacy. Monitoring should incorporate active users, service costs, household debt burdens, fraud incidents, and consumer protection indicators. Combining administrative statistics with representative surveys would improve regional assessments.

Limitations of the study. The Digital Financial Inclusion Index (DFII) measures relative regional differences rather than absolute financial well-being. Equal weighting of its four components is a normative choice that could be refined through PCA, entropy methods, or expert assessments. Regional transaction statistics do not always correspond to users' residence, particularly in Almaty and Astana.

The regression includes only 20 observations and does not establish causality. Global Findex 2025 reflects 2024 survey data, while National Bank statistics cover 2025, preventing their direct combination into a single panel. Global Findex covers approximately 148,000 adults across 141 economies, including 1,000 observations for Kazakhstan requiring survey weights (World Bank, 2025). Finally, insufficient regional data on debt, fraud, and financial literacy prevent constructing a reliable regional Risk Index; these risks are therefore assessed separately at the national level.

Conclusion. The study showed that financial inclusion in Kazakhstan has undergone a qualitative transformation over the past decade. If in the mid-2010s the key indicator of the population's inclusion in the financial system was the availability of payment cards and banking infrastructure, by 2025 the main focus shifted to the intensity of use of mobile services, cashless payments, and digital channels of interaction with financial organisations.

In 2025, the number of non-cash transactions using payment cards issued by Kazakhstani issuers reached 13.99 billion, and their volume amounted to 188.41 trillion tenge. Non-cash transactions accounted for 98.3% of the total number and 87.2% of the total monetary volume of card transactions. These indicators suggest that a digital model of everyday payments has effectively taken shape.

At the same time, digital financial inclusion is characterised by significant regional heterogeneity. The developed DFII ranges from 25.02 to 77.60 points, and cluster analysis has identified four distinct types of regional financial and payment ecosystems. This means a policy aimed at further developing financial inclusion uniformly across all regions will be less effective than a differentiated approach.

The analysis also showed that the number of issued cards is gradually losing its significance as an independent indicator of financial inclusion. The number of cards actually used, the intensity of non-cash transactions, the spread of mobile banking, and the structure of payment channels are becoming more informative.

At the same time, the expansion of digital financial inclusion does not eliminate financial risks. The growth of loans to the population to 24.8 trillion tenge, the significant volume of consumer lending, and the registration of tens of thousands of transactions with signs of fraud indicate the need for a broader approach to assessing the results of digitalisation.

Therefore, it is advisable to consider the further development of financial inclusion in Kazakhstan through the concept of effective and secure digital financial inclusion, in which access to a financial product is complemented by its regular and rational use, the user's financial stability, the protection of their data, and the ability to manage credit and digital risks.

The study's main scientific conclusion is that expanding digital access is not the outcome of financial inclusion. At the mature stage of digitalisation, the key factor becomes the relationship between accessibility, intensity of use, the product's economic utility, and the risk the user takes. This transition from a quantitative to a qualitative understanding of financial inclusion appears to be the most relevant direction for further research into the financial behaviour of Kazakhstan's population.

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