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DIGITAL ANALYTICS OF ETHNOSOCIAL PROCESSES AS A TOOL FOR THE EARLY IDENTIFICATION OF CONFLICT RISKS

Abstract. The rapid development of digital communication environments has significantly transformed ethnosocial interactions and interethnic relations in modern multiethnic societies. Traditional descriptive approaches are increasingly insufficient for the timely identification of emerging tensions and potential conflicts. This study examines the potential of digital analytics as a proactive tool for the early detection of ethnosocial conflict risks. A methodological framework based on the calculation of ethnosocial indices is proposed, integrating indicators such as migration dynamics, socio-economic conditions, existing conflict factors, and patterns of interaction in the digital environment. To assess the relevance of the proposed approach, an expert survey was conducted among specialists in sociology, political science, and ethnopolitics, confirming the necessity of using digital tools for monitoring ethnosocial dynamics and identifying conflict risks.

Keywords: ethnosocial processes, digital analytics, conflict risk identification, interethnic relations, ethnosocial indices, expert survey, conflict prevention.

Фарида Каюпова, Мира Бақытжанова, Айгүл Перекеева ҚАҚТЫҒЫС ҚАУІПТЕРІН ЕРТЕ АНЫҚТАУ ҚҰРАЛЫ РЕТІНДЕ ЭТНОӘЛЕУМЕТТІК ПРОЦЕСТЕРДІҢ САНДЫҚ ТАЛДАУЫ

Андатпа. Цифрлық коммуникациялық ортаның қарқынды дамуы қазіргі көп-этносты қоғамдардағы этноәлеуметтік өзара әрекеттесу мен этносаралық қатынастардың сипатын елеулі түрде өзгертті. Дәстүрлі сипаттамалық тәсілдер туындап жатқан шиеленістер мен ықтимал қақтығыстарды уақтылы анықтауға көбіне жеткіліксіз болып отыр. Бұл зерттеу этноәлеуметтік қақтығыс тәуекелдерін ерте кезеңде анықтаудың проактивті құралы ретінде цифрлық аналитиканың әлеуетін қарастырады. Зерттеуде көші-қон динамикасы, әлеуметтік-экономикалық жағдайлар, қолданыстағы қақтығыс факторлары және цифрлық ортадағы өзара әрекеттесу үлгілері сияқты көрсеткіштерді біріктіретін этноәлеуметтік

индекстерді есептеуге негізделген әдістемелік модель ұсынылады. Ұсынылған тәсілдің өзектілігін бағалау мақсатында әлеуметтану, саясаттану және этносаясат салаларының мамандары арасында сараптамалық сауалнама жүргізіліп, этноәлеуметтік динамиканы мониторингілеу және қақтығыс тәуекелдерін анықтау үшін цифрлық құралдарды қолданудың қажеттілігі расталды.

Түйін сөздер: *этноәлеуметтік үдерістер, цифрлық аналитика, қақтығыс тәуекелдерін анықтау, этносаралық қатынастар, этноәлеуметтік индекстер, сараптамалық сауалнама, қақтығыстардың алдын алу.*

Фарида Каюпова, Мира Бакытжанова, Айгуль Перекеева
**ЦИФРОВАЯ АНАЛИТИКА ЭТНОСОЦИАЛЬНЫХ ПРОЦЕССОВ
КАК ИНСТРУМЕНТ ДЛЯ РАННЕГО ВЫЯВЛЕНИЯ КОНФЛИКТНЫХ
РИСКОВ**

Аннотация. Быстрое развитие цифровой коммуникационной среды существенно трансформировало характер этносоциальных взаимодействий и межэтнических отношений в современных полиэтничных обществах. Традиционные описательные подходы все чаще оказываются недостаточными для своевременного выявления возникающих напряженностей и потенциальных конфликтов. В данной статье рассматривается потенциал цифровой аналитики как проактивного инструмента раннего выявления рисков этносоциальных конфликтов. Предлагается методологическая модель, основанная на расчёте этносоциальных индексов, интегрирующих такие показатели, как миграционная динамика, социально-экономические условия, существующие конфликтные факторы и особенности взаимодействия в цифровой среде. Для оценки актуальности предложенного подхода был проведён экспертный опрос специалистов в области социологии, политологии и этнополитики, подтвердивший необходимость использования цифровых инструментов для мониторинга этносоциальной динамики и выявления конфликтных рисков.

Ключевые слова: *этносоциальные процессы, цифровая аналитика, идентификация конфликтных рисков, межэтнические отношения, этносоциальные индексы, экспертный опрос, предотвращение конфликтов.*

Introduction

The current stage of Kazakhstan's socio-economic development is characterized by the necessity of transitioning from reactive responses to crisis phenomena toward anticipatory governance of regional stability and the reduction of conflict potential. In the state's strategic documents — the “Kazakhstan-2050” Strategy [1], the Concept of Digital Transformation and Development of ICT and Cybersecurity for 2023–2029 [2], the Addresses of the President of the Republic of Kazakhstan for 2024 and 2025 [3][4], as well as the Concept for the Development of the Assembly of the People of Kazakhstan (Decree of the President of the Republic of Kazakhstan dated 29 December 2025 No. 1144 “On Approval of the Concept for the Development of the Assembly of the People of Kazakhstan until 2030 ‘Unity in Diversity’”) [5] — priorities are defined for enhancing the effectiveness of public administration, advancing digitalization, developing human capital, and strengthening societal stability. These policy documents lay the foundation for the implementation of digital tools for analyzing social well-being and the early identification of destabilization risks.

Contemporary multi-ethnic regions are characterized by a high degree of dynamism in interethnic processes, which creates a sustained demand for the improvement of governance tools in the ethnosocial sphere. In this context, proactive approaches to the identification, assessment, and monitoring of ethnosocial risks have gained particular relevance, as they enhance the accuracy of forecasting potential social tensions and improve the effectiveness of managing interethnic communications.

Despite a substantial body of theoretical and applied research in ethnopolitics and interethnic relations, systematic quantitative approaches based on index models combined with expert assessment remain insufficiently developed and require further conceptual refinement and empirical validation.

This article aims to synthesize the results of conducted research and to develop a theoretical and methodological framework for constructing a system of ethnosocial indices intended for the comprehensive analysis of the state and dynamics of interethnic interactions in a regional context. The study addresses the question of how ethnosocial risks can be structurally organized and quantitatively assessed through an index-based approach combined with expert analysis, taking into account regional and institutional specificities.

In accordance with this objective, the following tasks were accomplished:

1. an analysis of domestic and international scholarly approaches to the study of ethnosocial processes and digital methods for monitoring social tensions, with the identification of existing methodological limitations;
2. the development and theoretical justification of a methodology for calculating ethnosocial indices designed for subsequent application in GIS-based modelling and comparative analysis;
3. the engagement of experts in political science, ethnopolitics, and social research to evaluate the proposed methodology and determine directions for its further validation;
4. the synthesis of expert assessments from representatives of academia, government institutions, and ethnocultural associations regarding the practical applicability of the proposed approach;
5. the systematization of expert evaluation results and the identification of prospects for implementing proactive analytical tools in interethnic governance practice;
6. the theoretical substantiation of the integration of index-based approaches, expert analytics, and digital technologies into a unified system for the early detection of ethnosocial risks.

Literature Review

As a substantial portion of social interactions increasingly shifts into the digital environment, the mechanisms underlying the formation, expression, and dissemination of ethnosocial processes are likewise undergoing profound transformation. Contemporary digital platforms function not only as spaces for communication but also as environments in which public sentiments are shaped, collective identities are reproduced, and intergroup tensions are either amplified or mitigated. Under these conditions, traditional qualitative approaches to the study of ethnosocial dynamics are no longer sufficient to fully capture the speed, scale, and complexity of ongoing transformations. This shift necessitates a transition toward

computational, data-driven, and predictive analytical frameworks, including tools from computational social science, natural language processing (NLP), and network analysis, which enable real-time monitoring and large-scale assessment of social processes within digital environments.

Empirical studies by Joni Salminen et al. demonstrate the effectiveness of multi-platform hate speech detection models trained on large-scale corpora of user-generated content [6]. Significant contributions to the development of interpretable models have been made by Harshkumar Mehta and Kalpdrum Passi, who advocate the use of explainable artificial intelligence (XAI) for analyzing the decision-making processes of detection algorithms [7]. The advancement of benchmark-driven approaches to the explainable identification of conflict-inducing content is further evidenced by the HateXplain framework [8], while modern transformer-based architectures and multilingual fine-tuned models have demonstrated high accuracy in classifying ethnically sensitive discourse [9].

The second group of studies focuses on the analysis of digital polarization and the structural characteristics of network interactions that shape the diffusion of conflict-related narratives in online environments. Within this research strand, particular attention is devoted to how the architecture of social networks and mechanisms of information selection contribute to the formation of cognitive and ideological segregation among users.

For instance, the study by Bakshy, Messing, and Adamic, based on Facebook data, demonstrates that algorithmic content filtering systems limit exposure to ideologically cross-cutting information; however, they are not the primary driver of political segregation, as a substantial portion of such segregation is attributable to users' own selective exposure and individual choices [10].

Comparable findings were reported by Cinelli et al., who, through a cross-platform analysis, identified a persistent “echo chamber” effect in social media ecosystems, particularly within politically engaged communities [11].

Additionally, Conover et al. show that politically polarized communities on Twitter form distinctly separated informational clusters characterized by weak intergroup connectivity, which reinforces intragroup cohesion while reducing informational permeability between groups [12]. Collectively, these studies suggest that the structure of digital networks not only mirrors pre-existing social and ideological divisions but also actively amplifies them through mechanisms of homophily and selective exposure.

Thus, the reviewed literature underscores the necessity of a comprehensive analytical framework for ethnosocial processes that accounts not only for the content of digital communications but also for the structural organization of the networks through which such information disseminates.

Furthermore, the study by Tekiroğlu, Chung, and Guerini demonstrated that digital platforms may function not only as environments that intensify polarization, but also as spaces for its mitigation through mechanisms of counter-narrative interaction [13]. The authors substantiated the effectiveness of the automated generation of “counter-narratives” — textual responses to hate speech and radicalized discourse aimed at reducing the dissemination of destructive content and preventing the further escalation of conflictual communication. Particular emphasis was placed on the integration of natural language processing techniques, generative models, and expert-based content verification, highlighting the potential of incorporating AI-

driven instruments into systems for monitoring and managing digital ethno-social risks. In this regard, the study confirms that the analysis of digital communication should address not only processes of network segmentation and the formation of “echo chambers,” but also the possibilities of proactive communicative intervention capable of reducing levels of social tension within online environments.

Thus, contemporary scholarship (2020–2025) demonstrates a growing interest in the application of digital approaches to the study of ethno-social processes. Nevertheless, a substantial methodological gap persists: to date, there remains no comprehensive model integrating digital communication analytics, quantitative indices of social tension, and regional comparative parameters into a unified framework for monitoring and forecasting interethnic dynamics. This gap underscores the necessity of developing integrated interdisciplinary approaches that combine machine learning methods, sociological theory, and digital governance frameworks.

Research Hypothesis

The author’s original hypothesis posits that integrating an index-based approach with expert evaluation and the use of digital technologies, including GIS modelling elements, enables the creation of a proactive system for monitoring ethnosocial processes, enhancing the effectiveness of interethnic communication and governance decisions.

To test this hypothesis, a methodology for calculating two ethnosocial indices was developed, and its expert evaluation was conducted. As part of the empirical component of the study, an expert survey was carried out between 3 and 5 February of the current year, involving 28 specialists from various regions of the Republic of Kazakhstan, including the capital and regions characterized by pronounced ethnocultural specificity (Mangystau, Almaty, Karaganda, Pavlodar, and Turkestan regions). The experts represented the academic sector, public administration bodies, and ethnocultural associations, ensuring a multilayered and balanced assessment of the applicability and practical relevance of the proposed methodology.

The obtained results are of a synthesizing nature and encompass both the expert evaluation of the proposed ethnosocial index calculation methodology and the analysis of the expert survey data aimed at identifying the degree of its applicability within the system of monitoring ethnosocial processes.

Methodology

Within the proposed framework, the author introduces two composite ethnosocial indices.

The first—the Index of Content Conflict and Distortion (ICCD)—is designed to assess the risk of conflictual interactions and the level of dissemination of distorted information in digital environments. The index is calculated on the basis of three interrelated parameters: the proportion of publications containing incomplete or inaccurate information, the average share of negative comments (measured using sentiment analysis techniques), and the potential audience reach, operationalized as the number of subscribers or users engaged in a given discussion. This combination of indicators enables the assessment of communicative toxicity, the degree of informational manipulation, and the overall level of ethnosocial tension within online spaces.

The second—the Index of Ethnosocial Well-Being (IEWB)—is aimed at a comprehensive assessment of the stability and quality of interethnic relations within a region. It integrates demographic, migration, economic, event-based, and media-discursive indicators, thereby enabling the identification of early warning signals of social tension, the diagnosis of risk zones, the assessment of the adaptability of the regional social environment, and the forecasting of potential threats to ethnosocial stability.

A promising direction for further development of the methodology is its digital integration into GIS-based platforms, allowing for spatial analysis, visualization, and near real-time monitoring of ethnosocial dynamics. At the same time, the practical implementation of such a system presupposes mandatory stages of expert verification, scientific validation, and confirmation of applied effectiveness. It is expected that the integration of these indices into GIS environments will enhance the speed of response, strengthen preventive monitoring, and support more evidence-based decision-making. Detailed analysis is presented in Table 1.

Table 1. Structure of Ethnosocial Indices

Index	Purpose	Key Components	Core Functions
Index of Content Conflict and Distortion (ICCD)	Assessment of digital conflict risks and informational toxicity	- share of distorted/incomplete information - proportion of negative comments (sentiment analysis) - potential audience reach	- identification of conflictual digital content - assessment of informational manipulation - measurement of online tension
Index of Ethnosocial Well-Being (IEWB)	Comprehensive assessment of the stability of interethnic relations	- demographic indicators - migration processes - economic indicators - frequency and intensity of conflict incidents	- early risk detection - identification of tension zones - assessment of regional resilience - forecasting ethnosocial stability

The methodology received a positive expert evaluation and was recommended for further academic validation by an internal expert—a Candidate of Political Sciences, Professor at the Department of Political Science, Faculty of International Relations, L. N. Gumilyov Eurasian National University (26 January 2026)—as well as by the Head of the Department of Comparative Political Science, Faculty of Political Science, Lomonosov Moscow State University, Doctor of Political Sciences, Associate Professor (29 December 2025).

To evaluate the practical feasibility of the methodology, an expert survey was conducted involving 28 specialists representing diverse regions and institutional groups. The geographic structure of the sample included the capital city, Astana, as well as cities and regions with high ethnocultural heterogeneity, such as Mangystau region and the city of Aktau, alongside Almaty, Karaganda, Pavlodar, and Turkestan regions. This design enabled the study to capture both the strategic perspective of capital-based policymakers and a regionally grounded evaluation of interethnic communication dynamics.

The institutional diversity of the experts provided a multilayered analysis of the processes under investigation. Participants included representatives from the academic sector, state governance bodies, and ethnocultural associations, allowing

the assessment of interethnic communications from scholarly, managerial, and practical perspectives.

The methodology was recommended for academic validation by an internal expert — Candidate of Political Sciences, Professor of the Department of Political Science, Faculty of International Relations, L. N. Gumilyov Eurasian National University (26 January 2026) — as well as by the Head of the Department of Comparative Political Science, Faculty of Political Science, Lomonosov Moscow State University, Doctor of Political Sciences, Associate Professor (29 December 2025).

The expert survey facilitated an evaluation of the potential for integrating the index-based approach with digital tools and GIS modelling elements, identified potential avenues for implementing the methodology in regional monitoring systems of ethnosocial processes, and provided recommendations for enhancing communication strategies. Data collection was conducted using standardised questionnaires and structured interviews, ensuring comparability of responses and high analytical density of the obtained information.

In summary, the conducted study provided both theoretical and methodological substantiation and expert validation of the methodology for calculating ethnosocial indices. It also tested the hypothesis regarding the feasibility of integrating an index-based approach, expert evaluation, and digital technologies in the analysis of interethnic communications. The developed model allows for the creation of a comprehensive analytical instrument to study interethnic processes, taking into account the geographic and institutional characteristics of regions. The obtained results provide a methodological foundation for further empirical testing and the development of the author's model for proactive analysis of ethnosocial risks and the enhancement of interethnic governance in multiethnic societies.

Research Results

For data analysis and index calculation, a combined approach is employed, integrating digital, sociological, and official sources. Digital tools include Pathsocial for profiling and analyzing user activity on social networks, Thunderbit Instagram Comments Insights for extracting comments and assessing their sentiment, as well as API-based platforms (Meta, X/Twitter, YouTube, Telegram, TikTok) for structured data retrieval with metadata.

In addition to digital sources, official datasets and documents are utilized, including demographic and migration statistics, socio-economic indicators, reports from government agencies, legal and regulatory acts, programs on interethnic relations, and media publications. These sources enable the incorporation of real-world events, institutional context, and territorial specificities of the region.

Content analysis covers the systematization of topics, identification of key actors, emotional markers, and sentiment of messages, using NLP algorithms combined with manual verification. The integration of digital and offline data, expert information, and official statistics enhances the accuracy of the indices, reduces the risk of unilateral interpretation, and enables the identification of early warning signals of tension as well as forecasting the dynamics of the ethnosocial situation.

The algorithm for constructing the Index of Content Conflict and Distortion (ICCD) and the Index of Ethnosocial Well-Being (IEWB) is based on a stepwise integration of heterogeneous data and includes the following key stages:

1. Data collection. Data sources are defined, including digital platforms (for the first index) and statistical, demographic, event-based, and media datasets (for the second index). At this stage, posts, comments, migration and economic indicators, complaints, and local narratives are extracted.

2. Data cleaning and preprocessing. Data are normalized, duplicates are removed, texts are lemmatized, events are categorized, and all variables are transformed into a comparable format.

3. Indicator extraction.

- For the Index of Content Conflict and Distortion — the share of posts with incomplete/inaccurate information, the proportion of negative comments (sentiment analysis), and audience reach.

- For the Index of Ethnosocial Well-Being — structural indicators (migration, employment), event-based indicators (incidents), discursive and media indicators, and the dynamics of local narratives.

4. Data normalization. All indicators are rescaled to a unified scale (0–1 or 0–100), ensuring comparability. Min–max normalization is applied.

5. Weight assignment. Weights are assigned to indicators—either equally, expert-defined, or derived using statistical methods.

6. Indicator aggregation. Normalized indicators are integrated into a composite index using a summation formula or weighted mean, producing the final index value.

7. Interpretation and classification. Final index values are classified into risk/well-being levels (low, medium, high), enabling clear analytical interpretation.

8. Spatial visualization capability. After computation, indices can be geographically mapped (district, city, region) within a GIS framework, including dynamic temporal monitoring.

The formula for calculating the Index of Content Conflict and Distortion (ICCD) as an integration of three key indicators is as follows:

- Share of posts with incomplete information (D_n);
- Average share of negative comments (D_{neg});
- Number of subscribers (O_{xp}), representing potential reach.

Notation:

D_n — share of posts with incomplete information (in percentages or proportions);

D_{neg} — average share of negative comments per post (in percentages or proportions);

O — number of subscribers or potential reach.

Given that an integral assessment is assumed, the value is calculated using the following formula:

$$ICCD = (\alpha \times D_n + \beta \times D_{neg} + \gamma \times f(O)) \times 100$$

where:

α , β , γ — coefficients or weights determining the importance of each indicator, typically summing to 1 ($\alpha + \beta + \gamma = 1$);

$f(O)$ — a function characterizing the role of reach, for example, a normalized measure of O (e.g., division by the maximum reach value in the dataset) or alternatively the use of the absolute number of subscribers.

The Index of Ethnosocial Well-Being is represented by the following formula:

$$IEWB = w_1M + w_2E + w_3C$$

where:

M—migration and demographic indicators,
 E—economic indicators of welfare and inequality,
 C — frequency and intensity of conflict incidents,
 and w1, w2, w3, w4 — weights reflecting the significance of components within the overall structure of the index.

Data analysis methods include a set of procedures for processing, interpreting, and verifying information obtained through monitoring the digital environment and ethnosocial processes, aimed at constructing indicators, calculating composite indices, and identifying dynamic trends. In the initial preprocessing stage, data cleaning is performed (removal of duplicates, spam, bots, and noise), followed by normalization and transformation to a unified scale, as well as thematic categorization. Quantitative analysis includes statistical methods (frequency, correlation, and variance analysis), an index-based approach with normalized composite indicators and threshold-based risk classification, as well as trend analysis for identifying dynamics and forecasting changes. The qualitative component includes content analysis aimed at identifying key themes and narratives, narrative and discourse analysis for examining frames and rhetorical strategies, and expert evaluation ensuring validation of results and adjustment of index weighting coefficients.

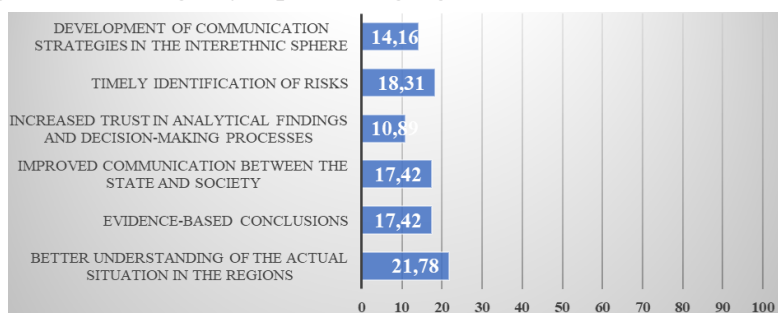
The results of the expert survey demonstrated a robust consensus regarding the necessity of introducing new digital and more objective analytical tools for the assessment of ethnosocial processes, indicating a broad recognition of the limitations inherent in traditional descriptive and predominantly reactive approaches. The experts highly appraised the feasibility and relevance of employing digital interactive platforms, including a real-time interactive map of ethnosocial indices, emphasizing its high level of usability and visual clarity. The most effective areas of application of digital analytical tools were identified as expert-analytical work, public administration, strategic planning, monitoring of social tensions, public opinion analysis, development of communication strategies, and academic research (Figure 1).

Figure 1. The most effective areas of application of digital analytical tools (%)



Among the key advantages of implementing such tools, respondents highlighted the enhanced evidence base for managerial decision-making, a deeper understanding of regional contexts, improved interaction between the state and society, timely identification of potential hotspots of tension, and increased precision in the targeting of communication strategies (Figure 2).

Figure 2. Advantages of implementing digital tools in research



The priority parameters of digital analysis were identified as the index of social tension, the geographical distribution of ethnic groups, the level of ethnosocial well-being, migration indicators, and characteristics of the quality of digital communication. Taken together, these findings substantiate the need to develop a comprehensive digital model for monitoring and analyzing ethnosocial processes.

The study results demonstrated that a digital interactive map with ethnosocial indices integrates analytical, managerial, and communication functions into a single platform. Experts highlighted the usability of visualising complex indicators, allowing for the monitoring of interethnic dynamics over time, across territories, social groups, and thematic areas. This approach aligns with international research on enhancing the effectiveness of social risk monitoring through digital and interactive tools but extends it by enabling simultaneous assessment of conflict, well-being, and institutional resilience while accounting for regional and demographic specifics.

Nevertheless, the study has certain limitations. First, the limited geographic scope (Mangystau region) may affect the generalisability of the findings. Second, the small expert sample and the use of demonstration (hypothetical) index values limit the precision of quantitative assessments. These limitations highlight the need for further studies with expanded geographic coverage, the use of empirical data, and automated digital indicators.

Discussion of Results

The conducted study demonstrated that the introduction of digital and index-based tools for analysing the ethnosocial sphere is both relevant and in high demand. The most significant finding is the identified expert consensus regarding the necessity of transitioning from descriptive and reactive methods to early-warning systems based on digital data and index models. This conclusion aligns with a number of international studies that confirm the positive impact of digitalisation and the integration of analytical tools on the accuracy of monitoring interethnic communications and the capacity for timely adjustment of management decisions.

Specifically, the United Nations report *Our Common Agenda* emphasises the need to establish global early-warning systems based on big data analysis and cross-sectoral coordination [14]. The document highlights a shift from post hoc reaction to preventive analytics, conceptually coinciding with the findings of the present study regarding the need for proactive management of ethnosocial dynamics.

A significant contribution to the development of quantitative methods for conflict forecasting was made by Pettersson, Högladh, and Öberg [15] within the

framework of the Uppsala Conflict Data Program [16]. Their work demonstrates the effectiveness of integrating event-based databases and geospatial analysis to describe and detect hotspots of organised violence at an early stage. However, these models are predominantly oriented towards armed conflicts and require adaptation to analyse latent forms of interethnic tension in multiethnic regions.

Thus, contemporary international research confirms the feasibility of transitioning toward digital and index-based models for monitoring social dynamics. At the same time, a persistent methodological challenge remains the integration of digital data, expert assessments, and regional specificities into a unified framework for analyzing interethnic communication and institutional resilience, which constitutes the scientific novelty of the present study.

At the same time, the implementation of digital analytical tools requires consideration of a range of ethical and methodological constraints, including issues of personal data protection, adherence to confidentiality principles in the processing of digital traces, as well as the minimization of risks associated with algorithmic errors and false-positive outputs in automated content classification. These aspects necessitate the development of additional procedures for data verification and ethical oversight at all stages of the analytical process. Given the novelty and interdisciplinary nature of this field, these issues represent one of the key directions for future research aimed at improving digital analytical models, enhancing their reliability, ethical robustness, and applied applicability in the monitoring of ethnosocial processes.

Conclusion

The practical significance of the results lies in the applicability of the developed methodology and visualization tools for proactive analysis of ethnosocial risks, identification of potential zones of tension, and the formulation of evidence-based managerial and communication strategies. In accordance with the stated research objectives, the analysis of domestic and international approaches to the study of ethnosocial processes and digital methods for monitoring social tension made it possible to identify existing methodological limitations associated with data fragmentation and the predominance of descriptive analytical frameworks.

The developed and theoretically substantiated methodology for calculating ethnosocial indices, designed for subsequent integration into GIS-based modelling and automated visualization systems, ensures comprehensive and comparative analysis of ethnosocial processes at the regional level. The expert evaluation of the methodology, conducted with the participation of domestic and international specialists in political science, ethnopolitics, and social analysis, confirmed its conceptual validity and practical applicability, and enabled the formulation of recommendations for its further testing and refinement.

The expert survey involving representatives of the academic community, public administration bodies, and ethnocultural associations provided additional validation of the proposed approach and demonstrated its high practical relevance within systems for monitoring ethnosocial processes. The synthesis of expert evaluation results allowed for the identification of promising directions for implementing proactive analytical tools in interethnic governance practices, including the development of digital monitoring platforms and the expansion of indicator-based analytical capabilities.

Overall, the study confirms the theoretical foundations of the index approach while simultaneously advancing it by proposing an integrative model that combines quantitative indices, expert analytics, and digital technologies into a unified system for the early detection of ethnosocial risks. The obtained results substantiate the need for further development of this research agenda in the following key directions: expanding the geographical scope of studies to validate the model across diverse multiethnic contexts; incorporating empirical and automated digital data to enhance predictive accuracy; deepening the analysis of the impact of digitalization on perceptions of interethnic communication among different social groups; and further developing GIS-based tools and visualization solutions for operational monitoring and decision-support systems.

Thus, the conducted research demonstrates high scientific and practical significance, providing a methodological foundation for improving interethnic governance systems and enhancing the prevention of ethnosocial risks in multiethnic regions.

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