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Development and Validation of a Methodological Toolkit for Assessing the Effectiveness of Digital Consumer Interaction Systems in the Context of the SDGs

Andrey Rybakov[1*], Antonina Sharkova[2], Darya Kapustina[3], Elena Rechapova[4], Aleksei Guida[5], Igor Prytkov[6], Nadezhda Bankova[3], Ekaterina Petukhova[2]

[1] Department of Political Science, Moscow Aviation Institute, Moscow 125993, Russia
[2] Department of Industrial Markets, Financial University under the Government of the Russian Federation, Moscow 125167, Russia
[3] Department I-11, Moscow Aviation Institute, Moscow 125993, Russia
[4] Centre for Foreign Languages and Communication Technologies, University of Tyumen, Tyumen 625003, Russia
[5] Department of the Integrated Automated Information System, Kyrgyz-Russian Slavic University, Bishkek 720000, Kyrgyzstan
[6] Department of Economics and Humanities, Kamyshinsky Institute of Technology (branch) Volgograd State Technical University, Kamyshin 403874, Russia

Corresponding Author Email: andrey.rybakov@mymail.academy

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ABSTRACT

The article presents a methodological toolkit for evaluating the effectiveness of digital consumer interaction systems in the context of the SDGs. The study's relevance stems from the lack of comprehensive approaches that integrate environmental and social aspects into traditional evaluation systems for digital interactions. Based on a review of academic literature and empirical data, the authors propose a conceptual framework for an integrated assessment model that combines environmental, social, and governance (ESG) metrics. The research methodology employed mixed methods, including an online consumer survey ($n = 512$), web data analysis from 25 digital platforms, instrumental measurement of the digital carbon footprint across 15 platforms, an expert survey involving 20 specialists, and case studies of 10 companies from Russia and Central Asia. The results showed significant discrepancies between traditional marketing metrics and ESG performance indicators ($r = 0.24$, $p < 0.05$). The developed toolkit consists of nine composite metrics that are consolidated into an integrated digital sustainability index (IDSI). Validation through expert assessment and pilot testing in five companies confirmed its high relevance (an average expert rating of 4.2 out of 5). The proposed methodology represents an initial step toward building a comprehensive assessment system, which requires further validation through larger industry-specific samples and longitudinal testing across different sectors.

1. INTRODUCTION

The rapid expansion of data-driven digital consumer interaction systems within business processes is occurring in parallel with the growing significance of sustainable development within corporate strategies [1, 2]. Digital consumer interaction systems, including online platforms, chatbots, mobile applications, and feedback systems, are evolving beyond mere communication tools to serve as key mechanisms for promoting sustainability principles and fostering responsible consumer behavior [3-5].

Integrating the SDGs into business operations requires effective evaluation and monitoring systems [6]. However, the methodological toolkit for assessing the effectiveness of digital consumer interaction systems in the context of SDG achievement remains underdeveloped [7, 8]. Existing metrics, such as the net promoter score (NPS), customer satisfaction index (CSI), and engagement indicators, are primarily focused on marketing outcomes and fail to account for the environmental and social impacts of digital platforms [9].

In recent years, several important steps have been taken toward integrating sustainability principles into the evaluation of digital systems. Gupta and Rhyner [10] proposed the Digitainability Assessment Framework (DAF), a system designed for the systematic analysis of the impact of digital interventions on SDG indicators, laying the theoretical groundwork for comprehensive evaluation. Gupta et al. [11] and Soni et al. [12] further advanced this approach by emphasizing the need for holistic, data-driven assessments of the effectiveness of digital engagement in the context of sustainable development.

In the field of environmental impact assessment for digital technologies, Hoffman et al. [13] examined the effectiveness of carbon footprint tracking applications and their influence on consumer behavior, proposing methods for the quantitative evaluation of CO_2 emissions resulting from digital interactions. Nahar et al. [14] developed a methodology within the CarbonShunya system for measuring and mitigating the impact of consumer transactions on greenhouse gas emissions, creating a toolkit for real-time carbon footprint monitoring.

Despite these advancements, existing approaches remain fragmented, i.e., they seldom integrate environmental, social, and governance (ESG) aspects into a unified assessment system [15, 16]. There is a lack of comprehensive tools that would enable companies to simultaneously evaluate the effectiveness of digital consumer interaction systems in traditional business performance indicators and SDGs [17].

This issue is particularly relevant for companies in Russia and Central Asia, where digital platforms often evolve independently of broader ESG strategies [18]. Developing a specialized methodological toolkit that accounts for regional specifics and distinctive characteristics of digital transformation in these contexts is a critical scientific and practical challenge.

The aim of this study is to assess the effectiveness of existing digital consumer interaction systems in Russia, Kazakhstan, and Kyrgyzstan in order to identify opportunities for improving the methodological toolkit for evaluating ESG components in a regional context. The study does not seek to develop a universal methodology; rather, it offers recommendations for adapting existing instruments (such as the DAF [8]) by taking into account the specific features of consumer perception in the countries under consideration.

1.1 Theoretical foundations of the research

Digital consumer interaction systems represent technological solutions that enable multichannel communication between companies and their customers [19, 20]. In modern understanding, these systems encompass online platforms, mobile applications, chatbots, feedback mechanisms, and AI-powered analytics tools [21-23]. The evolution of such systems has progressed from one-way information channels to interactive platforms capable of analyzing consumer behavior and generating personalized offers. The current phase is marked by the integration of digital interaction systems into corporate sustainability strategies [24, 25].

The SDGs adopted by the UN in 2015 [26] serve as guiding principles for forming corporate strategies and value propositions. Within the context of digital consumer interaction systems, the most relevant goals include SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 9 (Industry, Innovation, and Infrastructure). Despite the increasing focus on ESG factors, companies often lack the tools to assess the impact of their digital platforms on the SDG achievement.

Traditionally, the effectiveness of digital consumer interaction systems is evaluated using marketing metrics, such as NPS, CSI, engagement rates, customer retention metrics, and customer lifetime value (LTV). These metrics primarily focus on economic performance and differ significantly from the ESG indicators commonly used in Europe and the US [27, 28]. While there have been attempts in the academic literature to integrate ESG indicators into the evaluation frameworks for digital platforms, a comprehensive methodological toolkit that combines traditional marketing metrics with sustainability indicators remains underdeveloped.

2. METHODS

2.1 Methodological research design

To comprehensively examine the effectiveness of digital consumer interaction systems within the framework of sustainable development, we used mixed methods [29]. This approach combines qualitative and quantitative methods. It was selected to enable data triangulation and ensure the validity of the methodological toolkit under development.

The study followed a sequential mixed design, in which the quantitative and qualitative phases complement and verify one another. The research was structured in several stages: an analytical review of the scientific literature, the collection and analysis of empirical data, the development of the methodological toolkit, and its subsequent validation.

2.2 Data collection methods and sources

2.2.1 Quantitative methods

As part of the quantitative stage, an online survey was conducted among consumers using the digital platforms of companies in Russia, Kazakhstan, and Kyrgyzstan.

The geographical distribution of respondents was as follows: Russia – 62% (n = 317), Kazakhstan – 23% (n = 118), Kyrgyzstan – 15% (n = 77). The demographic structure of the sample: urban population – 78%, rural population – 22%; age distribution: 18-25 years – 28%, 26-35 years – 34%, 36-45 years – 23%, 46-60 years – 15%; income levels: below average – 19%, average – 58%, above average – 23%; level of digital literacy (self-assessment on a 10-point scale): low (1-4) – 12%, medium (5-7) – 61%, high (8-10) – 27%. The sample was formed using a stratified sampling method with quotas by age, gender, and geographical distribution, which ensured representativeness for the urban population of these countries.

The sample was formed using a stratified random sampling method, considering demographic characteristics and users' experience with digital platforms. The online survey instrument underwent a validation procedure. Pilot testing was conducted on a sample of 45 respondents (Russia – 20, Kazakhstan – 15, Kyrgyzstan – 10) over a two-week period prior to the main study. Based on the pilot results, 7 questions were revised to improve the clarity of the wording. The assessment of internal consistency showed acceptable Cronbach's Alpha values: environmental awareness – α = 0.78; social responsibility – α = 0.82; satisfaction with digital interaction – α = 0.85. Construct validity was assessed using confirmatory factor analysis (CFA), which demonstrated satisfactory model fit indices: Comparative Fit Index (CFI) = 0.91, Tucker-Lewis Index (TLI) = 0.89, Root Mean Square Error of Approximation (RMSEA) = 0.06. The scales were adapted from validated instruments used in Hoffman et al. [13] for environmental components and Lu et al. [30] for the assessment of user experience. The survey results formed the basis for the digital environmental awareness (DEA) indicator and the integrated consumer satisfaction (ICS) metric.

The analysis of digital platform data was carried out using web analytics tools for 25 companies from various sectors of the economy (retail – 9 companies, financial services – 7, telecommunications – 5, e-commerce – 4). The criteria for selecting platforms included annual traffic of more than 500 thousand unique users, the presence of a declared ESG strategy, and consent to provide anonymized data. The research focused on engagement rates, conversion metrics, and user behavior patterns related to ESG-oriented content (Table 1). These data were instrumental in developing the digital interaction quality (DIQ) indicator and assessing components of the digital inclusivity initiative (DII).

Table 1. Socio-demographic and geographical characteristics of the study sample (n = 512)

Characteristic	Russia (n = 317, 62%)	Kazakhstan (n = 118, 23%)	Kyrgyzstan (n = 77, 15%)	Total (n = 512)
Type of Settlement, %				
Urban population	84	72	62	78
Rural population	16	28	38	22
Age, %				
18-25 years	25	29	36	28
26-35 years	35	34	31	34
36-45 years	24	22	20	23
46-60 years	16	15	13	15
Gender, %				
Male	48	51	53	50
Female	52	49	47	50
Income level, %				
Below average	15	22	29	19
Average	59	58	55	58
Above average	26	20	16	23
*Level of digital literacy, %**				
Low (1–4 points)	9	14	19	12
Medium (5–7 points)	60	62	64	61
High (8–10 points)	31	24	17	27

*The level of digital literacy was determined based on respondents' self-assessment using a 10-point scale.

Instrumental measurements of the digital carbon footprint were conducted for 15 digital platforms using specialized tools (Website Carbon Calculator, Carbon Footprint API). These measurements included the assessment of energy consumption by server infrastructure, network infrastructure, and client devices across various interaction scenarios, followed by the normalization of the data according to industry standards. The resulting data served as the empirical foundation for the digital carbon footprint of interaction (DCFI).

The analysis of CRM system data from 8 companies (retail – 3, financial services – 3, telecommunications – 2; all companies from Russia and Kazakhstan, with an average customer base of 850 thousand users) was conducted to identify correlations between digital interactions and subsequent decisions to purchase sustainable development products. The companies were selected based on the following criteria: the presence of an integrated CRM system, publicly available ESG reporting, and willingness to provide anonymized data in accordance with the ethical standards of the study. The insights obtained were incorporated into the methodology for calculating the environmental consumption promotion index (ECPI) and the ESG loyalty index (ELI).

2.2.2 Qualitative methods

The qualitative component included semi-structured interviews with business representatives (n = 15) from the finance, retail, and IT sectors. Each interview lasted 45-60 minutes and focused on practices for assessing the effectiveness of digital interaction systems, challenges in integrating ESG metrics, and potential solutions. Interview materials were analyzed using thematic content analysis with coding based on the Strauss and Corbin methodology.

An expert survey of specialists in ESG and digital platforms (n = 20) was conducted using a modified Delphi method to determine the relevance of the proposed metrics, their applicability, and data collection methods. The experts also provided recommendations on weighting coefficients for various metrics depending on industry specifics. The resulting expert assessments were used to calibrate the weighting system in the integrated digital sustainability index (IDSI).

A case analysis of 10 companies in Russia and Central Asia that integrated SDGs into their digital consumer interaction systems allowed for identifying best practices and methodological patterns for assessing effectiveness. The case analysis formed the basis for establishing threshold values and developing interpretation scales for the proposed indicators.

An accessibility audit of 12 digital platforms was conducted to evaluate the inclusivity of interaction for different user groups. The audit methodology included compliance checks with WCAG 2.1 standards, analysis of language accessibility, and assessment of compatibility with various devices. The audit data were incorporated into the methodology for calculating the DII.

2.3 Data sources for the methodological toolkit

The empirical foundation for developing the methodological toolkit was based on the following data sources.

2.3.1 For environmental metrics

The DCFI is based on primary data concerning the energy consumption of digital infrastructure, including server hardware, network components, and client devices. Data sources included:

- Energy consumption monitoring records of server infrastructure;
- Traffic and computational load data under various interaction scenarios;
- CO_2 emission factors for energy systems in Russia and Central Asia, as published by the international energy agency (IEA).

The ECPI draws on:

- Transactional data from CRM systems, with product classification according to environmental sustainability criteria;
- Analysis of behavioral sequences, e.g., "interaction with ESG content → purchase";
- Conversion data for eco-oriented products obtained from web analytics systems.

The DEA was developed using:

- Data from an online consumer survey focused on environmental awareness;
- Results of knowledge tests on the environmental impact of digital interactions;
- Longitudinal data on behavioral changes following exposure to educational ESG content.

2.3.2 For social metrics

The DII integrates data from:

- Audit protocols assessing platform compliance with WCAG 2.1 accessibility standards;

- Evaluations of language accessibility, including regional languages of Russia and Central Asia;
- Analytics on platform accessibility across various device types and connection qualities.

The social engagement index (SIE) is based on:
- Quantitative data on user participation in social initiatives;
- Participation intensity metrics from CRM systems;
- Qualitative assessments of engagement obtained through interviews with business representatives.

The sustainable consumer practice index (SCPI) relies on:
- Longitudinal survey data on the development of sustainable habits;
- Transactional statistics on recurring sustainable behaviors;
- Results from control measurements tracking behavioral changes over time.

2.3.3 For management metrics

The ICS combines:
- Data from traditional consumer satisfaction surveys;
- Indicators of satisfaction with the environmental aspects of digital interaction;
- Assessments of satisfaction with the social components of interaction.

The ELI was developed using:
- Engagement metrics in ESG initiatives from web analytics systems;
- Data on repeated interactions with ESG content;
- Advocacy metrics (e.g., recommendations, reviews, and brand defense) from social media).

The DIQ is based on:
- Results from usability testing and user surveys;
- Analytics on goal completion effectiveness from web analytics systems;
- Objective performance and platform accessibility metrics.

2.4 Data analysis methods

The analytical toolkit of the study included the following methods:
- Statistical analysis of quantitative data (correlation, factor, and cluster analysis);
- Thematic content analysis of qualitative data using axial and selective coding techniques;
- Comparative case analysis, identifying patterns and best practices;
- Multi-criteria analysis for integrating diverse indicators into composite indices.

Quantitative data processing was conducted using SPSS Statistics 27.0, while qualitative analysis was carried out with NVivo 14.

2.5 Tested hypothesis

The core research hypothesis assumes that traditional metrics for evaluating the effectiveness of digital customer engagement systems do not accurately reflect the impact of digital platforms on the environmental and social aspects of sustainable development.

The hypothesis was verified through the following methods:

1. Correlation analysis of the relationship between traditional marketing metrics and ESG performance indicators;
2. Expert evaluation of existing approaches to assessing the effectiveness of digital systems;
3. Pilot testing of the developed methodological toolkit in five companies across various industries.

3. RESULTS

3.1 Analysis of existing metrics for evaluating digital consumer interaction systems

A review of academic literature and corporate practices showed significant limitations in traditional metrics used to evaluate digital consumer interaction systems. These limitations include an overreliance on economic indicators, fragmented assessment approaches, a lack of long-term perspective, and insufficient consideration of consumer preferences regarding ESG factors.

An online consumer survey showed that 78% of respondents consider corporate environmental responsibility important. However, only 32% can assess the impact of their digital interactions on sustainable development.

Correlation analysis revealed a statistically significant but weak relationship between traditional marketing metrics (NPS, CSI) and companies' ESG performance indicators ($r = 0.24$, $p < 0.05$), explaining only 5.8% of the variance. This indicates not so much the need to replace existing tools as the importance of complementing them with ESG-specific indicators when assessing the effectiveness of digital systems in the context of sustainable development. The result highlights that traditional metrics and ESG indicators measure different, although interrelated, aspects of the consumer experience.

3.2 Developed methodological toolkit

Table 2. Groups of metrics of the methodological toolkit*

Groups of Metrics	Metrics	Calculation Formula
Environmental metrics	DCFI	DCFI = (∑ CE × TV × CF) / IU
	ECPI	ECPI = (ESP/TP) × 100%
	DEA	DEA = 0.4 × AS + 0.3 × KB + 0.3 × EB
Social metrics	DII	DII = (WA × 0.4 + LA × 0.3 + DA × 0.3) × 100%
	SIE	SIE = (UP/TA) × IR × 100%
	SCPI	SCPI = (BC × 0.5 + FC × 0.5) × 100%
Management metrics	ICS	ICS = 0.4 ×TS + 0.3 × ES + 0.3 × SS
	ELI	ELI = (ER × 0.5 + RR × 0.3 + AR × 0.2) × 100%
	DIQ	DIQ = (UX × 0.4 + EF × 0.3 + AS × 0.3) × 10

DCFI = digital carbon footprint of interaction, ECPI = environmental consumption promotion index, DEA = digital environmental awareness, DII = digital inclusivity initiative, SIE = social engagement index, SCPI = sustainable consumer practice index, ICS = integrated consumer satisfaction index, ELI = ESG loyalty index, DIQ = digital interaction quality

Based on the study results, we developed a methodological toolkit for assessing the effectiveness of digital consumer interaction systems in the context of the SDGs. This toolkit integrates three categories of metrics (Table 2).

*Adapted metrics based on existing approaches [10, 12] for testing in a regional context. Definitions of variables for each metric:

Environmental metrics:

- DCFI: CE – energy consumption per transaction (kWh), TV – traffic volume (GB), CF – CO_2 emission factor for the region (kg CO_2/kWh), IU – number of user interactions (units per period). Measured in kg CO_2 equivalent per user per month.
- ECPI: EP – purchases of environmentally friendly products (number), TP – total number of purchases, EE – interaction with ESG content (time in minutes), CI – interaction intensity (frequency of visits). A dimensionless index ranging from 0 to 100.
- DEA: KS – knowledge test score (0–100), EC – interaction with environmental content (minutes per month), BC – behavior change (assessment on a 1–5 scale). Index ranging from 0 to 100.

Social metrics:

- DII: AS – accessibility score according to WCAG 2.1 (%), LA – language accessibility (number of languages), DA – device accessibility (%), CA – connection accessibility (% of users with access). Index ranging from 0 to 100.
- SIE: PT – participation in initiatives (number of actions), IE – engagement intensity (score 1–10), SR – social response (number of interactions). Index ranging from 0 to 100.
- SCPI: SH – sustainable habits (frequency of repeated actions), BP – behavior change (dynamic assessment, %), RT – repeated sustainable transactions (number). Index ranging from 0 to 100.

Management metrics:

- ICS: CS – traditional satisfaction (1–10), ES – satisfaction with environmental aspects (1–10), SS – satisfaction with social aspects (1–10). A weighted average index ranging from 0 to 10.
- ELI: EI – engagement in ESG initiatives (number of interactions), RC – repeated interactions with ESG content (frequency), AM – advocacy metrics (number of recommendations, reviews). Index ranging from 0 to 100.
- DIQ: UE – usability efficiency (testing score, 0–100), GA – goal achievement (percentage of successful sessions, %), PA – platform performance and availability (uptime percentage, %). Index ranging from 0 to 100.

The main element of the toolkit is the IDSI calculated as a weighted sum of normalized metric groups, with weighting coefficients determined based on the industry specifics of a company. This index builds upon the approaches proposed by Gupta and Rhyner [10] in the DAF, adapting them to the context of evaluating digital customer engagement systems.

3.3 Toolkit validation results

The validation of the developed toolkit was carried out through expert assessment (n = 20) and pilot testing in five companies from different industries.

The criteria for selecting experts for validation included: an academic degree in the field of sustainable development or digital marketing (15 experts held PhD degrees and 5 held doctoral degrees); practical experience in implementing ESG strategies in companies of at least 5 years (average experience – 8.2 years); sector representation – academia (8), ESG consulting (7), and the corporate sector (5).

The experts were geographically distributed as follows: Russia (n = 14), Kazakhstan (n = 4), and Kyrgyzstan (n = 2). Inter-expert agreement was assessed using Kendall's Coefficient of Concordance ($W = 0.68$, $\chi^2 = 97.2$, $p < 0.001$), indicating a moderate level of consensus among the experts. The 5-point evaluation scale was defined as follows: 1 – the metric is not relevant for assessing ESG effectiveness; 2 – low relevance, requiring substantial revision; 3 – moderate relevance, applicable with certain limitations; 4 – high relevance, recommended for application; and 5 – a critically important metric, mandatory for comprehensive assessment. Potential conflicts of interest were identified: three experts had previously worked as consultants for the companies participating in the study; this was disclosed, and their evaluations did not differ significantly from those of the overall expert group (t-test, $p = 0.42$). The results of the expert assessment are presented in Table 3.

Table 3. Results of expert assessment of methodological tools

Evaluation Criterion	**Mean Score (on a 5-Point Scale)**	**Standard Deviation**	**Expert Agreement Level (Kendall's W)**
Comprehensiveness and completeness of coverage of sustainable development aspects	4.3	0.6	0.78
Applicability in corporate governance	4.0	0.7	0.72
Objectivity and reliability of indicators	4.2	0.5	0.77
Flexibility and adaptability to industry specifics	4.5	0.4	0.81
Total	**4.2**	**0.6**	**0.74**

Pilot testing was conducted in five companies from different industries (retail – 2, financial services – 2, telecommunications – 1; all companies from Russia and Kazakhstan) over a three-month period (July–September 2024). The observed IDSI values ranged from 42.3 (Company A, retail) to 67.8 (Company E, financial services) on a 100-point scale ($M = 54.6$, $SD = 10.2$). Inter-industry differences were statistically significant (one-way ANOVA, $F(2,2) = 8.94$, $p = 0.04$, $\eta^2 = 0.47$). Tukey's post-hoc analysis revealed a significant difference between the financial sector ($M = 65.1$) and retail ($M = 44.8$, $p = 0.03$), but not between the financial sector and telecommunications ($p = 0.19$). The correlation between the traditional NPS and IDSI was $r = 0.31$ ($p = 0.61$), confirming that these measures capture different constructs. The largest discrepancies were observed in environmental metrics (average gap of 34% from optimal values), moderate discrepancies in social metrics (21%), and minimal discrepancies in managerial metrics (14%), indicating the need to place greater emphasis on environmental components of digital systems in the studied region. The results of the pilot testing also enabled the identification of recommended weighting coefficients for various industries (Table 4).

Table 4. Recommended weighting factors for calculating the IDSI by industry

Industry	Coefficient for Environmental Metrics (α)	Coefficient for Social Metrics (β)	Coefficient for Management Metrics (γ)
Financial sector	0.25	0.30	0.45
Retail	0.30	0.42	0.28
IT and telecommunications	0.33	0.33	0.34
Energy sector	0.51	0.24	0.25
Industrial sector	0.45	0.27	0.28

The weighting coefficients used to calculate the integrated IDSI were derived using regression analysis, with expert assessments of the priority of each metric group for a given industry as the dependent variable (n = 20 experts × 5 industries = 100 observations). For each industry, a multiple regression model was constructed with predictors representing the relative importance of environmental, social, and managerial aspects (rated on a 0–1 scale). The regression coefficients were normalized so that their sum equaled 1.00 for each industry.

Model quality was acceptable, with R^2 values ranging from 0.62 for the industrial sector to 0.78 for retail, indicating moderate to high explanatory power. The standard errors of the coefficients ranged from 0.03 to 0.05 for α, from 0.02 to 0.04 for β, and from 0.03 to 0.06 for γ. Given the small number of companies involved in the pilot testing (n = 5), these estimates result in relatively wide confidence intervals (95% CI: ±0.10–0.15 for most coefficients). Accordingly, the proposed weighting coefficients should be regarded as preliminary and subject to validation on a larger sample.

An alternative weighting approach based on the analytic hierarchy process (AHP) produced comparable results, with coefficient deviations not exceeding 0.07, supporting the robustness of the derived weights.

4. DISCUSSION

The obtained results indicate the need for regional adaptation of existing approaches to assessing the effectiveness of digital consumer interaction systems in the context of sustainable development. The identified statistically significant but weak correlation between traditional marketing metrics and companies' ESG performance indicators, explaining only 5.8% of the variance, points not to the need to replace existing tools but to the importance of complementing them with ESG-specific indicators. This is consistent with the study by Dauerer [31], who also note that traditional metrics and sustainability indicators measure different, although interrelated, aspects of the consumer experience.

The testing results should be regarded as a complement to existing international approaches rather than as their replacement. ISO 26000 standards provide general principles of social responsibility but do not contain specific metrics for digital interactions. The GRI framework focuses on corporate reporting and does not cover consumer behavioral changes induced by digital platforms. The B Impact Assessment evaluates the overall impact of a business but does not specialize in the effectiveness of digital communication channels. The DAF proposed by Gupta and Rhyner [10] represents the most relevant conceptual approach; however, it remains limited in empirical applications. This study complements the DAF by testing adapted metrics in the regional context of Russia, Kazakhstan, and Kyrgyzstan.

The key contribution of the study lies in identifying features that must be taken into account when applying international instruments in the countries examined. The testing showed a higher importance of social metrics (digital inclusivity, language accessibility) compared to Western markets: an optimal weighting coefficient of β = 0.32 versus typical values of 0.20–0.25 reported in EU studies [11]. Relatively lower awareness of the digital carbon footprint (DEA = 42.1 compared to 58–65 in Northern Europe according to Hoffman [13]) indicates the need to strengthen the educational function of digital platforms.

The identified cross-country differences confirm the impossibility of applying universal weighting coefficients: respondents from Russia demonstrate higher sensitivity to managerial aspects, whereas social components are more significant for consumers in Kazakhstan and Kyrgyzstan [32]. This is consistent with the findings of Silveira et al. [33] on cultural features of the perception of sustainable development.

Based on the assessment conducted, when applying existing approaches (DAF, GRI) in Russia, Kazakhstan, and Kyrgyzstan, it is proposed to: (1) increase the weighting coefficients of social metrics by 30–60% relative to standard values; (2) integrate educational components on the digital carbon footprint into platform effectiveness assessments; and (3) apply country-specific adjustment coefficients when calculating integrated indicators. These recommendations are applicable exclusively to the context of the three countries studied and require validation when expanding the geographical scope.

5. CONCLUSIONS

The conducted study made it possible to assess the effectiveness of existing approaches to measuring ESG components of digital consumer interaction systems and to identify opportunities for their improvement in Russia, Kazakhstan, and Kyrgyzstan. Testing of the adapted environmental, social, and managerial metrics on a sample of 512 consumers and in five companies revealed regional specificities that need to be taken into account when applying international assessment instruments (DAF, GRI, ISO 26000) in these countries.

Empirical validation confirmed that traditional marketing metrics (NPS, CSI) measure aspects different from ESG effectiveness ($r = 0.24$, $p < 0.05$), indicating the need to complement rather than replace them. The identified differentiated weighting coefficients for various industries (β = 0.32 for social metrics in the financial sector compared to typical values of 0.20–0.25 in Western markets) demonstrate the importance of adapting international approaches to regional specificities.

The theoretical significance of the study lies in expanding the understanding of regional characteristics of consumer perception of ESG components of digital platforms and in identifying the need to adapt existing methodological approaches for the countries under study. The practical significance is determined by recommendations for improving the application of international assessment instruments in the development of ESG strategies for digital platforms in Russia, Kazakhstan, and Kyrgyzstan.

The limitations of the study are related to its geographical focus (Russia, Kazakhstan, and Kyrgyzstan) and the limited number of companies involved in the pilot testing (n = 5), which does not allow the results to be generalized to other regions. The recommendations are applicable exclusively to the three countries examined. Future research may focus on increasing the number of participating companies (n > 30 for each industry), longitudinal testing of metric stability, and cross-cultural validation in other countries of the region.

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