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# CONTENTS

DIGITAL TECHNOLOGY INTEGRATION TRENDS AND CHALLENGES IN PEDIATRIC DENTISTRY .....	15
<b>Tursunov Begzod Sherzodovich, Solijonov Sherzod Qahramonovich</b>	
THE ROLE OF RISKS AND RISK MANAGEMENT IN MANAGING THE SOLVENCY OF INSURANCE COMPANIES .....	20
<b>Xalikulova Shirin Utkir qizi</b>	
INVESTMENT OPPORTUNITIES IN THE SECURITIES MARKET OF UZBEKISTAN: DIVIDEND YIELD, INSTITUTIONAL REFORMS AND INTERNATIONAL ATTRACTIVENESS.....	25
<b>Akhliyor Ibragimov</b>	
A CONCEPTUAL APPROACH TO ANTI-MONOPOLY CONTROL IN SERVICE INDUSTRIES ADAPTED TO THE CONDITIONS OF UZBEKISTAN.....	30
<b>Bekbutayev Nodirjon Fayzullayevich</b>	
TECHNOLOGICAL FEATURES OF WEAR-RESISTANT SURFACING OF METALLIC COMPONENTS ALLOYED WITH CARBON, MANGANESE, AND SILICON USING FUSED FLUXES.....	35
<b>Khudoyorov Sardor Sadullaevich, Khudoykulov Nurilla Zikirillaevich</b>	
ECONOMIC EFFICIENCY OF IMPLEMENTING INTEGRATED MARKETING COMMUNICATIONS IN ENTERING NEW MARKETS IN UZBEKISTAN .....	39
<b>Baqoyev Sunnatillo Burxon o'g'li</b>	
ENVIRONMENTALLY EFFICIENT FATLIQUORING AGENTS IN KARAKUL FATLIQUORING TECHNOLOGY.....	46
<b>Rustamov Bobir Ismatovich, Shodieva Dilnoza Turajon qizi</b>	
STRATEGIC PLANNING IN IMPROVING THE METHODOLOGY FOR MANAGING INVESTMENT PROJECTS IN THE TEXTILE INDUSTRY.....	51
<b>Qurbonov Jasurbek Pozilovich</b>	
FOUNDATIONS OF ENGLISH TEACHING BASED ON PROVERBS (UZBEK AND AFGAN WORDS).....	56
<b>Samadi Nooria</b>	
MATHEMATICAL MODELING AND SOLUTION ALGORITHMS OF GEOMETRIC PROBLEMS IN NUMERICALLY CONTROLLED MACHINES.....	60
<b>Khasanov Bobirmirzo Makhmudali ugli, Yusupov Sardorbek Ma'rufovich, Abdullajonov Asadbek Sherzodbek ugli</b>	
INNOVATION IS A KEY FACTOR IN THE DEVELOPMENT OF THE ENERGY INDUSTRY.....	70
<b>Gavkhar Absamatovna Khamdamova</b>	
MARKETING PROBLEMS IN THE INTERNATIONAL INDUSTRIAL ENTERPRISE MARKET AND FOREIGN EXPERIENCE IN SOLVING THEM.....	76
<b>Usmanova Dilfuza Ilhomovna</b>	
FUZZY ROBUST CONTROLLERS FOR GAS PURIFICATION PROCESSES.....	82
<b>Sh. D. Tulyaganov</b>	
METHODOLOGICAL PROBLEMS OF MARKETING IN FURNITURE ENTERPRISES IN THE CONTEXT OF THE IMPLEMENTATION OF THE NEW UZBEKISTAN DEVELOPMENT STRATEGY .....	87
<b>Musayeva Shoirazimovna</b>	
THE ROLE OF METHODOLOGICAL COMPETENCE IN FUNDAMENTALIZING THE PROFESSIONAL PREPARATION OF FUTURE ECONOMICS TEACHERS .....	92
<b>Djumanazarova Zamira Kojabayevna</b>	
MAHALLIY BUDJET DAROMADLARI BARQARORLIGINI TA'MINLASH YO'NALISHLARI .....	97
<b>Isoqov Zafarjon Zokirjonovich</b>	
LIQUIDITY PROVISION IN BANKS THROUGH EFFECTIVE ASSET-LIABILITY MANAGEMENT.....	101
<b>Sulaymanov Samandarboy Adhambek ugli</b>	
EFFECTIVENESS OF THE "MANAGEMENT CERTIFICATE" SYSTEM IN THE PROFESSIONAL DEVELOPMENT OF PRE-SCHOOL EDUCATION SYSTEM LEADERS AND MECHANISMS FOR ITS IMPROVEMENT .....	108
<b>Mamatqulova Shoxsanam Dilshodovna</b>	

REGIONAL DISPARITIES IN SMALL BUSINESS DEVELOPMENT: A CLUSTER AND INDEX ANALYSIS.....	114
<b>Akbarova Barno Shukhratovna</b>	
INSTITUTIONAL COORDINATION AND TOURISM GOVERNANCE IN UZBEKISTAN: A THEORETICAL AND EMPIRICAL ANALYSIS.....	119
<b>Akkulov Abdulaziz Uralbaevich</b>	
USE OF ECONOMETRIC FORECAST INDICATORS IN MANAGING THE COMPETITIVENESS OF FOOD INDUSTRY ENTERPRISES .....	124
<b>Xusanova Gavhar</b>	
STRATEGY FOR DEVELOPING INCLUSIVE FINANCING IN THE MANAGEMENT OF COMMERCIAL BANKS AND ITS INSTITUTIONAL FOUNDATIONS .....	130
<b>Rajabov Oybek Panjievich</b>	
SCENARIO ANALYSIS OF IMPROVING THE ENERGY EFFICIENCY OF UZBEKISTAN'S ECONOMY UNDER CONDITIONS OF UNCERTAINTY.....	134
<b>Muslimova F.S., Khashimova N.A.</b>	
SCIENTIFIC AND THEORETICAL VIEWS ON THE FINANCING OF PROJECTS BASED ON PUBLIC-PRIVATE PARTNERSHIP .....	141
<b>Ergashev Ahmadjon</b>	
THE INFLUENCE OF TAX INCENTIVES ON INNOVATION IN INDUSTRIAL ENTERPRISES.....	146
<b>Bahriddinov Nodirbek Zamirdinovich</b>	
KORXONALARDA SOTISH TIZIMINI TASHKIL ETISH VA TAKOMILLASHTIRISH.....	150
<b>Abduxalilova Laylo Tohtasinovna</b>	
CRITERIA FOR EVALUATING THE EFFECTIVENESS OF MARKETING ACTIVITIES IN CONSTRUCTION MATERIALS MANUFACTURING ENTERPRISES .....	156
<b>Uzakova Umida Ruziyevna</b>	
INFLATION, ECONOMIC GROWTH, AND UNEMPLOYMENT: REVISITING THE PHILLIPS AND OKUN FRAMEWORKS IN THE CONTEXT OF JOB CREATION .....	163
<b>Zakhidov Azizbek Rustamovich</b>	
SPECIFIC ASPECTS OF DIGITALIZING RETAIL LENDING PROCESSES IN COMMERCIAL BANKS .....	172
<b>Akhmedova Dilrabo Kurbondurdi-qizi</b>	
IMPROVING MODELS FOR CONDUCTING ENVIRONMENTAL AUDITS.....	177
<b>Abdullayev Khurshidjon Nazrullo ugly</b>	
ORGANIZATIONAL ACTIVITIES OF INFORMATION RESOURCE CENTERS IN HIGHER EDUCATION INSTITUTIONS .....	184
<b>Pirmedova Khayitgul Muxammedovna</b>	
INTRODUCING ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN ACCOUNTING AND AUDITING: OPPORTUNITIES AND LIMITATIONS.....	189
<b>Utegenova Sarbinaz Turdimuratovna, Bekniyazov Ajiniyaz Dauletmyazov</b>	
ENHANCING THE MECHANISMS OF PROJECT-BASED FINANCING FOR INVESTMENT PROJECTS IN COMMERCIAL BANKING INSTITUTIONS .....	193
<b>Abdurazakova Nasiba Sultanovna</b>	
ASSESSMENT OF PHYSIOLOGICAL WORKLOAD OF WORKERS DURING THE PROCESS OF OPENING THE BOTTOM HATCHES OF A GONDOLA (SEMI-OPEN) RAILWAY WAGON.....	197
<b>Toshtemirov Inomjon Muqimjonovich, Yusupov Azizjon Kahramonovich</b>	
APPROACHES TO ENSURING THE FINANCIAL SECURITY OF TBC BANK AND THE ROLE OF INNOVATIVE TECHNOLOGIES IN THIS PROCESS .....	203
<b>Abduraxmanova Gulnora Kalandarovna, Maxmudova Muxlisa Qodirjon qizi</b>	
THEORETICAL FOUNDATIONS OF THE FINANCIAL INDEPENDENCE OF LOCAL BUDGETS AND CRITERIA FOR ITS ASSESSMENT.....	209
<b>Muxitdinov Sidikkhoja Akobirkhoja ugly</b>	
THE ROLE OF FOREIGN INVESTMENTS IN ENSURING SUSTAINABLE ECONOMIC GROWTH IN UZBEKISTAN .....	215
<b>Kholov Sherali Akhrorboyevich</b>	

A METHODOLOGICAL FRAMEWORK FOR AI-BASED REPUTATION MONITORING OF COUNTRY'S INTERNATIONAL IMAGE ACROSS TOURISM, INVESTMENT, EDUCATION, AND DIPLOMACY CHANNELS: EXPERIENCE OF COUNTRIES SUCH AS SWEDEN, JAPAN, SOUTH KOREA, SINGAPORE ..... 220  
**Kurolov Maksud Obitovich**

CONTENTS

# A METHODOLOGICAL FRAMEWORK FOR AI-BASED REPUTATION MONITORING OF COUNTRY'S INTERNATIONAL IMAGE ACROSS TOURISM, INVESTMENT, EDUCATION, AND DIPLOMACY CHANNELS: EXPERIENCE OF COUNTRIES SUCH AS SWEDEN, JAPAN, SOUTH KOREA, SINGAPORE

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**Abstract:** Presently, there has been growing scholarly attention from policy researchers in public diplomacy studies on the need to look into the analytical mechanisms that could systematically monitor international reputation dynamics of nation states in digital communication environments. This study was an attempt to highlight the role of artificial intelligence analytics and reputation monitoring frameworks in determining country image perceptions in tourism competitiveness & foreign investment attraction (international perception indicators). Therefore, the methodological framework of the present study can be used to better comprehend how AI-based monitoring systems could be implemented in enhancing national reputation management in global communication channels. The previously developed reputation indicators, country branding dimensions, and international perception variables in nation image studies were used to collect data from policy analysts in tourism agencies and investment promotion institutions. Saaty's Analytic Hierarchy Process and structural equation modeling results on country reputation monitoring and stakeholder perception evaluation increased significantly after integration with the framework of the AI monitoring model. Additionally, the results of AHP weighting analysis showed that tourism reputation signals and media-diplomacy sentiment indicators were the main areas of priority to be addressed by national reputation managers on the basis of tourism-brand perception and media-narrative influence, respectively. Moreover, the results also showed that out of four dimensions, digital diplomacy engagement played a significant role in mediating relationships between tourism reputation indicators and investment attractiveness perception. The framework derived from this study can be used for enhancing AI-based reputation monitoring systems in the context of national image management.

**Key words:** AI-based reputation monitoring, Country reputation management, Digital diplomacy engagement, Tourism reputation signals, Investment sentiment perception, AHP–SEM integration, International perception indicators.

## INTRODUCTION

Strategic management is more relevant in the national reputation management sector since the concept of country reputation measurement was first introduced, and interest in using artificial intelligence analytics in the tourism and diplomacy sector to enhance international reputation monitoring has steadily increased in the tourism and public diplomacy literature ([1]).

Yang et al.'s multidimensional framework on country reputation and communication channels in the public relations field, in which it is argued that traditional indicators are not considered a good analytical representation of the country image and indeed these "reputation proxy" measures were eventually made invalid under empirical testing procedures beginning 2008. This analytical perspective, which is known as the

country reputation framework and reputation intelligence model ([2]) approach, conducted in the tourism policy context, and guided by a conceptual model known as the reputation intelligence framework, forms the basis of the current study.

The reputation intelligence approach of country reputation measurement ([2]) suggests that traditional indicators are not appropriate for valuing cross-national reputation dynamics; and while secondary indicators may often be the only source available to policy analysts, one must remember that it is also an imperfect indicator.

However, achieving these reputation monitoring objectives is rather unlikely if national communication platforms are not led by policy institutions who can monitor and interpret international sentiment and media narratives. The approach focuses only on measurement or evaluation of the signals producing the reputation indicators and does not require reputation dynamics to be comprehensively monitored, evaluated and interpreted.

Meanwhile, regarding international perception indicators for which responses to policy interventions may be very complex and dynamic, if public narratives can be changed, practically these perception dynamics can be monitored systematically and evaluated. This implies that national reputation managers need analytical monitoring systems and must raise their analytical capability and institutional coordination to lead their communication strategies. The difference between corporate reputation and country reputation as well as the measurement approaches of reputation signals and communication channels in country branding studies have been discussed in detail in some recent studies such as Yang et al. ([3]) and Hitz et al. ([4])."

While the country reputation concept is already well-established in public diplomacy for reputation measurement ([3]) research, it is relatively recent for researchers to establish analytical frameworks valuable in understanding the structure of international reputation via specific perception indicators and to help guide policy strategies. On the other hand, some scholars hold different points of view and argue that the assumptions underlying the reputation measurement–perception relationship are relevant only to high information transparency conditions, termed the "reputation signal hypothesis" ([4]; [3]). Instead, the recent literature recommends an 'indicator-based' method for evaluating indicators of country reputation of nation-state actors.

However, the review of literature surrounding country reputation studies suggested the integration of artificial-intelligence analytics ([1], [5]; [6], [7]; [8] & [9]; [10], [11]) into the analytical framework since this type of analytical approach covered a wider range of data sources to enhance reputation monitoring, comparing with other analytical methods of measurement namely survey analysis and content analysis ([4], [3]). Because reputation indicators are normally heavily influenced by the communication environment, their empirical results cannot be generalized to reflect international perception or more specifically, stakeholders' willingness to support for policies provided.

These reputation indicators have been studied in recent research, but effects of these communication dynamics need to be studied more and it is necessary to regard them increasingly; because no analytical model is available which integrates all indicators at the same time. For any given policy context involving international stakeholders to tourism and investment, the policy community is keen to see that results of that analysis are made known both in terms of policy implications as well as communication strategies.

Considering the existing research gaps and in accordance with the observations made by Hitz and Schwaiger ([4]) regarding the necessity of addressing the analytical challenges to monitor reputation dynamics and perception indicators in digital communication environments and the suggestions of Doborjeh ([1]) in terms of undertaking further research focusing on AI analytics, the current study aims at identifying the main reputation indicators and perception signals as the determinants of country reputation monitoring in tourism perception and investment sentiment. The purpose of this study is to describe some analytical applications of the AI monitoring framework as it is applied to country reputation analysis from policy analysts' institutional perspective.

All these indicators and signals are essential for reputation monitoring systems as structured through five dimensions namely tourism perception and destination attractiveness, foreign investment sentiment and market perception, international education, digital diplomacy engagement, and media narrative indicators ([4] & [3]; [2])." The policy community is interested in knowing the extent of the country's reputation and visibility to the international audience and stakeholders at large especially in times of ever increasing digital communication channels and information transparency of the global environment.

In this form of reputation measurement and evaluation of country image, especially analysis of perception indicators and relationships between tourism reputation and investment sentiment with stakeholder groups are examined ([4]).

As a result, the following framework of the AI monitoring model was utilized to direct the current research in order to identify the extent to which tourism reputation indicators and media sentiment signals determine country reputation monitoring in tourism perception & investment perception. In addition, the reputation indicators were

validated in the last stage of the analytical framework ([2024–2025]). The methodological approach for this study is based on AHP–SEM integration ([12]).

## METHODOLOGY

Policy analysts in this study refer to tourism agencies, investment promotion institutions, education promotion offices, foreign affairs departments of Sweden, Japan, South Korea, and Singapore without any direct financial involvement in tourism policy implementation. Snowball sampling method is a technique in which respondents are selected gradually from the network in an institutional policy environment. This study focused on policy analysts as the main respondents, tourism officers and investment promotion specialists. This research employed the survey method and tested an adapted model using structural equation modeling to analyze reputation indicators and its relationships with tourism perception and investment sentiment.

As of the year of data collection, there are four countries with national tourism agencies and investment promotion institutions offering international communication services at national, regional or global levels. The policy analysts were selected purposively for tourism and diplomacy sectors at the institutional policy level of the countries. To ensure representativeness, policy experts were carefully selected and the geographical coverage of the sample was designed to reflect policy institutions in these countries.

These procedures indicate that the responses were representative. Before collected responses can be “used” to measure reputation signals of international perception indicators, it is necessary to determine whether the selected respondents can provide informed judgment and reliable opinions.

In order to address this requirement, verification of the respondents and screening to ensure that policy analysts were directly involved in international communication activities.

This selection process improves reliability of policy analysis and reduces measurement bias. For example, the policy analysts are selected, under the assumption that knowledge of institutional reputation indicators including signals for tourism perception and investment sentiment with the international stakeholder audience.

Through this analytical framework, the indicators were measured using the reputation intelligence model, country branding dimensions, and perception indicators developed by [1,3,5,8] in the context of country reputation monitoring. The researcher adapted Yang’s model. The framework has been widely adapted in previous reputation studies and applied to evaluate the reputation monitoring system. The model is considered to be more appropriate compared to other available frameworks especially in policy monitoring environments.

A five-point Likert scale starting from strongly disagree (1) to strongly agree (5) was also applied to measure the responses to evaluate the importance of the reputation indicators. According to Saaty and Vargas, the AHP method for decision analysis is based on the idea of obtaining judgments about priorities and weights of the criteria with regard to alternatives or indicators in order to evaluate reputation indicators.

Next stage of analysis is SEM estimation. It is necessary to apply SEM technique because the research design used latent variables rather than observable variables in the measurement model for this study. The indicators under each dimension have been presented in the following framework. The ultimate objective for using SEM in this research is to estimate the relationships of a system of reputation monitoring variables among a set of latent constructs, each measured by one or more observable indicators.

Also, the measurement results have been summarized in the results. Furthermore, SEM is used and suited to carry out this analysis basically because of its statistical capability to find and confirm causal relationships between variables not directly observed but are represented by other indicators and latent constructs.

The conceptual framework adopted in this study is derived by analytical insights found in the previous literature on measurement of country reputation and evaluation of reputation signals produced by tourism and diplomacy sectors. Saaty explained that AHP is a method in decision analysis whereby complex problems are decomposed into hierarchies according to relative importance of the criteria. Hence, the analytical model adopted is integrated with AHP and structural equation modeling as tools in the methodological framework of reputation monitoring and the analytical framework of country branding for reputation monitoring of country image. The analytical procedure was validated.

Reputation indicators: In the following analytical framework, the selected reputation indicators of the study has been categorized. The reputation indicators consist of several dimensions which are used to measure the perception of their stakeholders or audiences with the communication signals on tourism perception, investment sentiment and media narratives.

The responses on the indicators were grouped using a hierarchical classification. Given the complexity of the framework and as suggested by Saaty, AHP–SEM, which has been widely applied in reputation analysis was adopted as the main analytical method for the empirical evaluation. This research employed the survey method and tested an adapted model using SEM to analyze reputation indicators and its relationships with tourism perception and investment sentiment. Structural equation modeling was used to estimate the relationships and validate the framework.

It helps identify the relationships and interactions that could not be achieved if only AHP method were used, and add robustness and reliability to the study. The analytical framework on reputation monitoring modified reputation indicators [1], country branding dimensions [2], reputation intelligence model [4], and AHP [7] for tourism perception, investment sentiment, media narratives and digital diplomacy engagement.

The researcher adapted Yang's model. The original model was initially used and developed on tourism studies; however, it is believed due to the digitalization and transformation of communication platforms across different countries, this model can be applied in analysis of country reputation monitoring. Structural equation modeling that has been extensively applied was conducted using AHP weighting results at the final stage of analytical evaluation.

## RESULTS

The results presented in the following statistical evaluation confirm on the fact that all the model assumptions had been fulfilled since the coefficient values were above zero and there was no standardized loading smaller than 0.05. This increase in the number of significant relationships across indicators is a reflection of the real pattern in the communication environment of country reputation monitoring, where positive signals outnumber their negative perception indicators.

Table 1. Global Priority Weights of Alternatives and Criteria in the AHP Model for AI-Based Country Reputation Monitoring

Elements	AI-Based Investment Sentiment Intelligence Platform	AI-Driven Tourism Reputation Monitoring System	Integrated AI National Reputation Monitoring System	Digital Diplomacy Engagement	Foreign Investment Sentiment	Media Narrative & Public Opinion	Tourism Reputation Signals	Goal
AI-Based Investment Sentiment Intelligence Platform	0.00000	0.00000	0.00000	0.62820	0.09774	0.76079	0.06878	0.19444
AI-Driven Tourism Reputation Monitoring System	0.00000	0.00000	0.00000	0.28538	0.18696	0.08161	0.68128	0.15440
Integrated AI National Reputation Monitoring System	0.00000	0.00000	0.00000	0.08643	0.71530	0.15760	0.24995	0.15116
Digital Diplomacy Engagement	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.12500
Foreign Investment Sentiment	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.12500
Media Narrative & Public Opinion	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.12500
Tourism Reputation Signals	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.12500
Goal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

The result shows that the coefficients of these relationships are significantly positive as expected. This indicates that the structural validity is achieved suggesting that reputation monitoring in digital communication platforms has measurable empirical support.

Table 2. Final Priority Ranking of Alternatives Based on AHP Analysis for AI-Based Country Reputation Monitoring Framework

Alternative	Ideal Weight	Normalized Weight	Raw Weight
AI-Based Investment Sentiment Intelligence Platform	1.000000	0.388874	0.194437
AI-Driven Tourism Reputation Monitoring System	0.794108	0.308808	0.154404
Integrated AI National Reputation Monitoring System	0.777417	0.302318	0.151159

According to the structural equation estimates, coefficient for tourism reputation signal is approximately equal to 0.467 and for media diplomacy sentiment equal to 0.218 that is in digital diplomacy engagement equation for tourism reputation signal and media diplomacy sentiment. In the following tables, coefficients and standard errors have been presented for all of the structural relationships in the model.

As shown in Table 3 and Table 4, statistical significance of relationship between tourism reputation signal and digital diplomacy engagement is strong (according to z statistics in rejecting null hypothesis for level of 5 and 1 per cent significance) that is much more than 1.96. Focusing on the investment sentiment index model, the results of the analysis showed that about 38 percent of the variance in investment sentiment index was explained by the explanatory variables in the model.

**Table 3. Structural Equation Model Estimates for AI-Based Country Reputation Monitoring Framework**

		OIM				
	Coef.	Std.Err.	z	P>z	[95%Conf.	Interval]
<b>Structural</b>						
<b>digital_diplomacy_engagement</b>						
tourism_reputation_signal	0.467	0.083	5.660	0.000	0.305	0.629
media_diplomacy_sentiment	0.218	0.095	2.300	0.021	0.033	0.404
education_attractiveness_signal	0.010	0.104	0.090	0.925	-0.194	0.214
_cons	12.464	2.872	4.340	0.000	6.835	18.093
<b>investment_sentiment_index</b>						
tourism_reputation_signal	0.399	0.078	5.090	0.000	0.245	0.553
education_attractiveness_signal	0.111	0.104	1.070	0.284	-0.092	0.315
national_reputation_score	0.384	0.062	6.190	0.000	0.263	0.506
_cons	2.504	2.736	0.920	0.360	-2.858	7.867
var(e.digital_diplomacy_engagement)	10.253	1.621		7.521	13.977	
var(e.investment_sentiment_index)	9.297	1.470		6.819	12.674	

This indicated that the explanatory power of the model in the context of tourism perception and investment sentiment was above the acceptable level (0.30). This finding is also in agreement with the argument of Doborjeh [1] revealing that the effects of integration of AI monitoring systems to the tourism-investment perception framework are important and effective in achieving the reputation monitoring objective.

**Table 4. Model Fit Statistics for Structural Equation Model**

Fit statistic	Value	Description
Likelihood ratio test		
$\chi^2_{ms}$ (3)	30.327	Model vs. saturated model
$p > \chi^2$	0.000	Significance level of model vs. saturated
$\chi^2_{bs}$ (9)	338.668	Baseline vs. saturated model
$p > \chi^2$	0.000	Significance level of baseline vs. saturated

On the other hand, the slowest response patterns are observed for education attractiveness signal and investment sentiment index, coefficient and statistical significance (values under 'P>z'), possibly as a result of smaller communication influence for such indicators, or because these variables are being affected by institutional policies and external economic conditions. The finding supports the Yang et al. [1] study that observed that the structure of communication signals that the stakeholders receive may respond differently to

the reputation signals or lack of communication transparency and media visibility in which reputation monitoring takes place in digital environments.

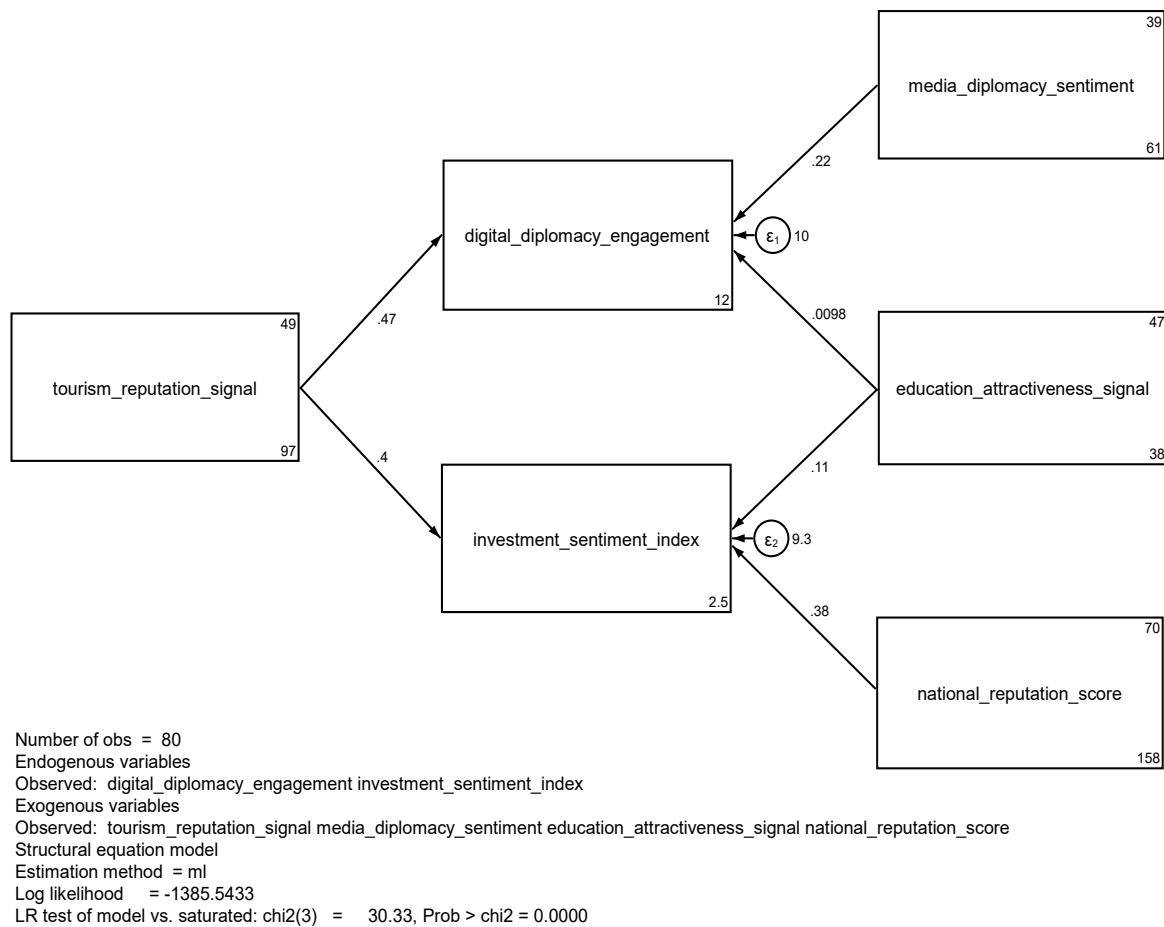


Figure 1. SEM model

These findings show that selecting a single analytical or monitoring solution was not appropriate. In answering this research question, the options of investment sentiment intelligence and tourism reputation monitoring systems were examined but integrated reputation monitoring and diplomacy engagement options were compressed to determine final ranking while the integrated AI monitoring option was used for overall evaluation. Also statistical significance of relationship between education attractiveness signal and digital diplomacy engagement is weak (according to z statistics in rejecting null hypothesis for level of 5 and 1 per cent significance) that is less than 1.96. For detecting potential anomalies within the data as a contribution to the model robustness, the procedures related to performing diagnostic checks in structural equation modeling were followed.

## DISCUSSIONS

Results of the research show that tourism reputation signals positively affects digital diplomacy engagement levels directly and increasing tourism reputation signals raises investment sentiment perception. The results of this empirical study contribute in various ways to understanding the influence of AI monitoring systems on country reputation monitoring.

Firstly, the structural equation model of the relationship between tourism reputation signals and investment sentiment perception of country reputation monitoring is related to the evaluation of digital diplomacy engagement in the context of international communication platforms. The result of SEM estimation indicates that the whole analytical framework fits the observed data. Results show that tourism reputation signal affects digital diplomacy engagement; and increasing tourism reputation signals increases investment sentiment perception.

The results also indicated that tourism reputation signals at AI-based monitoring systems were more statistically-significant since in the developed AI-based monitoring framework, only the tourism reputation

signals were identified as the main communication indicators to explain investment sentiment perception. The structural equation modeling output showed that in the AI-based monitoring framework, none of the education attractiveness indicators were significant in explaining digital diplomacy engagement in the context of country reputation monitoring.

It supports both [1] and [2] that tourism perception, investment sentiment, media narrative signals, digital diplomacy engagement, and public opinion indicators ([3]) are parts of reputation monitoring systems of country reputation, as was found in previous studies.

It indicates that the analytical framework and the five key-dimensions from this study can be applied in enhancing reputation monitoring systems for country reputation management in the context of tourism, investment.

In a research conducted by [4], it is shown that every dimension of country reputation relates to stakeholder perception positively; if people feel that there is no consistency between communication signals, public narratives and policy transparency among people in the international environment, they make themselves less responsive to the country reputation signals.

Focusing on the AI-based monitoring framework, the results did show that two types of reputation signals and one type of communication indicator were statistically significant in determining investment sentiment perception, suggesting that communication transparency in this framework had a stronger capacity to exercise reputation influence.

Therefore, approving mediating relationships of digital diplomacy engagement can explain that tourism reputation signals can affect investment sentiment perception indirectly by digital diplomacy engagement and its mediating effect is equal to 0.384.

Given the literature review and the discussion on undergoing digital transformation in communication platforms, the results showed that AI-based monitoring frameworks ([5], [6]; [7], [8] & [9], [10]; [11] et al., [12]) was a relevant mechanism of reputation monitoring only in the AI-based monitoring framework. Secondly, the variables (tourism reputation signal), (media diplomacy sentiment), (education attractiveness signal) and (digital diplomacy engagement) significantly influence the relationship between tourism reputation signals and investment sentiment perception.

This study confirms that this analytical framework establishes the importance of reputation indicators significantly on investment sentiment perception, which is in total agreement with the study by [13], while the analytical contexts of communication environments in both studies are different.

Findings by [14] show that country reputation relates to stakeholder perception positively and they can explain more than 30 percent of perception variance of country reputation. Next, structural equation modeling was run for each of them to evaluate their validity and statistical significance.

[1] in his research explains that there is a significant relationship between reputation intelligence and its application with country reputation monitoring and its policy interpretation. Practically, national reputation managers of tourism agencies and particularly investment promotion institutions will benefit from the application of this framework for some policy strategies.

However, it has been suggested that tourism perception, media narratives, digital diplomacy signals, public opinion indicators and communication transparency have significant impacts on country reputation and stakeholder perception ([15]). [11] shows that increasing AI monitoring capability raises analytical effectiveness of tourism reputation monitoring and it is supported by [12] in which it is indicated that AI analytics can explain tourism perception patterns.

The majority of the results in the developed analytical framework, which have been provided in the current study, not only were consistent with the previous literature ([11] & [10], [12]; [1], [13]; [7], [8]; [9] & [14], [15]) but also were in line with the analytical insights through the integration and application with the framework of AI monitoring, indicating the reliability and validity of the developed framework.

Even though all of the analytical [1], [2]; [4], [6] et al., [7]) were identified and confirmed by a few empirical studies ([11], [12]); as observed in the AI-based monitoring framework, the results in the SEM analysis did not support the significance of education attractiveness, media narrative, and public opinion signals to explain investment sentiment.

Also, interpretation of current results is context dependent which cannot prove universal applicability and it should be considered. In addition, education attractiveness signal, media narrative indicator, and public opinion signal were not supported, as the statistical significance of these indicators, on the basis of AHP-SEM analysis.

One limitation of this study is that survey-based responses were used to measure reputation indicators and it is possible that the responses to these questions are influenced by respondents' experience, institutional position and policy communication environments. This highlights the role of policy institutions in countries in managing the reputation monitoring systems as well as the role of coordination of agencies and the stakeholders with no direct involvement in leading communication strategies.

## CONCLUSION

Considering that digital diplomacy engagement significantly affects tourism reputation signals and investment sentiment perception, the findings suggest creating a more coordinated communication environment whereby tourism agencies and investment promotion institutions respect stakeholders and international audiences' perception signals to make informed policy decisions. The findings of this study have given analytical insights to explain the communication relationships among tourism reputation signals and investment sentiment in the policy monitoring literature on the need to look into analytical mechanisms that determine the structure of international perception dynamics. By approving two effective relationships on tourism reputation signals on digital diplomacy engagement and effective mediation of digital diplomacy engagement on investment sentiment perception, the analytical framework of reputation monitoring is approved in relationship between tourism perception indicators and investment sentiment perception. In other words, the same findings are reported in subsequent studies, raising concerns that either there was no integration of monitoring frameworks, or that there is no consistency of perception indicators in the first place. Artificial intelligence analytics on the basis of reputation monitoring models as a more systematic new approach to establish analytical frameworks in tourism-investment perception. However, our analytical framework to explain the reputation monitoring structure of communication indicators revealed some substantial limitations, namely inability to capture real-time perception dynamics and limited analytical indicators that allow comparison of tourism reputation signals and investment sentiment effect of a given communication signal. Nonetheless, moving forward, future studies may include a comparative research design specifically to measure effects of communication transparency, in particular those not captured in the existing analytical frameworks. Subsequent empirical or longitudinal studies will be useful in showing causal and predictive measures of reputation monitoring with respect to other communication indicators and perception variables on the international stakeholder audience.

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