

A Multi-Criteria Decision-Making Approach for Transparency Assessment in Donation-Dependent Foundations Using TOPSIS

Wichai Witayakiattilerd^{1,*}, Jirapon Sunkpho², Pankan Phungwikrai¹,
Boodsakorn Wingwon¹, Sukanya Iamasa¹

¹*Department of Mathematics and Statistics, Faculty of Science and Technology, Thammasat University, Paholyothin Road, Klong Luang, Rangsit, Pathum Thani 12120, Thailand.*

²*College of Innovation, Thammasat University, Bangkok 10200, Thailand*

Received 5 February 2025; Received in revised form 13 June 2026

Accepted 19 June 2026; Available online 30 June 2026

ABSTRACT

In this research, factors influencing corruption are studied. The transparency of charitable foundations accepting donations is evaluated using the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) and Factor Analysis. The research process starts with Factor Analysis, employed to identify and cluster related factors. Expert judgment then determines pairwise comparisons of these factor groups' importance, with weights for these groups derived through the Analytical Hierarchy Process (AHP). These weighted factors are then used to assess the foundations' transparency. Furthermore, the TOPSIS model ranks the foundations based on their operational transparency. The research offers an innovative approach for comprehensively evaluating the transparency of charitable foundations, thereby providing potential strategies to minimize corruption. It holds substantial implications for improving the transparency of non-profit organizations, contributing to their operational integrity and efficacy.

Keywords: AHP; TOPSIS; Charitable foundations; Factor Analysis

1. Introduction

Charitable giving is an important social mechanism that supports public welfare, social solidarity, and community re-

silience. In many societies, donation-dependent foundations serve as intermediaries between donors and beneficiaries by mobilizing financial and non-financial re-

sources for humanitarian, educational, religious, health-related, and social purposes. The effectiveness of such organizations depends not only on the amount of resources they receive but also on the degree to which their operations are transparent, accountable, and trusted by the public. When transparency is weak, donor confidence may decline, resources may be misallocated, and the intended social benefits of charitable giving may be reduced.

Thai society is renowned for its strong sense of community and mutual support. In times of crisis, people readily step forward to help one another. This is substantiated by a comprehensive analysis carried out by the Economic Intelligence Center (EIC) of the Siam Commercial Bank ([1]). Drawing on data from the National Statistical Office's survey of the Thai household economy and society from 2009 to 2017, the EIC found that an overwhelming 96% of Thai households engaged in charitable activities. This means that at least one member of these households contributed a minimum of 1 baht to a charitable cause over the span of a year. Charitable expenses can take various forms, including food offerings to monks, offerings to deities, merit-making money, and donations to diverse organizations. In 2017, the total value of charitable expenses across Thailand amounted to approximately 130 billion baht, translating to an average of 6,200 baht per household per year ([1]). These figures demonstrate the importance of donations within Thai society and highlight the need for mechanisms that ensure donated resources are managed with integrity, transparency, and accountability.

Each act of donation is a voluntary decision made by the donor, and the purpose of each donation often varies according to the donor's intentions. In this land-

scape of charitable giving, foundations play a critical role. These organizations act as conduits between donors and those in need. They collect donations and then distribute them to people who require support or utilize them to meet the foundation's stated objectives. Therefore, the governance quality of foundations has direct implications for donor trust, beneficiary welfare, and the credibility of the nonprofit sector as a whole.

However, the act of giving also involves potential risks. Corruption within foundations can erode trust and mutual assistance, which are cornerstones of Thai society. Several notable instances of donation fraud have been reported in the media, causing significant public concern. For example, a staff member of the Siriraj Foundation was accused of signature forgery and illicit withdrawal of funds amounting to 56.6 million baht ([2]). Another incident involved falsely claiming to represent the Luang Por Kasem Khemko Foundation and encouraging people to transfer money to a fraudulently represented account ([3]). Furthermore, a high-ranking official of the Asian Peace and Reconciliation Foundation allegedly embezzled at least 500,000 baht that had been intended as donations ([4]).

These episodes of donation fraud reflect the vulnerability of donation-dependent foundations to internal corruption and weak governance controls. The consequences of such corruption are far-reaching and multifaceted. They damage organizational reputation, undermine institutional credibility, weaken donor confidence, and may prevent beneficiaries from receiving the assistance they need. Moreover, the absence of a systematic and transparent assessment mechanism for the internal operations of foundations accepting donations in Thailand exacerbates

this situation. Although existing studies have examined corruption, nonprofit governance, and transparency from various perspectives, relatively limited research has developed an integrated quantitative framework for identifying corruption-related factors, assigning their relative importance, and ranking foundations according to transparency performance.

Considering the above, this research sets out to critically investigate factors associated with internal corruption in donation-dependent foundations and to assess their relative influence on organizational transparency. The study integrates Factor Analysis, the Analytic Hierarchy Process (AHP), and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) to construct a structured transparency assessment framework. Factor Analysis is used to identify and group related corruption-related indicators, AHP is employed to determine the relative importance of the resulting factor groups based on expert judgment, and TOPSIS is applied to rank foundations according to their transparency performance. This integrated approach provides a practical and systematic mechanism for evaluating transparency in foundation operations and for supporting evidence-based governance improvement.

The objectives of the study are:

1. To explore the factors influencing internal corruption within the operations of foundations.
2. To identify indicators that can be used to rank the level of transparency in a foundation's operations.
3. To create a ranking system that assesses the transparency in the operations of foundations.

This study contributes to the literature and practice of nonprofit governance in three main ways. First, it identifies and classifies key factors associated with corruption and transparency in donation-dependent foundations. Second, it integrates Factor Analysis, AHP, and TOPSIS into a unified decision-making framework for transparency assessment. Third, it provides a practical ranking mechanism that can support foundations, policymakers, regulators, and donors in evaluating governance quality and improving accountability in the nonprofit sector.

The scope of this study primarily involves collecting and transforming qualitative data into a quantitative format. To ascertain factors influencing corruption, data were solicited from individuals with relevant expertise, including the director of the Anti-Corruption Center at Thammasat University and representatives from the Office of the Social Contract for Democracy. The research focuses on evaluating transparency in the operations of donation-dependent foundations in Thailand. The foundations or associations included in the study are public charitable organizations or charitable institutions under Article 47(7)(k) of the Penal Code. This study is confined to organizations with accessible contact information, totaling up to 200 entities.

2. Literature Review

2.1 Corruption and transparency in donation-accepting foundations

Transparency and accountability are widely recognized as fundamental principles for sustaining the legitimacy and effectiveness of non-profit organizations, particularly those that rely heavily on public donations. Unlike profit-oriented organizations, donation-dependent foundations derive their operational capacity largely

from public trust. Consequently, even isolated incidents of fraud or financial mismanagement can significantly undermine donor confidence, reduce future contributions, and diminish the social impact of charitable activities. Recent studies in nonprofit governance emphasize that transparency not only serves as a mechanism for financial accountability but also functions as a strategic asset that strengthens organizational credibility and stakeholder engagement.

The importance of charitable giving in Thailand has been documented by the Economic Intelligence Center (EIC) of the Siam Commercial Bank. Based on household economic and social survey data from the National Statistical Office, [1] reported that approximately 96% of Thai households participate in charitable activities, highlighting the significant economic and social role of philanthropic behavior. The substantial volume of charitable donations also implies a corresponding need for effective governance mechanisms to ensure that donated resources are managed responsibly and transparently.

The vulnerability of charitable organizations to corruption and financial misconduct has become increasingly evident through a number of widely publicized incidents. [2] and [3] documented high-profile fraud cases involving charitable foundations in Thailand, while [4] highlighted the misappropriation of donation funds by individuals in positions of authority. These incidents illustrate that the risks associated with weak internal controls, inadequate oversight, and limited transparency are not merely theoretical concerns but practical governance challenges that directly affect public confidence in nonprofit institutions.

Beyond the Thai context, international studies have identified similar con-

cerns regarding the governance of nonprofit organizations. [5] examined measures designed to prevent nonprofit organizations from being exploited as channels for financial support of terrorism, emphasizing the importance of robust regulatory and financial monitoring systems. Likewise, [6] discussed the role of the Financial Action Task Force (FATF) and related international initiatives in safeguarding charitable organizations against terrorist financing and fraudulent activities. These studies reinforce the argument that transparency and accountability are integral components of effective nonprofit governance.

Research on corruption and financial integrity has consistently shown that weak governance structures increase the likelihood of resource misallocation and organizational misconduct. [7] demonstrated how insufficient financial oversight contributes to systemic corruption in educational institutions, while [8] identified financial mismanagement as a major challenge in public-sector organizations. In the Thai context, [9] proposed the Thailand Corruption Index to evaluate corruption through a range of governance and administrative indicators. Similarly, [10] critically examined the Corruption Perceptions Index (CPI), arguing that localized and context-specific corruption measurement frameworks are necessary for improving policy effectiveness.

A growing body of literature has also explored mechanisms for strengthening transparency and accountability. [11] investigated open government initiatives and noted that transparency alone may not guarantee accountability unless accompanied by effective monitoring and enforcement mechanisms. In a similar vein, [12] proposed practical guidelines for improving transparency standards in Thai public administration, many of which can be

adapted to nonprofit organizations. From the perspective of donor behavior, [13] demonstrated that trust and confidence significantly influence charitable giving decisions. Furthermore, [14] distinguished between altruistic motivation and warm-glow effects in philanthropic behavior, showing that donors increasingly consider organizational integrity and credibility when making donation decisions.

Studies focusing on the nonprofit sector in Thailand have further highlighted the importance of governance quality and institutional development. [15] and [16] provided foundational analyses of the structure and evolution of the Thai nonprofit sector, emphasizing the need for stronger regulatory frameworks and more effective governance mechanisms. In a broader context, [17] and [18] demonstrated that corruption control and transparent management practices generate significant social and economic benefits by strengthening public confidence and encouraging sustained philanthropic engagement. Likewise, [19] proposed approaches for evaluating financial integrity and transparency in public institutions, highlighting the role of accountability systems in improving organizational performance. These findings are consistent with the broader literature on nonprofit governance, which suggests that donor behavior is strongly influenced by perceptions of organizational accountability, transparency, and trustworthiness ([20]; [21]; [22]). Collectively, this body of research supports the view that robust governance structures and transparent operational practices are essential for strengthening public trust and promoting sustainable charitable giving.

Collectively, these studies indicate that transparency in donation-dependent organizations is a multidimensional concept encompassing governance structures, fi-

nancial accountability, stakeholder communication, and institutional integrity. Nevertheless, the existing literature has primarily focused on either conceptual discussions or qualitative analyses, with relatively limited efforts devoted to constructing systematic and operational frameworks for measuring transparency in charitable foundations.

2.2 Methods for assessing transparency and decision-making

The evaluation of organizational transparency and governance quality often involves multiple qualitative and quantitative criteria that must be considered simultaneously. Consequently, Multi-Criteria Decision-Making (MCDM) methods have gained considerable attention as effective tools for supporting complex decision-making processes. Among these methods, the Technique for Order Preference by Similarity to the Ideal Solution (TOPSIS) has emerged as one of the most widely adopted approaches due to its conceptual simplicity, computational efficiency, and ability to rank alternatives based on their relative distances from ideal and anti-ideal solutions.

[23] integrated fuzzy theory with the Rasch model and TOPSIS to evaluate tourism competitiveness across Asian countries, demonstrating that TOPSIS can effectively handle uncertainty and multidimensional evaluation criteria. Likewise, [24] compared AHP-TOPSIS and AHP-AHP approaches and concluded that TOPSIS provides a robust mechanism for prioritizing alternatives in multi-criteria decision environments. These studies illustrate the adaptability of TOPSIS across a broad range of practical applications involving heterogeneous decision variables.

In Thailand, MCDM techniques have been successfully applied in several do-

mains. [25] integrated fuzzy logic with the Analytic Hierarchy Process (AHP) for stock portfolio selection under uncertain market conditions, while [26] combined fuzzy quantitative analysis and multi-criteria decision-making techniques to optimize investment decisions. The success of these applications demonstrates the flexibility of TOPSIS and AHP in dealing with problems that require balancing multiple and often conflicting criteria.

Several researchers have further enhanced MCDM methodologies by integrating AHP with latent factor models and fuzzy logic. [27] proposed an extended AHP framework incorporating latent factors and stratification to prioritize economic development programs. Meanwhile, [28] and [29] conducted comparative analyses of SAW, AHP, TOPSIS, and fuzzy TOPSIS, highlighting the strengths and limitations of each method under different decision contexts. Their findings suggest that combining weighting mechanisms with ranking methods can improve decision consistency and interpretability.

The application of statistical techniques to governance and corruption studies further supports the use of integrated decision-making frameworks. [30] employed quantitative methods to investigate corruption patterns in Thai society, while [31] examined the ethical and institutional dimensions of governance in public administration. These studies collectively indicate that corruption and transparency are inherently multidimensional phenomena and therefore require analytical frameworks capable of integrating diverse information sources.

Despite the growing popularity of MCDM methods, relatively few studies have applied these techniques directly to the assessment of transparency in donation-

dependent nonprofit organizations. Existing applications have largely focused on engineering, finance, tourism, and public administration, leaving substantial opportunities to extend these methodologies to nonprofit governance and charitable foundation evaluation.

2.3 Bridging the gap: transparency assessment of charitable foundations

Although previous studies have substantially advanced our understanding of corruption, nonprofit governance, and multi-criteria decision-making, several important gaps remain. First, much of the literature on corruption and transparency emphasizes conceptual analysis, policy recommendations, or case-specific investigations, with relatively limited attention given to the development of operational and quantitative evaluation frameworks. Second, studies employing MCDM techniques have largely concentrated on fields such as engineering, investment analysis, tourism, and public administration, whereas applications to the nonprofit and philanthropic sectors remain comparatively scarce. Third, existing transparency studies often examine isolated indicators rather than integrating multiple latent dimensions into a unified and interpretable assessment model.

To address these limitations, this study integrates Factor Analysis, the Analytic Hierarchy Process (AHP), and the Technique for Order Preference by Similarity to the Ideal Solution (TOPSIS) into a single analytical framework for evaluating the transparency of donation-accepting foundations. Factor Analysis is employed to identify and cluster related corruption- and transparency-related variables into meaningful latent dimensions. Subsequently, expert judgment is incorporated through

pairwise comparisons using AHP to determine the relative importance of each factor group. Finally, TOPSIS is applied to synthesize the weighted information and rank foundations according to their transparency performance.

The proposed framework offers several practical advantages. By reducing the dimensionality of corruption-related variables, it improves the interpretability of transparency assessment. The incorporation of expert-based weighting through AHP allows the framework to reflect practical governance priorities, while the use of TOPSIS provides an objective and systematic mechanism for comparing organizations across multiple criteria. Consequently, the approach is capable of supporting evidence-based decision-making for regulators, foundation administrators, auditors, and potential donors.

This study therefore contributes to the literature by bridging the gap between governance theory and practical evaluation methodology. Rather than examining corruption and transparency solely from a conceptual perspective, it proposes a structured quantitative framework that integrates latent factor identification, expert judgment, and multi-criteria decision analysis into a coherent transparency assessment process. The resulting framework not only advances the methodological application of MCDM techniques within the nonprofit sector but also provides a practical foundation for future transparency benchmarking systems and digital governance platforms designed to strengthen accountability and public trust in donation-dependent foundations.

3. Background

This section presents the methodological foundations underlying the proposed transparency assessment framework.

The study integrates three complementary analytical techniques: the Analytic Hierarchy Process (AHP), the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), and Factor Analysis. Factor Analysis is employed to identify latent dimensions associated with corruption and transparency indicators, AHP is used to determine the relative importance of these dimensions through expert judgment, and TOPSIS provides a systematic mechanism for aggregating the weighted criteria and ranking foundations according to their transparency performance. Together, these methods establish a coherent quantitative framework for supporting evidence-based transparency assessment and governance evaluation.

3.1 Analytic hierarchy process

The Analytic Hierarchy Process (AHP), originally proposed by [32], is one of the most widely used multi-criteria decision-making (MCDM) techniques for problems involving both qualitative and quantitative evaluation criteria. The method decomposes a complex decision problem into a hierarchical structure consisting of the overall objective, evaluation criteria, and decision alternatives. Through pairwise comparisons, AHP transforms expert judgments into a set of relative weights while incorporating a consistency measure to evaluate the reliability of those judgments.

In transparency and governance assessment, many evaluation criteria cannot be measured directly through objective numerical indicators. Consequently, expert knowledge is essential for determining the relative importance of different dimensions of organizational transparency. The application of AHP in this study enables these subjective assessments to be systematically

quantified and integrated into the proposed transparency evaluation framework.

For completeness and to establish the mathematical notation used throughout the study, the principal concepts underlying the AHP methodology are summarized below.

3.2 Technique for order preference by similarity to ideal solution

The Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), introduced by Hwang and Yoon, is a widely adopted multi-criteria decision-making method for ranking alternatives according to their relative proximity to an ideal solution. The fundamental concept of TOPSIS is that the preferred alternative should simultaneously have the shortest distance from the positive ideal solution (PIS) and the greatest distance from the negative ideal solution (NIS).

Compared with many alternative MCDM approaches, TOPSIS provides a transparent computational procedure, intuitive interpretation, and the ability to synthesize multiple and potentially conflicting criteria into a single performance measure. These characteristics make it particularly suitable for evaluating organizational transparency, where governance quality is determined by several interrelated dimensions. In the proposed framework, TOPSIS serves as the final decision-support mechanism for ranking donation-accepting foundations according to their overall transparency performance.

Assume that the decision matrix consists of n alternatives $[A_1, A_2, A_3, \dots, A_n]$ and m evaluation criteria $[C_1, C_2, C_3, \dots, C_m]$. The decision matrix is represented by

$$X = [x_{ij}]_{n \times m},$$

where x_{ij} denotes the performance value of

alternative i under criterion j .

3.3 Factor analysis

Factor Analysis is a multivariate statistical technique used to identify latent structures underlying a large set of observed variables. By grouping highly correlated variables into common factors, the method reduces data dimensionality while preserving the essential information contained in the original variables. Variables belonging to the same factor are expected to exhibit strong internal relationships, whereas variables associated with different factors generally display weaker correlations.

In the context of the present study, numerous observed variables are associated with corruption risk and organizational transparency. Directly incorporating all variables into the evaluation process would reduce interpretability and increase redundancy. Therefore, Factor Analysis is employed as an initial data reduction technique to identify and classify related indicators into meaningful latent dimensions. These extracted factors subsequently provide the basis for expert weighting through AHP and the transparency ranking procedure using TOPSIS.

The mathematical formulation of the factor model adopted in this study is presented below.

3.4 Population, sample, and definitions of key terms

3.4.1 Population and sample

The target population of this study comprises personnel affiliated with foundations registered as public charitable organizations under Section 47(7)(b) of the Revenue Code and for which public contact information is available. A total of 200 organizations satisfied these criteria and constituted the sampling frame. The empirical

analysis was conducted using questionnaire responses collected from personnel representing 31 foundations selected from this population.

3.4.2 Definitions of key terms

Donation: A donation refers to the voluntary transfer of money, goods, services, or other resources for charitable or public-benefit purposes without the expectation of direct personal gain. Consistent with the philanthropy literature and the World Giving Index, donations are regarded as expressions of altruism and social responsibility that contribute to the well-being of individuals and communities ([33, 34]).

Foundation: A foundation is a legally recognized nonprofit organization established to manage dedicated assets for charitable, educational, religious, scientific, or other public-benefit purposes. Its operations are governed by relevant legal and regulatory frameworks and are not intended to generate private profit for members or administrators ([35, 36]).

Transparency: Transparency refers to the extent to which an organization openly discloses relevant information, conducts its operations in an accountable manner, and enables stakeholders to verify its activities and decision-making processes. Within the nonprofit sector, transparency constitutes a key determinant of organizational legitimacy and public trust ([12]).

Corruption: Corruption is the abuse of entrusted power or authority for private or organizational gain. It includes behaviors such as fraud, embezzlement, bribery, and the misuse of organizational resources, all of which undermine accountability and weaken public confidence in institutional governance ([30]).

4. Methodology and Evaluation Process

This study employs an integrated methodological framework that combines Factor Analysis, the Analytic Hierarchy Process (AHP), and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) to construct a systematic transparency assessment model for donation-dependent foundations. The overall framework consists of five sequential stages: (1) identification of corruption-related factors, (2) questionnaire development and data collection, (3) extraction of latent dimensions through Factor Analysis, (4) estimation of factor importance using AHP, and (5) transparency ranking through TOPSIS. The workflow of the proposed framework is illustrated in Fig. 1.

Step 1: Identification of Factors Influencing Corruption and Transparency

The first stage aims to establish a comprehensive set of variables associated with corruption risk and organizational transparency in donation-dependent foundations.

- (1) Literature Review: Relevant studies on corruption, nonprofit governance, transparency, accountability, and donation behavior are systematically reviewed to identify potential evaluation variables.
- (2) Expert Consultation: Preliminary factors identified from the literature are refined through consultation with experts, including specialists from the Office of the Social Contract for Democracy and anti-corruption researchers. The objective is to ensure that the selected

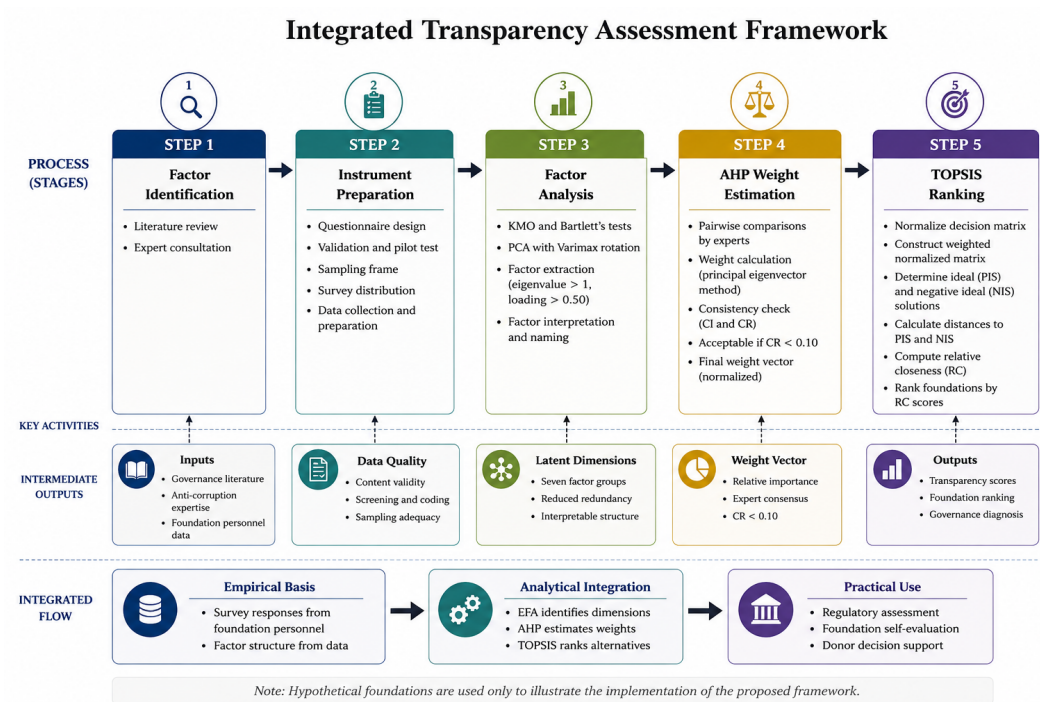


Fig. 1. Workflow of the integrated transparency assessment framework.

variables adequately reflect the practical and institutional characteristics of charitable foundations in Thailand.

Step 2: Questionnaire Development and Data Collection

The second stage involves constructing and validating a survey instrument to collect empirical data for subsequent statistical analysis.

- (1) Questionnaire Design: Survey items are developed based on the factors identified in Step 1 and are organized to capture different dimensions of corruption risk and transparency.
- (2) Content Validation: The questionnaire is reviewed by domain experts to assess its clarity, rel-

evance, and content validity before distribution.

- (3) Sampling Procedure: Foundations and respondents are selected using convenience sampling from the list of public charitable organizations satisfying the inclusion criteria described in Section 3.
- (4) Questionnaire Distribution: The validated questionnaire is distributed to selected foundations and their personnel through available communication channels.
- (5) Data Collection and Preparation: Completed questionnaires are screened, coded, and compiled into a structured dataset for statistical analysis.

Step 3: Extraction of Latent Factors Using Factor Analysis

Exploratory Factor Analysis (EFA) is employed to identify latent structures underlying the observed corruption- and transparency-related variables and to reduce data dimensionality.

(1) Assessment of Data Suitability:

- The Kaiser–Meyer–Olkin (KMO) measure is used to evaluate sampling adequacy.
- Bartlett’s Test of Sphericity is performed to verify that the observed variables exhibit sufficient correlations for factor analysis.

(2) Factor Extraction:

- Principal Component Analysis (PCA) is employed as the extraction technique.
- Varimax orthogonal rotation is applied to improve the interpretability of the factor structure.
- The number of retained factors is determined by considering multiple criteria, including eigenvalues greater than one, the scree plot, and factor loadings exceeding 0.50.

(3) Factor Interpretation and Naming: Variables with similar conceptual characteristics are grouped together, and each extracted factor is assigned a descriptive label reflecting its dominant governance or transparency dimension.

Step 4: Weight Estimation Using the Analytic Hierarchy Process

Following factor extraction, the relative importance of the identified factor groups is determined using the Analytic Hierarchy Process.

(1) Expert Judgment:

- Subject-matter experts evaluate the relative importance of the factor groups identified in Step 3.
- Pairwise comparison matrices are constructed according to Saaty’s fundamental scale.

(2) Weight Calculation:

- Pairwise comparison matrices are normalized to derive the corresponding priority vectors.
- The principal eigenvector method is employed to estimate the relative weight of each factor.

(3) Consistency Verification and Weight Aggregation:

- The Consistency Index (CI) and Consistency Ratio (CR) are computed to assess the reliability of expert judgments.
- Pairwise comparison matrices are considered acceptable when $CR < 0.10$.
- The resulting factor weights are aggregated and normalized to obtain the final weight vector used in the transparency evaluation model.

Step 5: Transparency Ranking Using TOPSIS

The final stage applies TOPSIS to synthesize the weighted factor scores and rank foundations according to their overall transparency performance.

(1) Normalization of the Decision Matrix

The decision matrix is normalized using vector normalization:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}}.$$

(2) Construction of the Weighted Normalized Matrix

The weighted normalized values are calculated as

$$v_{ij} = w_j r_{ij},$$

where w_j denotes the weight of criterion j obtained from the AHP procedure.

(3) Determination of the Ideal Solutions

The positive ideal solution (PIS) is defined by the best attainable values for all benefit criteria, whereas the negative ideal solution (NIS) is defined by the least desirable values.

(4) Distance Measurement

The Euclidean distances between each alternative and the ideal solutions are computed as

$$D_i^+ = \sqrt{\sum_{j=1}^m (v_{ij} - v_{ij}^+)^2},$$

and

$$D_i^- = \sqrt{\sum_{j=1}^m (v_{ij} - v_{ij}^-)^2}.$$

(5) Relative Closeness Calculation

The relative closeness of each alternative to the ideal solution is calculated by

$$RC_i = \frac{D_i^-}{D_i^+ + D_i^-}.$$

(6) Transparency Ranking

Foundations are ranked according to their relative closeness coefficients. A higher RC_i value indicates that a foundation is closer to the ideal transparency profile and therefore demonstrates a higher level of operational transparency.

Remark. Owing to practical limitations in obtaining complete operational information from charitable organizations, the TOPSIS procedure is illustrated through a case study involving five hypothetical foundations. The hypothetical examples are employed solely to demonstrate the applicability and implementation of the proposed transparency assessment framework and do not affect the empirical identification of corruption-related factors or the estimation of factor weights derived from the survey data.

5. Research Findings

This section presents the empirical findings obtained from applying the integrated transparency assessment framework proposed in Section 4. Following the methodological workflow, corruption- and transparency-related variables were first

identified through a combination of literature synthesis and expert consultation. Questionnaire data collected from foundation personnel were then analyzed using Exploratory Factor Analysis (EFA) to extract latent dimensions, after which the Analytic Hierarchy Process (AHP) was employed to estimate the relative importance of the extracted factor groups. Finally, the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) was used to demonstrate the application of the proposed framework in ranking foundation transparency. The sequential implementation of these methods provides an interpretable and evidence-based mechanism for assessing governance quality in donation-dependent foundations.

5.1 Identification of key factors

An extensive review of the literature, together with consultations with experts in anti-corruption and nonprofit governance, resulted in the identification of 50 factors associated with corruption risk and transparency within charitable foundations. These factors encompass multiple dimensions of organizational governance, including personnel management, financial accountability, governance structure, operational control, regulatory compliance, and external influence.

To facilitate subsequent statistical analysis and interpretation, each factor was assigned a standardized abbreviation and incorporated into a structured coding framework. The resulting set of indicators constitutes the conceptual foundation for the proposed transparency assessment model and provides a comprehensive representation of the governance mechanisms affecting corruption vulnerability in donation-dependent foundations.

5.2 Factor grouping results using factor analysis

Exploratory Factor Analysis (EFA) was conducted using questionnaire responses collected from 59 personnel representing 31 foundations. Prior to factor extraction, the suitability of the dataset for factor analysis was assessed using standard diagnostic measures. The Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy yielded a value of 0.782, indicating that the observed variables exhibited sufficient common variance to justify factor analysis. In addition, Bartlett’s Test of Sphericity was statistically significant ($p < 0.05$), confirming that the correlation matrix was not an identity matrix and that meaningful latent structures could be extracted.

Principal Component Analysis (PCA) with Varimax orthogonal rotation was subsequently applied to improve the interpretability of the factor structure. Variables with factor loadings below 0.50 were excluded from further analysis, resulting in 47 retained variables that were grouped into seven interpretable latent dimensions. The retained factors capture the principal organizational mechanisms associated with corruption prevention and transparency enhancement in foundation operations.

Table 1 summarizes the extracted factor groups and their corresponding abbreviations.

The extracted factor structure reveals that corruption risk in charitable foundations is inherently multidimensional. Rather than being determined solely by financial controls, transparency is influenced by the interaction between governance arrangements, internal monitoring systems, personnel management, organizational culture, and capacity-building mechanisms. In particular, the emergence of dedicated di-

Table 1. Factor groups and abbreviations.

Group	Group Name	Factors Included	Abbreviation
1	Corruption Audits and Penalties	Whistleblower system, fraud detection, corruption risk assessment, transparency, document management, budget monitoring, public disclosure, dishonest individual record, limited public access, misreporting, penalties, severity of penalties	CAP
2	Budget and Internal Operations Management	Price verification, budget efficiency, asset oversight, resource borrowing, internal regulations, teamwork, compliance monitoring, performance evaluation, anti-corruption committee, project monitoring	BIOM
3	Position and Financial Management	Internal promotions, job rotation, board elections, role division, procurement regulations, budget allocation, donation system, lack of anti-corruption training	PFM
4	Authority of Board and Key Personnel	Board influence, appointment authority, staff dismissal, board monopoly, external influence, no donation limits	ABKP
5	Personnel Relationships and Financial Standing	Close staff relationships, patronage system, decision-making power, low salaries, financial difficulties, overestimated budgets	PRFS
6	Job Responsibilities and Organizational Structure	Multiple job roles, organizational structure, accounting budgeting	JROS
7	Training and Knowledge Development	Training programs for personnel development	TKD

mensions related to board authority, audit and penalty systems, and internal operational management highlights the importance of institutional governance structures in promoting organizational integrity. Consequently, the extracted factors provide an empirically grounded basis for subsequent weighting and transparency evaluation.

5.3 Weight assessment using the AHP method

Following factor extraction, the Analytic Hierarchy Process (AHP) was employed to determine the relative importance of the seven factor groups. Three experts with professional backgrounds in anti-corruption policy and governance evaluation, including specialists affiliated with the National Anti-Corruption Commission (NACC) and the Office of the Social Contract for Democracy, independently as-

sessed the relative importance of each factor group using pairwise comparisons based on Saaty's fundamental scale.

To reduce individual assessment bias and obtain a balanced representation of expert opinion, the priority weights derived from the three pairwise comparison matrices were aggregated using arithmetic averaging. This aggregation approach provides a consensus estimate of the relative contribution of each governance dimension to overall corruption risk and organizational transparency.

Table 2 indicates that the most influential factor group is Authority of Board and Key Personnel (ABKP), which received the highest average weight of 0.2501. This finding suggests that governance concentration, board oversight, and the allocation of decision-making author-

Table 2. Weights of factor groups influencing corruption in foundation operations.

Factor Group	Expert 1	Expert 2	Expert 3	Average Weight
CAP	0.2465	0.1234	0.1851	0.1850
BIOM	0.0758	0.2372	0.1564	0.1565
PFM	0.0758	0.0827	0.0794	0.0793
ABKP	0.0758	0.4244	0.2502	0.2501
PRFS	0.1397	0.0262	0.0831	0.0830
JROS	0.1397	0.0531	0.0963	0.0964
TKD	0.2465	0.0531	0.1499	0.1498

ity constitute the most critical determinants of corruption vulnerability within charitable foundations. The second most influential dimension is Corruption Audits and Penalties (CAP), with a weight of 0.1850, emphasizing the importance of effective monitoring mechanisms, whistleblower systems, and enforceable sanctions in strengthening organizational accountability.

In contrast, Position and Financial Management (PFM) received the lowest average weight of 0.0793, suggesting that although personnel allocation and financial administration remain relevant, they exert a comparatively smaller influence than broader governance and oversight mechanisms. Collectively, these findings imply that strengthening institutional governance structures may generate greater improvements in transparency than isolated administrative interventions.

To evaluate the reliability of expert judgments, the Consistency Ratio (CR) was calculated for each pairwise comparison matrix.

Table 3. Consistency Ratio (CR) of expert evaluations.

Expert	CR Value
1	0.0032
2	0.0573
3	0.0458

As reported in Table 3, all three experts achieved Consistency Ratio values below the recommended threshold of 0.10, indicating an acceptable level of logical consistency in the pairwise comparison process. The low CR values provide evidence that the estimated priority weights are internally coherent and suitable for subsequent application within the TOPSIS ranking framework.

The weighting results therefore establish an empirically supported hierarchy of corruption-related dimensions and provide the quantitative basis for constructing the integrated transparency assessment model proposed in this study.

5.4 Ranking foundations using the TOPSIS method

To illustrate the practical applicability of the proposed framework, the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) was applied to rank foundations according to their overall transparency performance. The evaluation combines the factor structure identified through EFA with the relative weights obtained from the AHP procedure, thereby integrating empirical evidence and expert judgment within a unified multi-criteria decision-making framework.

Transparency scores were assigned using a six-level ordinal scale ranging from

0 (No Transparency) to 5 (Very High Transparency). The evaluation criteria are summarized in Table 4.

Table 4. Transparency score criteria.

Score	Transparency Level
5	Very High Transparency
4	High Transparency
3	Moderate Transparency
2	Low Transparency
1	Very Low Transparency
0	No Transparency

Remark: The transparency scale is intended to illustrate the implementation of the proposed framework. In practical applications, each criterion should be supported by detailed operational indicators and standardized scoring guidelines to improve inter-rater reliability and assessment consistency.

The implementation of TOPSIS consists of the following computational stages:

Step 1: Assignment of Transparency Scores

Illustrative transparency scores were assigned to five representative foundations across the seven extracted factor groups. The factor weights obtained from the AHP analysis were incorporated into the decision matrix, as summarized in Table 5.

Table 5. Transparency scores and factor group weights for the illustrative case.

Foundation	CAP	BIOM	PFM	ABKP	PRFS	JROS	TKD
Factor Weights	0.1850	0.1565	0.0793	0.2501	0.0830	0.0964	0.1498
A	5	4	5	5	5	4	4
B	4	5	4	4	3	3	4
C	4	4	3	3	4	2	4
D	2	4	3	3	4	2	2
F	1	2	2	1	1	2	3

Step 2: Normalization of the Decision Matrix

The original scores were transformed into normalized values using vector

normalization:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}},$$

thereby ensuring comparability across evaluation criteria. The normalized decision matrix is reported in Table 6.

Table 6. Normalized scores for the illustrative case.

Foundation	CAP	BIOM	PFM	ABKP	PRFS	JROS	TKD
A	0.6350	0.4558	0.6299	0.6455	0.6108	0.6576	0.5121
B	0.5080	0.5698	0.5040	0.5164	0.3665	0.4932	0.5121
C	0.5080	0.4558	0.3780	0.3873	0.4887	0.3288	0.5121
D	0.2540	0.4558	0.3780	0.3873	0.4887	0.3288	0.2561
F	0.1270	0.2279	0.2520	0.1291	0.1222	0.3288	0.3841

Step 3: Construction of the Weighted Normalized Matrix

Each normalized score was multiplied by its corresponding factor weight according to

$$v_{ij} = w_j r_{ij},$$

where w_j represents the AHP-derived weight of criterion j . The resulting weighted normalized matrix is presented in Table 7.

Table 7. Weighted normalized scores for the illustrative case.

Foundation	CAP	BIOM	PFM	ABKP	PRFS	JROS	TKD
A	0.1175	0.0713	0.0500	0.1614	0.0507	0.0634	0.0767
B	0.0940	0.0892	0.0400	0.1292	0.0304	0.0475	0.0767
C	0.0940	0.0713	0.0300	0.0969	0.0406	0.0317	0.0767
D	0.0470	0.0713	0.0300	0.0969	0.0406	0.0317	0.0384
F	0.0235	0.0357	0.0200	0.0323	0.0101	0.0317	0.0575

Step 4: Identification of Ideal Solutions

The positive ideal solution (PIS) and negative ideal solution (NIS) were determined by selecting, respectively, the most desirable and least desirable values for each criterion. The resulting benchmark vectors are summarized in Table 8.

Table 8. Positive and negative ideal solutions for the illustrative case.

	CAP	BIOM	PFM	ABKP	PRFS	JROS	TKD
A ⁺	0.1175	0.0892	0.0500	0.1614	0.0507	0.0634	0.0767
A ⁻	0.0235	0.0357	0.0200	0.0323	0.0101	0.0317	0.0384

Step 5: Distance Calculation

The Euclidean distances between each alternative and the ideal solutions were computed according to

$$D_i^+ = \sqrt{\sum_{j=1}^m (v_{ij} - v_j^+)^2},$$

and

$$D_i^- = \sqrt{\sum_{j=1}^m (v_{ij} - v_j^-)^2}.$$

Step 6: Relative Closeness Calculation

The relative closeness of each foundation to the ideal transparency profile was calculated using

$$RC_i = \frac{D_i^-}{D_i^+ + D_i^-}.$$

A larger RC_i value indicates that the foundation is closer to the positive ideal solution and therefore exhibits a higher level of transparency.

Step 7: Transparency Ranking

The final transparency rankings were obtained by ordering the foundations according to their relative closeness coefficients. The resulting rankings are reported in Table 9.

The illustrative TOPSIS application demonstrates that Foundation A achieved the highest relative closeness coefficient

Table 9. Foundation transparency rankings for the illustrative case.

Foundation	D_i^+	D_i^-	RC Score	Rank
A	0.0178	0.1783	0.9091	1
B	0.0485	0.1405	0.7432	2
C	0.0809	0.1136	0.5840	3
D	0.1115	0.0838	0.4290	4
F	0.1797	0.0192	0.0964	5

and therefore exhibited the strongest transparency profile among the evaluated alternatives. Foundation B ranked second, while Foundation F obtained the lowest score, indicating comparatively weaker governance and transparency characteristics. The ranking pattern is consistent with the relative strengths and weaknesses observed across the extracted factor groups, particularly those associated with board authority, audit mechanisms, and internal governance controls.

More importantly, the findings demonstrate the practical feasibility of integrating Factor Analysis, AHP, and TOPSIS into a unified transparency assessment framework. The factor extraction process reduces the complexity of governance-related variables, AHP provides a theoretically and practically grounded weighting mechanism, and TOPSIS synthesizes these weighted dimensions into an interpretable ranking. Consequently, the proposed framework offers a systematic and transparent decision-support tool that can assist regulators, foundation administrators, auditors, and donors in evaluating organizational governance quality and identifying areas requiring improvement.

It should be emphasized that the foundation rankings presented in this section are intended solely to illustrate the operational implementation of the proposed

methodology. The use of hypothetical examples does not affect the validity of the extracted factor structure or the estimated factor weights, which are derived from empirical survey data. Future studies may extend this framework by applying the methodology to larger datasets of real-world charitable organizations and by developing standardized transparency scoring protocols to further enhance the robustness and comparability of the resulting evaluations.

6. Conclusion and Recommendations

This study set out to identify the principal factors associated with corruption risk in donation-dependent foundations, establish a set of transparency indicators, and develop a structured framework for evaluating and ranking organizational transparency. To achieve these objectives, the study integrated Exploratory Factor Analysis (EFA), the Analytic Hierarchy Process (AHP), and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) into a unified decision-support framework. The proposed methodology combines data-driven factor extraction, expert-based weighting, and multi-criteria ranking, thereby providing a systematic and interpretable mechanism for transparency assessment in the nonprofit sector.

The empirical findings indicate that corruption and transparency in charitable foundations are multidimensional phenomena shaped by the interaction of governance structures, financial oversight, organizational processes, and human resource management. The factor analysis identified seven latent dimensions that collectively characterize corruption vulnerability and transparency performance: (1) corruption audits and penalties, (2) budget and internal operations management, (3) posi-

tion and financial management, (4) authority of the board and key personnel, (5) personnel relationships and financial standing, (6) job responsibilities and organizational structure, and (7) training and knowledge development. These dimensions provide an empirically grounded representation of the governance mechanisms that influence accountability in donation-dependent organizations.

The subsequent AHP analysis revealed that the Authority of Board and Key Personnel factor exerts the strongest influence on corruption risk, followed by Corruption Audits and Penalties. This finding highlights the central role of institutional governance, oversight structures, and effective accountability mechanisms in strengthening transparency. Rather than relying solely on administrative controls, the results suggest that improving governance architecture and balancing organizational authority may produce more substantial and sustainable reductions in corruption risk.

The application of TOPSIS further demonstrates the practical utility of the proposed framework by transforming multiple governance dimensions into an interpretable transparency ranking. The integration of factor extraction, expert judgment, and multi-criteria decision analysis enables the proposed model to distinguish between organizations with different transparency profiles in a systematic and transparent manner. Although the illustrative case study employs hypothetical foundation data for demonstration purposes, the methodology itself is generalizable and can be applied to empirical datasets obtained from real-world charitable organizations.

From a theoretical perspective, this study contributes to the growing literature on nonprofit governance by extending the application of multi-criteria decision-

making techniques to the evaluation of transparency in donation-dependent foundations. While previous studies have often investigated corruption, governance, or transparency separately, the present research demonstrates how latent factor identification, expert-based weighting, and organizational ranking can be integrated into a single analytical framework. The study therefore bridges the gap between conceptual discussions of nonprofit accountability and the practical need for operational tools capable of supporting evidence-based governance evaluation.

From a practical perspective, the proposed framework offers several opportunities for implementation. First, it can be developed into a standardized Foundation Transparency Assessment System that enables regulators, auditors, and independent evaluators to assess charitable organizations using objective and reproducible criteria. By incorporating predefined indicators and structured weighting mechanisms, such a system could reduce subjectivity and improve the consistency of transparency evaluations across organizations.

Second, the proposed methodology can serve as the analytical engine of a digital Transparency Dashboard that continuously monitors and visualizes governance performance. Foundations could use this platform as a self-assessment and benchmarking tool to identify organizational weaknesses, monitor improvements over time, and strengthen internal accountability mechanisms. At the same time, supervisory agencies could employ aggregated transparency indicators to support risk-based auditing and governance oversight.

Third, the framework may be extended to support a transparency-informed philanthropic platform, where transparency

scores are integrated into online donation systems. Such a platform would allow donors to compare charitable organizations based not only on their missions or activities but also on independently assessed governance and accountability indicators. By making transparency information more accessible, the platform could promote informed philanthropic decision-making, strengthen public confidence, and encourage foundations to improve governance practices through constructive competition.

In addition to its practical contributions, the findings of this study have important policy implications. The extracted factor structure and the resulting transparency indicators provide a foundation for developing standardized governance guidelines for donation-dependent nonprofit organizations. Policymakers and regulatory agencies may utilize these indicators as part of broader initiatives aimed at enhancing accountability, promoting ethical management practices, and strengthening public trust in the charitable sector. Moreover, the proposed framework could support the future development of national or regional transparency indices for nonprofit organizations, facilitating benchmarking and longitudinal governance assessment.

Despite these contributions, several limitations should be acknowledged. First, the factor structure was derived from data collected from a limited number of foundations and personnel, reflecting the practical constraints associated with accessing nonprofit organizations. Second, the AHP weighting process relies on expert judgment, and although the consistency ratios indicate acceptable reliability, some degree of subjectivity is unavoidable. Third, the illustrative TOPSIS application is intended to demonstrate the operational im-

plementation of the proposed framework and does not constitute a comprehensive empirical ranking of all charitable foundations in Thailand. Finally, the present framework primarily focuses on internal governance dimensions and does not explicitly incorporate external factors such as regulatory changes, political conditions, macroeconomic uncertainty, or broader institutional environments that may also influence organizational transparency.

Future research can extend and strengthen the proposed framework in several directions. Expanding the sample size and incorporating a broader range of charitable organizations would improve the generalizability of the findings. Comparative studies across different countries or nonprofit sectors could provide valuable insights into the influence of institutional contexts on transparency and governance. In addition, integrating external governance variables and adopting complementary decision-making techniques, such as fuzzy MCDM approaches or hybrid artificial intelligence methods, may further enhance the robustness and adaptability of the evaluation model. The development and validation of standardized transparency scoring protocols would also contribute to improving the consistency and comparability of future assessments.

In conclusion, this study proposes and demonstrates an integrated framework for evaluating transparency in donation-dependent foundations by combining Factor Analysis, AHP, and TOPSIS. The findings highlight the importance of governance structures, oversight mechanisms, and institutional accountability in reducing corruption risk and strengthening public trust. Beyond its academic contribution, the proposed framework provides a practical foundation for develop-

ing digital transparency assessment systems, governance benchmarking platforms, and transparency-informed philanthropic decision-support tools. By promoting objective evaluation, evidence-based governance, and greater accountability, the framework has the potential to support more effective nonprofit management and foster sustainable public confidence in the charitable sector.

Acknowledgements

We sincerely thank the Thammasat University Research Unit in Mathematical Sciences and Applications for their financial support. Special thanks to the Department of Mathematics and Statistics, Faculty of Science and Technology, Thammasat University, for their inspiration and encouragement.

References

- [1] Economic Intelligence Center (EIC). Thai Charitable Giving: Trends and Insights from Household Donation Data. Bangkok: Siam Commercial Bank; 2018. Available from: <https://www.scbeic.com/en/detail/product-/4385>.
- [2] Bangkok Post. Signature forgery, Siriraj Foundation fund withdrawal. Bangkok Post. 2019 Mar 14. Available from: <https://www.bangkokpost.com/thailand/-general/1643372>.
- [3] Thai PBS News. Fraud in the name of Luang Por Kasem Foundation. Thai PBS News. 2019 Aug 5. Available from: <https://news.thaipbs.or.th/content/282801>.
- [4] Bangkok Post. Asian Peace Foundation, DSI accused of official misappropriation of donations. Bangkok Post. 2018 Nov 22. Available from: <https://www.bangkokpost.com/thailand/-general/1578370>.

- [5] Intharat N. Measures to Prevent Non-profit Organizations from Being a Source of Financial Support for Terrorism: A Case Study of Foundations [Doctoral dissertation]. Pathum Thani: Rangsit University; 2015. Available from: <https://rsuir-library.rsu.ac.th/handle/123456789/1250>.
- [6] Romaniuk P, Keatinge T. Protecting charities from terrorists and counterterrorists: FATF and the global effort to prevent terrorist financing through the non-profit sector. *Crime Law Soc Change*. 2018;69:265–282.
- [7] Hallak J, Poisson M. *Corrupt Schools, Corrupt Universities: What Can Be Done?* Paris: International Institute for Educational Planning, UNESCO; 2007.
- [8] Mobegi FO, Ondigi BA, Simatwa EMW. Factors contributing to financial mismanagement and misappropriation in public secondary schools in Gucha District, Kenya. *Educ Res*. 2012;3(7):592–600.
- [9] Phongphaew P. *Thailand's Corruption Index: Construction and Reliability Testing*. Bangkok: Office of the National Anti-Corruption Commission; 2000.
- [10] Budsaratagoon P, Jitmaneeroj B. A critique on the Corruption Perceptions Index: An interdisciplinary approach. *Socio-Econ Plan Sci*. 2020;70:100768.
- [11] Shkabatur J. Transparency with(out) accountability: Open government in the United States. *Yale Law Policy Rev*. 2012;31:79–140.
- [12] Khopornprasert B. Guidelines for developing transparency standards in government agencies. *J Manag Sci*. 2011;28(1):33–48.
- [13] Apinunmahakul A. Religious and non-religious giving in Thailand: An economic perspective. *J Econ Sustain Dev*. 2014;5(3):111–118.
- [14] Amonhaemanon D, Khongkaew P, Akartwipart A, Thamthanakoon N. Distinguishing altruism from warm glow: Psychological motivations for money donations to Thailand's Buddhist society. *Rev Behav Finance*. 2024.
- [15] Pongsapich A, Salamon LM, Anheier HK. *Defining the Nonprofit Sector: Thailand*. Baltimore, MD: Johns Hopkins University Institute for Policy Studies; 1993.
- [16] Pongsapich A. The nonprofit sector in Thailand. In: Anheier HK, Salamon LM, editors. *The Nonprofit Sector in the Developing World: A Comparative Analysis*. Manchester: Manchester University Press; 1998. p. 294–315.
- [17] Basopu PM. *Assessing Challenges of Corruption in the Eastern Cape Department of Education* [Doctoral dissertation]. Alice, South Africa: University of Fort Hare; 2010.
- [18] Buraschi A, Cornelli F. The economics of donations and enlightened self-interest. *Eur Financ Manag*. 2014;20(1):1–32.
- [19] Bukhtiarova A, Dukhno Y, Kurochkina I, Lypchanskyi V. Ensuring transparency of key public finance authorities. *Invest Manag Financ Innov*. 2019;16(2):128–139.
- [20] Bekkers R, Wiepking P. A literature review of empirical studies of philanthropy: Eight mechanisms that drive charitable giving. *Nonprofit Volunt Sect Q*. 2011;40(5):924–973.
- [21] Ebrahim A. Accountability in practice: Mechanisms for NGOs. *World Dev*. 2003;31(5):813–829.
- [22] Saxton GD, Guo C. Accountability online: Understanding the web-based accountability practices of nonprofit organizations. *Nonprofit Volunt Sect Q*. 2011;40(2):270–295.

- [23] Huang JH, Peng KH. Fuzzy Rasch model in TOPSIS: A new approach for generating fuzzy numbers to assess the competitiveness of tourism industries in Asian countries. *Tour Manag.* 2012;33(2):456–465.
- [24] Sharma D, Sridhar S, Claudio D. Comparison of AHP-TOPSIS and AHP-AHP methods in multi-criteria decision-making problems. *Int J Ind Syst Eng.* 2020;34(2):203–223.
- [25] Kesamoon C, Witayakiattilerd W. Hierarchy analysis process under fuzzy environment: A positive way of selecting stocks into portfolio under ambiguity in stock information. *Sci Technol Asia.* 2019;24(3):1–12.
- [26] Yodmun S, Witayakiattilerd W. Stock selection into portfolio by fuzzy quantitative analysis and fuzzy multicriteria decision making. *Adv Oper Res.* 2016;2016:9530425.
- [27] Suttipong R, Phanphet S, Wangmai A, Reungsri S, Chattinnawat W. Extended AHP approach with latent factor and stratum in prioritizing and positioning of OTOP Thailand's program for elderly market. *Int J Glob Optim Its Appl.* 2022;1(1):22–31.
- [28] Apiradee S. Multi-criteria decision-making: Comparing SAW, AHP, and TOPSIS methodologies. *Princess of Naradhiwas University Journal.* 2016;8(2):180–192.
- [29] Akhavan P, Philsoophian M, Karimi MH. Selection and prioritization of knowledge management strategies using fuzzy TOPSIS approach: A case study of a research organization. *VINE J Inf Knowl Manag Syst.* 2019;49(3):397–419.
- [30] Nuamsiri S, Chamroenchat K, Maneechai K, Phonsayom A, Phan-ngam P. Corruption in Thai society. *Grad Stud J Mahamakut Buddhist Univ.* 2018;16(2):273–282.
- [31] Vichit-Vadakan J. Public ethics and corruption in Thailand. In: *Public Administration in Southeast Asia*. London: Routledge; 2017. p. 79–94.
- [32] Saaty TL. *The Analytic Hierarchy Process: Planning, Priority Setting, Resource Allocation*. New York: McGraw-Hill; 1980.
- [33] Yuen P. *Athapithan (Thesaurus)*. Bangkok: SE-EDUCATION; 1992. p. 318.
- [34] Charities Aid Foundation. *World Giving Index 2022*. Kent, UK: CAF; 2022. Available from: <https://www.cafonline.org/docs/default-source/about-us-publications/caf-world-giving-index-2022.pdf>.
- [35] Royal Institute. *Dictionary of the Royal Institute of Thailand 2011*. Bangkok: Royal Academy; 2013.
- [36] Revenue Department. *Tax Manual for Foundations and Associations*. Bangkok: Ministry of Finance; 2014.