

Article

Hybrid Approach to Corporate Sustainability Performance in Indonesia's Cement Industry

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Abstract: This study aimed to create a solid framework for decision-making in Indonesia's cement industry, emphasizing those factors which bring about the most impactful results. The framework was developed using the fuzzy Delphi method, the fuzzy decision-making trial and evaluation laboratory, and a fuzzy Kano model. This study builds a hierarchical structure to approach the impact of corporate sustainability performance. We classify important factors into causes or effects and further identify those factors which are critical to improving the performance of Indonesia's cement industry. Although corporate sustainability performance is a crucial topic in today's business environment, sustainability strategies remain underrated in Indonesia. We confirm the validity of 19 factors within the following dimensions: environmental impact, social sustainability, economic gain, technological feasibility, and institutional compliance. The sub-dimensions of community interest, risk-taking ability, and regulatory compliance were identified as causes of perceived risks and benefits. In contrast, the following factors were identified as critical to improving corporate sustainability performance: renewable energy resources, contributions to charity, the perception of management regarding technology as a differentiator, and firm readiness to collaborate with high-tech companies.

Keywords: corporate sustainability performance; technological feasibility; cement industry; fuzzy Kano model; fuzzy decision-making trial and evaluation laboratory



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1. Introduction

Since 2019, the Indonesian cement industry's capacity has reached 114 million tons, of which 70 million tons were destined for domestic consumption [1]. The cement industry involves air pollution, energy consumption, and CO₂ emissions worldwide, including sulfur dioxide (SO₂), nitrogen oxides (NO_x), and particulate matter (PM). The cement-producing province of North Sulawesi on Celebes exported 63,000 tons of cement in May 2021. Over the same period, the associated air pollution, energy consumption, and CO₂ emissions increased due to various sustainable development measures being essential to the industry. Those firms in the industry need to build performance measures toward sustainability. Hence, corporate sustainability performance (CSP) is important to transform how businesses operate in order to create value for multiple stakeholders [2–4]. However, the industry is facing increasing competition and pressures from economic, environmental, and social aspects [5–7]. A decision-making CSP framework needs to highlight the attributes to guide industry leaders and policy-makers for sustainable development.

Tseng et al. [8] claimed that the CSP functions measure a firm's effectiveness. Xia et al. [9] argued that CSP can assist industry in reaching business goals while protecting the sustainable development of society and the natural environment. However, strategies of sustainability remain underrated in many sectors and national economies [4]. One of these is the cement industry in Indonesia, which serves as the backbone of infrastructural development in the country. Indonesia is one of the top-five global producers of cement [10]. High-level CSP mandates balance among social, economic, and environmental requirements. It has been called the 'triple bottom line' (TBL) [3,8,11]. The concept of the TBL has been widely applied to assessments of CSP; however, this approach may be missing crucial aspects [9,12,13]. Aras et al. [12] argued that the concept of sustainability is vast and pervasive, which means it is unlikely to be limited to only three components. Fu et al. [14] suggested that technology plays a role in attaining high-quality CSP. Diaz-Chao et al. [15] emphasized that technology can be used to enhance efficiency in order to increase firm performance. In addition, Chatzitheodorou et al. [16] argued that firms face institutional pressure to meet the needs of their stakeholders. It includes regulations set by governments and industry associations. Baah et al. [17] claimed that regulatory compliance can serve to gain the support of regulatory institutions, which results in improved corporate performance. Hence, in this paper, we add technological feasibility and institutional pressure to the TBL definition of CSP.

Many studies have pointed out the complexity of CSP and the uncertainty associated with relevant qualitative and quantitative data. We therefore employed the fuzzy Delphi method (FDM) and the fuzzy decision-making trial and evaluation laboratory (DEMATEL) to approach measurements of CSP. First, we applied fuzzy Delphi to confirm the validity of CSP factors extracted from the literature. Second, we used DEMATEL to determine the relationships among these factors, including cause and effect relationships [18]. Third, we sought to determine the effect exerted by the different attributes. That is, sustainability factors are critical to improving CSP [19]. To answer this question, we applied the fuzzy Kano technique, which categorizes factors into distinct clusters. Ilbahar and Cebi [20] proposed the fuzzy Kano model to assist decision-makers in determining the importance and relevance of selected factors. Shokouhyar et al. [21] applied it to determine the significance of individual factors in the face of limited corporate resources. The objectives of this study were therefore as follows:

- To develop a valid hierarchical structure for CSP;
- To determine the causal relationships among CSP factors;
- To identify factors critical to the improvement of CSP in Indonesia's cement industry.

The remainder of this study is structured as follows: Section 2 presents a review of relevant literature on CSP, including theoretical background, our methodology, and the factors selected for analysis. Section 3 provides a detailed overview of the methodologies employed in this study. Section 4 contains our findings and discussion. Section 5 discusses the practical and theoretical implications. Lastly, Section 6 summarizes our findings, discusses limitations, and makes recommendations for future studies.

2. Literature Review

Our discussion of relevant literature is divided into four sections. We first present a nuanced definition of CSP. We then focus on technological feasibility and institutional compliance. Finally, we outline the proposed methodology and the factors selected for the original framework.

2.1. Corporate Sustainability Performance

CSP is defined as the activities a firm engages in in quest of sustainability at the economic, social, and environmental levels. The definition includes the firm's relationships with relevant stakeholders and operating strategies [22]. The business sector has profoundly engaged with the concept of CSP as an incentive rather than a requirement. This has resulted in a paradigm shift in how companies conceptualize and generate value [23,24].

Indeed, CSP is considered as the process of meeting and managing stakeholders' demands and preferences on behalf of the organization, while maintaining profitability and preserving human capital and environmental resources for the near and distant future [25,26]. It means it is closely linked with the concept of the TBL [4,9]

Elkington [27] presented the idea of the "triple bottom line" (TBL), which refers to the notion of sustainable performance as represented by a triple line with varying interfaces between social, economic, and environmental dimensions. Since then, the TBL approach has been adopted by many studies to measure corporate sustainability performance [28,29]. The TBL evaluates performance in three ways: traditional profit or economic measures, an assessment of its environmental responsibilities, and people's concerns about a firm's social responsibility as evidenced by its operations [30]. The TBL comprises fundamental pillars for determining a firm's sustainability [30,31]. Sustainability is the capacity to preserve long-term welfare that enables enterprises to meet current requirements without jeopardizing future generations' ability to meet their own.

Although CSP is often considered synonymous with the TBL concept, several researchers have claimed that assessments of CSP based on only three criteria may be insufficient [9,12,13]. For example, Bhupendra and Sangle [13] pointed out the importance of adopting advanced technology to eliminate the waste and emissions generated by production processes. Furthermore, Annunziata et al. (2018) argued that the adoption of advanced technology in the manufacturing process was associated with higher sustainability performance. It seems that technological incorporation could assist in improving the efficiency of CSP. Additionally, Xia et al. [9] noted the influence of pressure from governments and industry associations exerted to meet regulations. We therefore aimed to expand the notion of CSP by incorporating these two factors.

2.2. Technological Feasibility

Innovative sustainable technology is a novel avenue for alleviating environmental pressures and promoting sustainable capabilities [13]. To achieve unparalleled productivity levels, product breakthroughs and process innovations are required to reduce waste and emissions both within and outside of organizational boundaries [13,15]. This mandates a fundamental shift away from existing systems, technologies, and products [32]. Severo et al. [33] argued that incorporating emerging technologies into manufacturing processes offers a significant advantage. Ozusaglam et al. [34] and Diaz-Chao et al. [15] specified that technology can help firms to boost their efficiency with renewable, less energy-intensive, and safer manufacturing processes. Therefore, there is a broad consensus that technical advancements can make a major difference to CSP, particularly in mitigating adverse environmental effects [13,14,35]. Severo et al. [33] suggested that by incorporating new technologies, such as cleaner production, into manufacturing processes, the consumption of raw materials is also likely to decrease. Maisiri et al. [36] pointed out that adopting this kind of new technology will enhance economic and environmental sustainability and is expected to positively impact social acceptance. These benefits are already being enjoyed by pioneering cement industries in countries around the world [33].

2.3. Institutional Compliance

The practices of firms are affected by the expectations of external parties such as institutions and stakeholders [37]. These external parties can have a substantial impact on the decision processes and behaviors of firms. Stakeholders have particular demands that must be met by the company, and the pressure generated by these demands can serve as an incentive for firms to adopt environmentally-friendly business practices. Prior studies have categorized stakeholders as either primary or secondary ones [17,38]. Primary stakeholders are entities capable of influencing important aspects of the company, while secondary stakeholders have less influence on company survival. Government and industry or trade associations are considered primary stakeholders because these bodies have the power to establish regulations and standards.

As a primary stakeholder, the government has power over corporate management through regulations and legal requirements of compliance [16,39,40]. Acquah et al. [41] argued that changes in prevailing laws and requirements for legal compliance at both regional and national levels have a substantial influence on firms' operations. Qi et al. [37] specified that technical requirements, environmental taxes, and emission license procedures obligate businesses to devote resources to pollution mitigation. Promoting socially-responsible behavior is the most apparent motivation driving institutional stakeholders; disciplinary procedures and fines are the most common consequence of non-compliance. These elements affect a firm's operating costs, thereby aiding in the advancement of its manufacturing processes.

An important secondary stakeholder is industry associations, who also gauge the environmental performance of their members [17,38]. Shubam et al. [40] argued that industry associations enforce industry standards and smear nonconforming organizations for high-pollution industries. Baah et al. [17] affirmed that a firm's inability to comply with industry-association demands or standards will significantly deteriorate the firm's reputation and legitimacy. This strengthens firm performance in environmental and social aspects, leading to stronger relationships among stakeholders, organizational credibility, healthy company image, satisfaction of stakeholders, and commitment to meeting stakeholder needs.

2.4. Proposed Methodology

This study employs multiple methods. Initially, FDM is used to filter the collection of factors gleaned from previous studies. Tseng et al. [18] suggested that the subjective perception of humans is replete with ambiguities. Therefore, they applied fuzzy set theory to the traditional Delphi method. Bui et al. [42] asserted that the benefit of the FDM approach is that it can reduce the time required to make a decision based on expert opinion. The large body of research on CSP has resulted in a wide range of factors purported to be relevant to the concept. FDM was used to ensure that we only considered valid factors relevant to the aims of the current study. We then applied FDEMATEL to determine the relationships among the factors with a specific focus on causes and effects [5,18]. This method aids decision-makers in visualizing the relationships among various relevant factors of complex topics. This greatly assists in the decision-making process.

Once relevant factors have been selected, and the relationships among them identified, it is necessary to determine their level of impact on the topic at hand [19]. This study employs a fuzzy Kano model to categorize the selected factors into distinct performance clusters. Shokouhyar et al. [21] used the Kano model to determine the functional and dysfunctional aspects of attributes. Jain and Singh [19] applied the Kano model to CSP, confirming its capacity to identify areas for development to foster an organization's overall sustainability. We classify the factors selected in this study into the following groups: required, one-dimensional, desirable, indifferent, and reversed effect.

2.5. Proposed Factors for Original Framework

Based on a review of relevant literature, we considered the following five dimensions of CSP: environmental impact, social sustainability, economic gain, technological feasibility, and institutional compliance. Each of these were divided into two sub-dimensions. Environmental impact comprises resource usage (A1) and environmental pollution (A2). Social sustainability is achieved through human resources development (A3) and community interest (A4). Economic gain can be measured by either financial performance (A5) or market performance (A6). Technological feasibility is determined by the adoption of technology (A7) and the ability to take risks (A8). Institutional compliance can be divided into regulatory compliance (A9), that is, compliance with government regulations, and compliance with industry associations (A10). Within these ten sub-dimensions, we found 44 factors of CSP. These are specified in Table 1. We introduce each in the following.

The optimization of resource usage (A1) is considered critical to CSP. A Firm's efforts to limit hazardous chemicals and components (C1) can mitigate negative environmental impacts [43]. Using waste as inputs (C2) also offers advantages [43]. Renewable energy resources (C3) are a promising avenue towards greater sustainable environmental [23,44]. Increasing the efficiency of the consumption of raw material (C4) helps firms build superior corporate resources and capabilities [23].

Environmental pollution (A2) includes waste (C5) and greenhouse gas emissions (C6) [11]. Reducing emissions and streamlining the disposal of waste are important aspects of controlling environmental pollution [23,45]. Other environmental impacts include noise pollution from manufacturing processes (C7), the mining of limestone (C8), and negative effects of company operations which lead to complaints from residents (C9) [46].

Human resources development (A3) emphasizes the critical nature of social resource management, which is at the heart of CSP [3]. Human resources development is focused on talent attraction and retention (C12), which is relevant to sustainability because talented employees contribute to innovative development [3,18]. Training develops dedicated staff, while reward systems positively affect behavior and increase commitment [3]. Managing employees' satisfaction (C10) regarding their jobs and the organization they work for as well as offering employees long-term benefits (C14) also help firms to retain the best talent [23]. Employing a skill-building orientation (C13) [22] and increasing gender diversity in the workplace (C11) [11] also lead to higher social sustainability performance.

Community interest (A4) can be generated by developing mission statements, establishing social networks, and committing to the protection of community rights [3]. A firm's mission determines its strategic priorities and differentiates it from competitors. A clear socio-oriented mission statement (C16) reflects the firm's concern for society [3]. However, a mission statement alone is not adequate to attain CSP; a firm's commitment to protect the rights of the local community (C20) and their contributions to charity (C17) reflect that the firm is recognizing and acting on the needs of the local community [43]. In order to attain social sustainability, firms should develop economic activity in their neighborhoods and create additional job possibilities (C18) [47]. This aids in fostering a mutually beneficial relationship (C19) with society.

Financial performance (A5) refers to the financial aspects of a firm which enhance its position compared to its competitors [48]. It encompasses profit growth (C23) [49,50] and return on assets (C26) [49]. Profitability can also be measured by the return on equity (C21) provided by shareholders [23,51]. Artiach et al. [25] argued that only firms that offer a large profit margin to shareholders have a high CSP. Return on investment (C22) reflects the efficiency of investment; this is therefore an indicator of superior financial performance [51]. When industry becomes saturated in one country, a company may consider exporting its products (C24) [46]. The ratio between debts and assets (C25) represents the proportion of financed assets where a larger ratio implies a higher level of leverage and financial risks [8]. While acceptable financial leverage can help companies remain viable, excessive financial leverage increases their financial vulnerability.

While financial performance demonstrates an organization's capacity to manage its financial activities, market performance (A6) demonstrates a corporation's capability to escalate its sales volume as well as its share of market [52]. The firm's market share (C27) reflects its competitiveness [49,52]: the higher the share of market, the higher the firm's economic gain. Sales growth (C28) indicates the performance of current sales compared to a previous period [23,52].

Technological adoption (A7) reflects a firm's intention to incorporate advanced technology to its production processes [13]. Businesses that adopt innovative technology can simultaneously reduce their dependence on conventional energy sources and improve their sustainability performance. Sustainability requires revolutionary, cleaner technologies capable of displacing traditional products and services [53]. Fu et al. [14] argued that firm readiness to adopt clean production processes (C31) may significantly decrease waste as well as carbon emissions. Recycling technology (C30) enables the recycling of industrial

waste to serve as inputs [13]. Technology adoption is only possible with adequate training (C33), which further serves to secure employee readiness to innovate (C32) [54].

Risk-taking ability (A8) determines a firm's performance in volatile future markets [13]. The development of long-term solutions is not merely about dramatic improvements to goods, operations, and services; it involves preparation for future transformation, which is eased by the proactiveness of top management [22]. A shift to sustainability begins with a succinct conceptualization and the formulation of an appropriate organizational strategy [24]. Hence, firms must have a clear view of what technologies will be beneficial (C35) in order to secure the resources necessary to execute future technologies. Firms are more likely to pursue technology if they believe it will improve their competitive edge [13]. Thus, if technology has the potential to differentiate the firm from competitors (C36), management will be encouraged to take greater risks. Top management risk-taking ability (C34) leads the opinions and perceptions of employees downstream [13]. Managers must make additional efforts to lessen their reliance on dwindling natural resources [55]. Therefore, in order to protect investment and share the risk associated with the adoption of sophisticated sustainable technologies, firms can explore partnerships with high-tech corporations (C37) [36].

Firms are embedded in complex relationships with internal and external stakeholders. These stakeholders are crucial to the firm's performance because they have the ability to influence the firm's long-term strategic goals; hence, incorporating stakeholder demands directly and clearly is vital [56]. One of the most influential stakeholders is government, which demands regulatory compliance (A9). Many firms have adopted an informed and strategic stance to regulations to ensure that environmental measures are likely to result in competitive advantages [57]. Moreover, Danso et al. [57] claimed that benefits may accrue as a result of reactive actions such as regulatory government policies or as a result of high proactive efforts. Chatzitheodorou et al. [16] and Zhao et al. [58] argued that government exerts significant influence on firms regarding sustainability issues. Government formulates both legislative (C38) and national (C39) standards [59]. Wagner [52] argued that strict environmental legislation will cause extra expense for firms that do not comply. Indeed, national and regional legislation have increased their authority and ability to interrupt firm operation through sanctions and penalties if firms do not comply with the legislation. Under the close control of the government (C41), implementing company sustainability practices should be regarded as a collaborative initiative to lessen regulatory pressure [59].

Secondary stakeholders such as industry associations (A10) can push firms to comply with industry standards. Shubham et al. [40] pointed out that industry associations in high-pollution industries pressure their members by self-regulating the industry and denigrating noncomplying groups (C44). Industry associations establish their own environmental standard so as to preserve their mutual legitimacy [40,60–64]. To retain memberships, firms must meet association requirements (C42) for social and environmental responsibility. With targeted environmental and social responsibility initiatives, the industry association also encourages (C43) organizations within its sector to adopt more sustainable practices. By the existence of industry associations, all firms within the industry are urged to become more ecologically and socially responsible.

Table 1. Proposed Attributes.

Perspectives	Aspect	Criteria	References
Environmental impact	Resource Usage (A1)	C1	Decrease harmful material
		C2	Waste as inputs
		C3	Renewable energy resources
		C4	Efficiency of raw material
	Environmental pollution (A2)	C5	Total waste disposal
		C6	Greenhouse gas emission
		C7	Noise pollution
		C8	Total closed/rehabilitated mining sites
		C9	Complaints

Table 1. Cont.

Perspectives	Aspect	Criteria	References
Social sustainability	Human resources development (A3)	C10	Employees' satisfaction
		C11	Gender diversity in workplace
		C12	Talent attraction and retention
		C13	Skill building orientation
		C14	Long-term employee benefits
		C15	Commitment to ethics
	Community interest (A4)	C16	Socio-oriented mission statement
		C17	Charity contribution
		C18	Employment opportunities
		C19	Beneficial relationships with the communities
		C20	Protected rights of local community
Economic Gain	Financial performance (A5)	C21	Return on equity
		C22	Return on investment
		C23	Profit growth
		C24	Total export earnings
		C25	Debt to asset ratio
		C26	Return on assets
	Market performance (A6)	C27	Market share
		C28	Sales growth
		C29	New market opportunities
Technical feasibility	Technology adoption (A7)	C30	Recycling technology
		C31	Firm's readiness to adopt clean production process
		C32	Employee's readiness to innovate
		C33	Training for future technology
	Risk taking ability (A8)	C34	Top management risk taking ability
		C35	Management perception about technology as differentiator in near future
		C36	Top management vision of future technology
Institutional Compliance	Regulatory Compliance (A9)	C37	Firm's readiness to collaborate with high tech firms
		C38	Comply with legislation standard
		C39	Obligation to comply with national regulation
		C40	Total number of penalties for non-compliance with laws/regulation
	Association compliance (A10)	C41	Government supervision
		C42	Meet the industry association requirement
		C43	Industry association encouragement
		C44	Industry association expectation

3. Method

3.1. Industry Background

The cement sector in Indonesia is facing increasing competition as well as pressures from stakeholders related to emissions, waste, health, safety, and the needs of the local community. In Indonesia, supply exceeds demand; in 2019, sales volumes fell by 2.05% [1]. This problem of overcapacity can be attributed to government policy that opened the nation to direct foreign investment. This has led to many foreign cement firms basing their production in Indonesia. Such circumstances significantly limit potential sales growth, especially in the domestic market. Therefore, cement firms in Indonesia have come under economic pressure. In addition, government regulations have mandated reductions in greenhouse gas emissions, creating institutional pressure. Dramatic cuts in emissions are only possible with new production technologies, but developing new production technology requires significant financial investment. Firms also rely on stakeholders such as industry associations to gain competitive advantage and ensure their survival. To gain their support, firms must pursue the interests of the community [62]. Faced with multiple interlinked pressures, decision-makers in the cement industry must determine which

areas are most urgently in need of improvement and identify means of increasing benefits, reducing risk, complying with regulations, identifying new opportunities, reducing costs, increasing efficiency, and strengthening the company's competitive advantage.

This study is conducted in order to assist the cement industry in Indonesia by providing a better knowledge and understanding of the interrelationship among the factors promoting CSP. Furthermore, this study also addresses the importance and relevance of the factors that help the decision-makers in making an optimal decision. Therefore, we combined several methods in order to fulfill these objectives.

3.2. Data Collection

We invited a panel of 40 specialists with experience working and studying in the cement industry in Indonesia, including 37 currently working in the industry and three experts from academic institutions. The average experience of the experts was 19.85 years (Table A1 in Appendix A).

3.3. Fuzzy Delphi Method

FDM was originally developed as a synthesis of fuzzy set theory and the Delphi method to address the limits of expert opinions and increase the reliability of questionnaires [63]. It effectively translates linguistic assessments into quantitative data from small sample sizes while reducing both time and financial costs [42].

In a committee of n experts, expert x is asked to determine the importance of a selected factor y as follows: $p = (h_{ab}; i_{ab}; j_{ab})$, $a = 1, 2, 3, \dots, t$; $b = 1, 2, 3, \dots, u$, where p_b is the weight of y represented as $p_b = (h_b; i_b; j_b)$ with $h_b = \min(h_{ab})$, $i_b = (\prod_1^n i_{ab})^{1/n}$, and $j_b = \max(j_{ab})$. Triangular fuzzy numbers (TFNs) are then used to translate linguistic evaluations into fuzzy numbers using the key presented in Table 2.

Table 2. Conversions table of linguistic phrases for FDM.

Phrases Used in Linguistics (Performance/Importance)	Corresponding Triangular Fuzzy Numbers (TFNs)
Extreme	(0.75, 1.0, 1.0)
Demonstrated	(0.5, 0.75, 1.0)
Strong	(0.25, 0.5, 0.75)
Medium	(0, 0.25, 0.5)
Fair	(0, 0, 0.25)

Values of the convex fusion are applied as follows:

$$u_b = h_b - \varepsilon(j_b - i_b), p_b = x_b - \varepsilon(b_b - \varepsilon h_b), i = 1, 2, 3, \dots, m, \quad (1)$$

where $\varepsilon = [0, 1]$ represents whether expert judgments are positive or negative. Fuzzy evaluation converts fuzzy data to quantified data F_b :

$$F_b = \int (u_b, p_b) = \sigma[u_b + (1 - \sigma)p_b] \quad (2)$$

where σ represents the expert's optimistic assessment of the state of equilibrium.

Following that, the threshold is determined as $R = (\sum_{b=1}^m F_b) / m$ for the factors in the initial list. If $F_b \geq R$, factor b is valid. Otherwise, it is eliminated.

3.4. Fuzzy DEMATEL

Defuzzification is used in fuzzy DEMATEL to convert qualitative data to fuzzy linguistic information. A defuzzification method in which the fuzzy output is converted to a single crisp value using the degree of membership values, similar to the fuzzification process [65]. In comparison to fuzzification, defuzzification is an inverse transformation, whereby the fuzzy output is turned into crisp values that can be applied to the system [66,67]. Fuzzy

membership functions $\tilde{e}_{xy}^n = (\tilde{e}_{1xy}^n, \tilde{e}_{2xy}^n, \tilde{e}_{3xy}^n)$ are employed to generate the sum of weighting factors. The right and left values, in particular, are derived by calculating the lowest and highest fuzzy values. Afterwards, the crisp values are settled in a matrix of complete direct relationships for the purpose of simplifying the analytical results by mapping them to a graphic representation. Finally, the cause-and-effect groupings assign specific factors to represent the structural relationships among them.

Set of factors $Q = \{q1, q2, q3, \dots, qz\}$ is provided, and mathematical associations are generated through the use of pairwise comparisons. Utilizing linguistic parameters ranging from ‘very little influence’ (VLI) to ‘very high influence’ (VHI), crisp values were determined using the information presented in Table 3. Assuming there are n experts participating in the assessment process, \tilde{e}_{ij}^n reflects the fuzzy weight of the i^{th} factor’s effect on the j^{th} factor as determined by expert n^{th} .

Table 3. TFNs linguistic parameter.

Parameter	Linguistic Variable	Corresponding Triangular Fuzzy Number (TFNs)
VLI	Very low influence	(0.0, 0.1, 0.3)
L	Low influence	(0.1, 0.3, 0.5)
M	Moderate influence	(0.3, 0.5, 0.7)
H	High influence	(0.5, 0.7, 0.9)
VHI	Very high influence	(0.7, 0.9, 1.0)

Fuzzy numbers are simplified as follows:

$$Q = (q\tilde{e}_{1xy}^n, q\tilde{e}_{2xy}^n, q\tilde{e}_{3xy}^n) = \left[\frac{(e_{1xy}^n - \min e_{1xy}^n)}{\Delta}, \frac{(e_{2xy}^n - \min e_{2xy}^n)}{\Delta}, \frac{(e_{3xy}^n - \min e_{3xy}^n)}{\Delta} \right] \quad (3)$$

where $\Delta = \max e_{3xy}^n - \min e$. Normalized values for the left (l) and right (r) sides are computed using

$$(l_{xy}^z, r_{xy}^z) = \left[\frac{qe_{2xy}^n}{(1 + qe_{2xy}^n - qe_{1xy}^n)}, \frac{qe_{3xy}^n}{(1 + qe_{3xy}^n - qe_{2xy}^n)} \right]. \quad (4)$$

Normalized crisp values (cv) are calculated using

$$cv_{xy}^n = \frac{[l_{xy}^n(1 - l_{xy}^n) + (r_{xy}^n)^2]}{(1 - l_{xy}^n + r_{xy}^n)}. \quad (5)$$

The individual perceptiveness of the n respondents is used to calculate the synthetic crisp values, which are then accumulated as follows:

$$\tilde{e}_{xy}^n = \frac{(cv_{xy}^1 + cv_{xy}^2 + cv_{xy}^3 + \dots + cv_{xy}^n)}{n}. \quad (6)$$

The $s \times s$ original matrix of direct relationships (IM) is obtained in a configuration of reciprocal comparatives, where \tilde{e}_{xy}^n denotes the degree of effect of factor i on factor j as $IM = [\tilde{e}_{xy}^n]_{s \times s}$.

The following procedure is used to construct the normalized direct relation matrix (U):

$$U = \tau \otimes IM$$

$$\tau = \frac{1}{\max_{1 \leq i \leq n} \sum_{x=1}^n \tilde{e}_{xy}^n}. \quad (7)$$

The interrelationship matrix (W) is then acquired as follows:

$$W = U(I - U)^{-1}, \quad (8)$$

where W is $[w_{xy}]_{s \times s}$, $i, j = 1, 2, \dots, z$. The values of driving power (α) and dependence power (β) are calculated using the row and column totals of the interrelationship matrix:

$$\alpha = \left[\sum_{x=1}^s w_{xy} \right]_{s \times s} = [w_x]_{s \times 1} \quad (9)$$

$$\beta = \left[\sum_{y=1}^s w_{xy} \right]_{s \times s} = [w_y]_{1 \times s}. \quad (10)$$

The output of the process is a cause-and-effect diagram in which factors are assigned positions via the derivation of $[(\alpha + \beta), (\alpha - \beta)]$, which yields the horizontal and vertical axes. The x-coordinate ($\alpha + \beta$) indicates the importance of the factors. In contrast, factors are separated into cause and effect clusters on the basis of their y-coordinates, which can be greater or less than zero. If the $(\alpha - \beta)$ value is greater than zero, the factor is considered a cause and if it is less than zero, it is considered an effect.

3.5. Fuzzy Kano Model

The primary purpose of the Kano model is to uncover, organize, and create a matrix based on the following five levels:

- Must-be (M): These are critical factors. Failure to work on these areas dramatically increases poor performance.
- One-dimensional (O): When these factors are present, the firm's performance is enhanced; if these factors are ignored, performance deteriorates.
- Attractive (A): These factors promise good performance once fully accomplished, but do not cause poor performance when not achieved. They are unpredictable and often undeclared.
- Indifferent (I): These factors have no bearing on performance.
- Reversed effect (R): These criteria refer to a high level of performance that later results in poor performance and that not all decision makers are similar.

The model poses two types of questions for each factor: functional and dysfunctional. Functional questions focus on adequate performance of the factor, while dysfunctional questions identify inadequate performance. The structure of the model is shown in Figure 1.

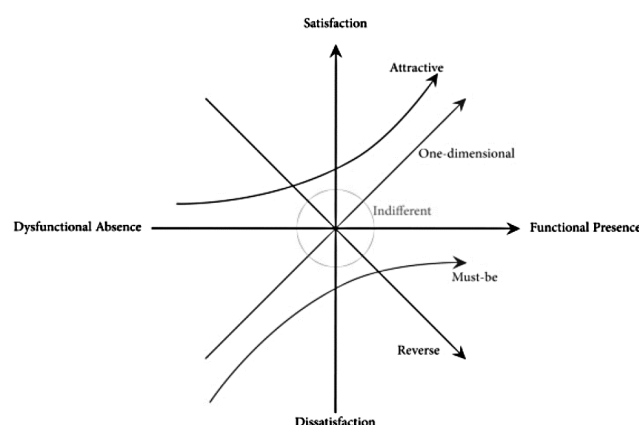


Figure 1. Kano Model.

Matrices F and D respectively record answers to the functional (F) and dysfunctional (D) inquiries. Matrix S is obtained by multiplying the transpose of matrix F by matrix D . Matrix S is $[5 \times 5]$, corresponding to the Kano evaluation table shown in Table 4.

Table 4. Kano model evaluation table.

Criteria i		Dysfunctional				
		Like	Expect	Neutral	Accept	Dislike
Functional	Like		A	A	A	O
	Expect	R	I	I	I	M
	Neutral	R	I	I	I	M
	Accept	R	I	I	I	M
	Dislike	R	R	R	R	

Fuzzy evaluations reduce imprecision and uncertainty. If respondents are asked to choose multiple answers on a fuzzy basis, the evaluation data will be a better representation of their original judgments. Hence, the method provides high flexibility in terms of revealing their authentic perceptions. Response options can include like, expected, neutral, acceptable, and dislike. Respondents can also mark multiple responses with quantitative values within the interval of 0 to 100%. That is, if they do not specify their judgment with one choice, they can indicate shared percentages as follows: like –25% and expected –75%. Then, $S[5 \times 5]$ is calculated by combining $F[5 \times 1]$ and $D[1 \times 5]$. For example,

$$F = \begin{bmatrix} 0.25 \\ 0.75 \\ 0 \\ 0 \\ 0 \end{bmatrix}, D = [0, 0, 0, 0, 1]$$

Then the fuzzy Kano Model is calculated as follows:

$$S_{5 \times 5} = F_{5 \times 1} \times D_{1 \times 5} = \begin{bmatrix} x_{11} & x_{12} & x_{13} & x_{14} & x_{15} \\ x_{21} & x_{22} & x_{23} & x_{24} & x_{25} \\ x_{31} & x_{32} & x_{33} & x_{34} & x_{35} \\ x_{41} & x_{42} & x_{43} & x_{44} & x_{45} \\ x_{51} & x_{52} & x_{53} & x_{54} & x_{55} \end{bmatrix} \quad (11)$$

For example,

$$S_{5 \times 5} = \begin{matrix} & & 0 & 0 & 0 & 0 & 1 \\ \begin{matrix} 0.25 \\ 0.75 \\ 0 \\ 0 \\ 0 \end{matrix} & \begin{bmatrix} 0 & 0 & 0 & 0 & 0.25 \\ 0 & 0 & 0 & 0 & 0.75 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \end{matrix}$$

Thereafter, the membership values can be calculated as follows:

$$\begin{aligned} (M) &= x_{25} + x_{35} + x_{45}, \\ (O) &= x_{15}, \\ (A) &= x_{12} + x_{13} + x_{14}, \\ (I) &= x_{22} + x_{23} + x_{24} + x_{32} + x_{34} + x_{42} + x_{43} + x_{44}, \\ (R) &= x_{21} + x_{31} + x_{41} + x_{51} + x_{52} + x_{54}. \end{aligned} \quad (12)$$

This gives us fuzzy set T:

$$T = \begin{bmatrix} 0 & 0.25 & 0.75 & 0 & 0 \\ A & O & M & I & R \\ 0 & 0 & 1 & 0 & 0 \end{bmatrix} \quad (13)$$

4. Results

4.1. Fuzzy Delphi Method

Application of FDM reduced the number of factors relevant to CSP from 44 to 19 with threshold $R = 0.289$. The results of this process are shown in Table A2. In addition, the remaining valid factors are shown in Table 5.

Table 5. Valid attribute set.

Perspective	Aspects	Criteria
Environmental impact	A1 Resource Usage	C1 Decrease harmful material
		C2 Renewable energy resources
		C4 Efficiency of raw material
	A2 Environmental Pollution	C5 Total waste disposal
		C6 Greenhouse gas emission
		C8 Total closed/rehabilitated mining sites
Social sustainability	A4 Community interest	C9 Complaints
		C16 Socio-oriented mission statement
		C17 Charity contribution
		C19 Beneficial relationships with the communities
Economic gain	A5 Financial performance	C20 Protected rights of local community
		C21 Return on equity
Technical feasibility	A8 Risk taking ability	C23 Profit growth
		C35 Management perception about technology as differentiator in near future
		C36 Top management vision of future technology
Institutional compliance	A9 Regulatory compliance	C37 Firm's readiness to collaborate with high tech firms
		C38 Comply with legislation standard
		C39 Obligation to comply with national regulation
		C40 Total number of penalties for non-compliance with laws/regulation

4.2. Fuzzy DEMATEL

Table 3 was used to translate linguistic parameters into TFNs. The average of all the respondents' crisp values was calculated and integrated into the origin direction matrix shown in Table 6. The matrix of total interrelationships was then produced; this matrix depicts the causal relationships among components (shown in Table 7). The causal-effect diagram is mapped in Figure 2.

Table 6. Original direction matrix for aspects.

	A1	A2	A4	A5	A8	A9
A1	0.840	0.692	0.433	0.676	0.651	0.599
A2	0.622	0.956	0.608	0.591	0.693	0.625
A4	0.695	0.697	0.701	0.685	0.517	0.665
A5	0.629	0.702	0.444	0.806	0.385	0.490
A8	0.790	0.702	0.607	0.672	0.735	0.618
A9	0.686	0.702	0.630	0.671	0.593	0.723

Table 7. Total interrelationship matrix and cause-and-effect interrelationship among aspects.

	A1	A2	A4	A5	A8	A9	α	β	$(\alpha + \beta)$	$(\alpha - \beta)$
A1	3.434	3.574	2.673	3.272	2.878	2.953	18.783	20.564	39.347	(1.780)
A2	3.572	3.846	2.874	3.436	3.052	3.130	19.910	21.692	41.602	(1.782)
A4	3.452	3.634	2.785	3.328	2.889	3.019	19.108	16.378	35.486	2.729
A5	2.993	3.171	2.368	2.933	2.483	2.589	16.537	19.798	36.335	(3.261)
A8	3.622	3.788	2.877	3.464	3.067	3.133	19.950	17.313	37.263	2.637
A9	3.492	3.680	2.802	3.365	2.944	3.070	19.352	17.894	37.246	1.457

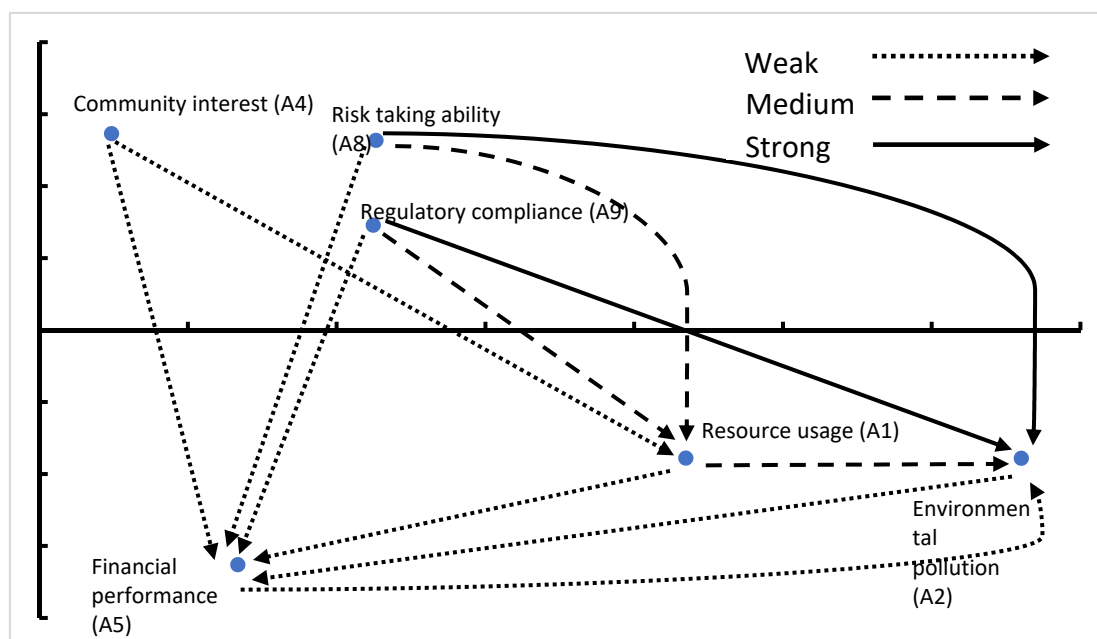


Figure 2. Causal-and-effect diagram for aspects.

Figure 2 shows that the following sub-dimensions are causes of perceived benefits and risks: community interest (A4), risk-taking ability (A8), and regulatory compliance (A9). Effects include resource usage (A1), environmental pollution (A2), and financial performance (A5). Furthermore, A4 has weak effects on A1 and A5, as does A8 and A9 on A5. On the other hand, A8 and A9 have a strong effect on A2, implying that A8 and A9 are important aspects to focus on.

4.3. Fuzzy Kano

From the Fuzzy Kano analysis, the criteria are sorted in 3 above 5 levels including must-be, one-dimensional, and attractive. There are no criteria fall into Indifferent and Reversed effect level. These are shown in Table 8.

Table 8. The fuzzy Kano model result.

Criteria		A	O	M	I	R	Attributes
C1	Decrease harmful material	0	2	34	1	0	Must-be
C3	Renewable energy resources	19	7	14	1	0	Attractive
C4	Efficiency of raw material	1	3	34	0	0	Must-be
C5	Total waste disposal	0	10	27	0	0	Must-be
C6	Greenhouse gas emission	0	1	37	0	0	Must-be
C8	Total closed/rehabilitated mining sites	0	0	37	2	0	Must-be
C9	Complaints	1	3	33	1	0	Must-be

Table 8. Cont.

Criteria		A	O	M	I	R	Attributes
C16	Socio-oriented mission statement	6	14	18	4	0	Must-be
C17	Charity contribution	20	2	15	1	0	Attractive
C19	Beneficial relationships with the communities	1	20	15	1	0	One-dimensional
C20	Protected rights of local community	3	16	13	5	0	One-dimensional
C21	Return on Equity	0	0	28	10	0	Must-be
C23	Profit growth	0	11	30	0	0	Must-be
C35	Management perception about technology as differentiator in near future	20	3	16	10	0	Attractive
C36	Top management vision of future technology	1	30	6	0	0	One-dimensional
C37	Firm's readiness to collaborate with high tech firms	20	3	1	14	0	Attractive
C38	Comply with legislation standard	8	19	17	3	0	One-dimensional
C39	Obligation to comply with national regulation	3	20	18	3	0	One-dimensional
C40	Total number of penalties for non-compliance with laws/regulation	0	20	17	0	0	One-dimensional

5. Implications

5.1. Theoretical Implications

This study analyzes the body of knowledge on CSP. We found that social performance, technological feasibility, and institutional compliance play essential roles in improving sustainability performance. Specifically, community interest (A4), risk-taking ability (A8), and regulatory compliance (A9) are causal aspects of the CSP framework.

Community interest (A4) should be a priority of firms, based on their relationships with financial performance and resource usage. This finding demonstrates that the firms must prioritize the interests of the community in order to attain CSP. Prior studies have addressed the significance of community interest to CSP [3]. It reflects the firm's responsibilities to society, which can increase competitiveness based on resources obtained. Shifting from regarding community interest as harm mitigation to creating significant benefits for both society and business can help the firm to achieve sustainable performance.

Moreover, risk-taking ability (A8) affects financial performance, resource usage, and environmental pollution. It is critical in pursuing the development and application of environmentally-friendly technology, operations, and goods, involving not only taking calculated risks, but also anticipating risk and effectively controlling and utilizing errors [15]. Risk-taking enables a firm to cultivate an environment of tolerance and risk, also serving as a catalyst for experimentation to accelerate the acquisition, learning, and absorption of new external technology. Adopting new technology in the production process requires significant investment and offers highly-unpredictable returns. Thus, selecting technology that is compatible with the needs of the firm while controlling for risk is an important skill set for today's firms.

Regulatory compliance (A9) can also assist firms in achieving CSP. It affects financial performance, resource usage, and environmental pollution. It further reflects firm requirements to comply with regulations related to sustainability practices. Regulation from government and local legislation exerts pressure on firms to employ eco—friendly manufacturing techniques and energy and raw materials efficiency. Such actions have a long-term effect on promoting environmental safety [41,63]. Consistent with prior studies, our results indicate that meeting government regulations relating to environmental obligations depletes a firm's financial resources, but violating those regulations will be more harmful for the firms [17]. When a firm fails to fulfill government regulations, it can lead to lawsuits, which harm the firm's image and its future sustainability performance. In other words, regulatory compliance is considered a prerequisite for sustainability initiatives. Compliance builds a positive image, gains support from the government, and achieves higher sustainability performance.

5.2. Practical Implications

According to the outcomes of this study, energy sources are critical factors for CSP in the cement industry. Desirable factors include renewable energy sources, contributions to charity, management perceptions of technology, and firm readiness to collaborate with high-tech firms. These factors can bring unexpected benefits without harmful consequences.

Currently, the cement industry in Indonesia is heavily dependent on fossil-based energy sources. While the industry does strive to achieve energy efficiency to reduce its impact on the environment, further measures are required. For instance, the industry should implement energy management to save on energy usage and secure energy supply. The implementation of energy management should encourage the industry to seek out renewable sources of energy. Several alternative sources can be considered for cement production. For example, biomass energy utilizes environmentally-friendly materials such as rice husk, coco peat, and tobacco waste.

CSP also relies on the social sub-dimension of contributions to charity. The cement firms should strive to achieve synergy between its operating activities with the interests of the local community. Although commitment to the local community is regulated by law, its implementation is often perfunctory. Contributions to charity must be well coordinated, requiring a dedicated department. In Indonesia, social activities are embedded in the roles of corporate secretaries or human resource managers, implying a lack of strategic focus on the potential benefits of this sub-dimension. Monitoring and evaluation of this activity will ensure more effective targeting.

To achieve sustainability, the adoption of new technology is essential. It will serve to differentiate the firm in the market. Cement products are considered commodities and many consumers cannot tell the difference between one cement and another. Firms could build a distinctive advantage by taking advantage of technology. Reducing production waste or pollution, for example, can be achieved through the adoption of novel technology. A firm's perception of technology depends on its experiences. Firms that have been operating for a long time tend to have a better understanding of how companies can leverage technology to create a competitive advantage.

In order to boost CSP, a firm's willingness to cooperate with high-tech companies is also important. The deployment of technology in the cement industry is not limited to manufacturing; all operations along the company's value chain can be optimized. The application of technology entails investment and significant risk. The readiness of the firm to cooperate with high-tech companies can help cement firms reduce the likelihood of implementation failure as well as investment failure. Collaboration should take place with well-known companies and may take on a variety of forms. Involvement at a low level is analogous to engaging tech businesses as consultants. High engagement solicits the assistance of other companies in developing new technology adapted to the company's demands.

6. Conclusions

This study expands the concept of CSP to include not only the TBL but also technological feasibility and institutional compliance. Using this expanded definition, we sought to determine the most important factors of CSP based on expert experience. We began the analysis by drawing 44 factors from the literature classified into the following 10 aspects: resource usage, environmental pollution, human resources development, community interest, financial performance, market performance, technology adoption, risk-taking ability, regulatory compliance, and association compliance. These were examined using FDM, DEMATEL, and fuzzy Kano. FDM first filtered the list of factors and DEMATEL then assessed the relationships among them. Fuzzy Kano then clustered the remaining factors into categories. Our findings offer both practical and theoretical contributions, especially within the context of the cement industry in Indonesia.

FDM confirmed 19 significant factors within the categories of environmental impact, social sustainability, economic gain, technological feasibility, and institutional compliance.

DEMATEL identified community interest, risk-taking ability, and regulatory compliance as causes of perceived risks and benefits. Fuzzy Kano classified the following factors as critical: renewable energy resources, contributions to charity, the perception of management regarding technology as differentiator, and firm readiness to collaborate with high-tech companies. Awareness of these areas could help firms in the cement industry move closer to achieving high levels of CSP. With energy management as a strategic objective, firms can explore alternative energy sources that are renewable to reduce energy use and ensure on-going supply. Well-coordinated contributions to charity are also a major factor in achieving CSP. Technology plays a significant role in differentiating firms. This criterion is linked to company willingness to cooperate with high-tech companies, enabling them to incorporate novel technology into their manufacturing processes. This willingness can assist cement manufacturers in minimizing the likelihood of investment failure. Therefore, partnerships with successful technology companies offer the cement industry an opportunity to move forward as pioneers in the field.

Our theoretical contributions include an extensive assessment of CSP encompassing environmental, economic, social, technological, and institutional aspects. Our expansion of the concept has particular relevance for the cement industry in Indonesia. We also combined three analysis methods to confirm the validity of the proposed framework, identifying interdependence among factors and highlighting those factors which can be considered critical to performance. This lays the foundation for future decision-making frameworks modeled on complex systems with imprecise and uncertain data. Our findings offer practical guidance for the cement industry in Indonesia as it works towards a sustainable future, both for itself and the wider society.

Although this paper offers several valuable contributions, it is subject to certain limitations worth noting. First, the factors in this study were derived from a single previous study. This may have hindered the holistic nature of our analysis. Subsequent research may include a meta-analysis of studies on the topic to offer a more comprehensive starting point. Second, this study is limited by the context of the Indonesian cement industry. To enhance generalizability, future studies may consider different countries and industries. Third, as we combined several methods to examine important factors and the relationships among them, it would be worth applying this approach to other contexts to compare the results and confirm the validity of the methodology.

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Appendix A

Table A1. Respondents' Characteristics.

	Occupation	Level of Education	Years of Expertise	Organization Type (Academia/Practice)
1	General Manager of Project Management Technology Expertise	Master	26 years	State-owned company/Practices
2	Senior Manager of Strategic Planning	Bachelor	25 years	State-owned company/Practices

Table A1. Cont.

	Occupation	Level of Education	Years of Expertise	Organization Type (Academia/Practice)
3	Senior Manager of Business Development	Master	12 years	State-owned company/Practices
4	Senior Manager of Land Transportation Planning	Bachelor	24 years	State-owned company/Practices
5	Senior Manager of Process Technical Expertise	Master	12 years	State-owned company/Practices
6	General Manager of Relationship Marketing	Bachelor	11 years	State-owned company/Practices
7	Manager of SCM infrastructure	Bachelor	30 years	Private-owned company/practices
8	Manager of CSR	Bachelor	27 years	Private-owned company/practices
9	Manager of Safety monitoring	Bachelor	27 years	Private-owned company/practices
10	Manager of IT Strategy	Bachelor	25 years	State-owned company/Practices
11	Manager of area sales	Bachelor	27 years	State-owned company/Practices
12	Manager of cash management	Bachelor	27 years	State-owned company/Practices
13	Senior manager of Transformation Management	Master	12 years	State-owned company/Practices
14	Manager of Project Management Tech Expertise	Master	12 years	Private-owned company/practices
15	Manager of Electrical Technical Expertise	Bachelor	29 years	State-owned company/Practices
16	Manager of Welfare	Bachelor	28 years	Private-owned company/practices
17	Manager of Procurement	Bachelor	25 years	Private-owned company/practices
18	Manager of Portfolio Management	Master	26 years	Private-owned company/practices
19	Manager of Asset Management	Bachelor	26 years	Private-owned company/practices
20	Manager of Waste Management	Bachelor	12 years	Private-owned company/practices
21	Manager of Services Procurement	Bachelor	23 years	Private-owned company/practices
22	Manager of Group Restructuring	Bachelor	25 years	Private-owned company/practices
23	Manager of Account Receivable	Bachelor	24 years	Private-owned company/practices
24	Senior Manager of Technical Sales	Master	12 years	Private-owned company/practices
25	Senior Manager of Internal Communication	Master	12 years	Private-owned company/practices
26	Supervisor of Production Planning and Management	Master	9 years	Private-owned company/practices
27	Supervisor of Distribution System Development	Bachelor	6 years	State-owned company/Practices
28	Supervisor of Supporting Maintenance	Bachelor	9 years	State-owned company/Practices
29	General Manager of Production Planning and Control	Master	26 years	State-owned company/Practices
30	General Manager of Mining and Raw Material Management	Master	26 years	State-owned company/Practices

Table A1. Cont.

	Occupation	Level of Education	Years of Expertise	Organization Type (Academia/Practice)
31	Operational and Production Director	Master	26 years	State-owned company/Practices
32	Human Capital and Finance Director	Master	26 years	State-owned company/Practices
33	Supervisor of Inventory Management	Bachelor	9 years	State-owned company/Practices
34	Manager of IT Development	Bachelor	12 years	State-owned company/Practices
35	Supervisor of Distribution Plan & Control	Bachelor	9 years	State-owned company/Practices
36	Supervisor of General Facilities	Bachelor	19 years	State-owned company/Practices
37	Supervisor of General Affairs	Bachelor	11 years	State-owned company/Practices
38	Associate Professor	Doctoral	22 years	Academia
39	Associate Professor	Doctoral	15 years	Academia
40	Professor	Doctoral	27 years	Academia

Table A2. FDM results for criteria.

	u_b	p_b	F_b	Decision
C1	(0.283)	0.783	0.321	Accepted
C2	0.000	0.500	0.250	Unaccepted
C3	(0.381)	0.881	0.345	Accepted
C4	(0.373)	0.873	0.343	Accepted
C5	(0.366)	0.866	0.342	Accepted
C6	(0.352)	0.852	0.338	Accepted
C7	0.000	0.500	0.250	Unaccepted
C8	(0.378)	0.878	0.345	Accepted
C9	(0.336)	0.836	0.334	Accepted
C10	0.000	0.500	0.250	Unaccepted
C11	0.000	0.500	0.250	Unaccepted
C12	0.000	0.500	0.250	Unaccepted
C13	0.000	0.500	0.250	Unaccepted
C14	0.000	0.500	0.250	Unaccepted
C15	0.000	0.500	0.250	Unaccepted
C16	(0.387)	0.887	0.347	Accepted
C17	(0.400)	0.900	0.350	Accepted
C18	0.000	0.500	0.250	Unaccepted
C19	(0.008)	0.883	0.440	Accepted
C20	(0.334)	0.834	0.333	Accepted
C21	(0.342)	0.842	0.335	Accepted
C22	0.000	0.500	0.250	Unaccepted
C23	(0.311)	0.811	0.328	Accepted
C24	0.000	0.500	0.250	Unaccepted
C25	0.000	0.500	0.250	Unaccepted
C26	0.000	0.500	0.250	Unaccepted
C27	0.000	0.500	0.250	Unaccepted
C28	0.000	0.500	0.250	Unaccepted
C29	0.000	0.500	0.250	Unaccepted
C30	0.000	0.500	0.250	Unaccepted
C31	0.000	0.500	0.250	Unaccepted
C32	0.000	0.500	0.250	Unaccepted
C33	0.000	0.500	0.250	Unaccepted
C34	0.000	0.500	0.250	Unaccepted

Table A2. Cont.

	u_b	p_b	F_b	Decision
C35	(0.169)	0.669	0.292	Accepted
C36	(0.378)	0.878	0.344	Accepted
C37	(0.356)	0.856	0.339	Accepted
C38	(0.350)	0.850	0.337	Accepted
C39	(0.169)	0.669	0.292	Accepted
C40	(0.375)	0.875	0.344	Accepted
C41	0.000	0.500	0.250	Unaccepted
C42	0.000	0.500	0.250	Unaccepted
C43	0.000	0.500	0.250	Unaccepted
C44	0.000	0.500	0.250	Unaccepted
Threshold R			0.289	

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