

# Application of a new DEMATEL to explore key factors of China's corporate social responsibility: evidence from accounting experts

Fu Hsiang Chen · Der-Jang Chi

Published online: 24 December 2013  
© Springer Science+Business Media Dordrecht 2013

**Abstract** Corporate social responsibility (CSR) reporting focuses on the disclosure of information, however, the information reported is all too often determined by what the company deems important. To improve the reliability of CSR information and to enhance stakeholders' confidence, CSR reports are now often reviewed by certified public accountants. This study attempts to explore the key factors in Chinese CSR from the perspective of accounting experts. The data obtained from interviews with experts were analyzed using the decision making trial and evaluation laboratory (DEMATEL) to construct the dimensions and sub-factors of China's CSR, to determine the impact of each dimension, and to ascertain the mutual impact among the sub-factors, from which to construct an influential network relation map. Among the CSR dimensions, four were found to be mutually influential with "Safety Production" being the most influential dimension. Based on the analysis of expert interviews, it is suggested that CSR improvement should be made in the following order: Safety Production (A) \_Environmental Protection (C) \_Product Quality (B) \_ Employment Promotion (D).

**Keywords** Corporate social responsibility (CSR) · Stakeholders · Decision making trial and evaluation laboratory (DEMATEL) · Multiple criteria decision making (MCDM)

## 1 Introduction

Following the 2004 Indian Ocean Tsunami as well as increasing global crises brought about by global warming and energy depletion, performance issues related to corporate social responsibility (CSR) have gained increasing public attention. In addition to achieving economic gains, enterprises can no longer avoid responsibility in areas such as environmental protection, industrial safety, human rights, and product quality and information disclosure in their corporate operations. In fact, the value of enterprises can be enhanced by fulfilling

---

F. H. Chen · D.-J. Chi (✉)  
Department of Accounting, Chinese Culture University, No. 55, Hwa-Kang Road,  
Yang Ming Sang, Taipei 11114, Taiwan  
e-mail: derjang@yahoo.com.tw

their social responsibility, particularly in areas such as environmental, social and ethical performance. A positive reputation can often improve operational efficiency, enhance corporate image, enhance brand value and goodwill, and increase revenues and other benefits (Arendt and Brettel 2010; Carroll 2004; Handelman and Arnold 1999; Griffin and Mahon 1997; Lee 2009; Luo and Bhattacharya 2006; McGehee et al. 2009; Mittal et al. 2008; Porter and Kramer 2006; Vogel 2005). Fueled by a wave of social responsibility, CSR performance has gained increasing public attention internationally. Social responsibility investment (SRI) research institutes and internationally renowned investment indices have created socially responsible investment indices. Among these, the world's first index to track the financial performance of sustainable enterprises is the Dow Jones Sustainability Index (DJSI) jointly established by Dow Jones and Zurich, Switzerland's Sustainable Asset Management (SAM) in 1999. Based on the Dow Jones industrial index constituent stocks (about 3,000 companies), the top 10 % of companies among different industries selected for the best sustainability performance in the DJSI constituent stocks showed asset management of US\$8 billion. It has been observed in a number of past studies that when an enterprise is awarded an SRI index, its corporate market value increases by about 2.1 % (Robinson et al. 2011) and its positive excess returns by about 0.03 % (Consolandi et al. 2009), clearly showing that promoting social responsibility is beneficial to enterprises.

Enterprises usually seek to promote social responsibility performance by releasing CSR reporting.<sup>1</sup> These descriptions which are basically a form of communication tool between companies and stakeholders and the individuals or groups who will receive gains, demands or have vested interests in the company (Hannan and Freeman 1984; Savage et al. 1991). Past studies have indicated that implementing social responsibility relevant to stakeholders enhances business performance (Donaldson and Preston 1995; Jones 1995). Others, such as Du et al. (2010), have pointed out that for enterprises to achieve commercial gains from social responsibility activities, management must have an in-depth understanding of effective communication with stakeholders. Given that CSR reporting is already the primary channel for communication, it has also become a tool for increasing stakeholder awareness toward CSR (Morsing and Schultz 2006). In recent years, CSR research frameworks are often stakeholder oriented (Kacperczyk 2009; Velaz et al. 2007). Progress in CSR has been made, not only with respect to the legal and political environment, but also in relation to the awareness of stakeholders (González-Rodríguez et al. 2013). CSR reports have become a tool for communication between enterprises and stakeholders. However, in the past, enterprises have emphasized information that is often determined by what the company deems important. In order to improve reliability and enhance stakeholder confidence, many such reports are now reviewed by third-party experts (Mao and Zhang 2010). Since the content of CSR reports is extremely complex with many dimensions and criteria, the trend is to have the CSR reporting reviewed by international accounting firms or other expert institutes (Shen et al. 2010).

This study seeks to give enterprises a reference for the preparation of CSR reports by selecting those with a higher degree of professional knowledge, such as certified public accountants experienced with CSR review reporting and professors of accounting, when exploring the key factors involved.

CSR comprises many broad dimensions and sub-factors, and if these can be constructed, and the extent of their impact and mutual impact among the sub-factors can be determined, a list of improvement strategies can then be established to be used by management to pri-

---

<sup>1</sup> General non-financial reports are termed "Report". However, current types of CSR information disclosures are relatively diverse and are often not limited to hard textual copies, but may be immediately presented to readers in other forms such as websites (Nam et al. 2013) and CD multimedia. These are termed "Reporting" in this study.

oritize improvements in their CSR. In practice, the factors are usually not independent, and the dimensions and sub-factors may also be mutually influential. This study adopted the multiple criteria decision making (MCDM) method to resolve the problem of mutual influence among the factors and sub-factors. MCDM is a methodology that simultaneously takes into account multiple decision-making attributes, to help decision-makers rank the merits of options according to their attributes, and then evaluate and select the best option from limited feasible choices (Liou and Tzeng 2012). Yang et al. (2013) demonstrated that the DEMATEL can quantify complex qualitative issues and define their direct and indirect relationships. In the past, few studies have examined the key CSR factors from the perspective of accounting experts. Given the importance of CSR and to compensate for this gap in the literature, this study attempted to examine CSR based on a MCDM model developed in consultation with experts. The DEMATEL was applied to establish the basis for prioritizing improvements, and to confirm the mutual influence between the dimensions and criteria, thereby determining key factors that enhance CSR and to establish a reference and developmental foundation for enterprises that wish to improve their performance in this area. Most real-world CSR problems are dynamic, including vision and strategies, dimensions, criteria, and possible alternatives. We develop a new DEMATEL as a scientific analytical method for evaluating a set of alternatives by considering multiple dimensions and criteria from which to determine improvement alternatives, and to solve complicated dynamic problems in the real world (Liou 2013). Our method offers multiple solutions to prioritize CSR improvement, while the conventional MCDM merely allows for the selection and ranking of alternatives or strategies. These alternative methods shift the focus from how to conduct “ranking” or “selection” of the most preferable alternatives to how to “improve” them.

## 2 Literature review

### 2.1 Social responsibility reporting

CSR is defined as the obligation of enterprises to have a positive impact on society and to minimize negative influence (Pride and Ferrell 2006). The World Business Council for Sustainable Development (WBCSD 1993) defined CSR as entrepreneurial commitment to comply with ethical codes, contribute to economic development, and improve the quality of life of employees and their families, communities and society. The ISO 26000 (2010) defines social responsibility as entrepreneurial responsibility for the impact of their decisions and activities on communities and the environment through transparency and ethical actions. Furthermore, CSR reporting also includes descriptions of the economic, environmental and social impact of operations to demonstrate the commitment, methods and performance in fulfilling social responsibility. Thus they are an effective tool for communicating with stakeholders and an important method recognized and used by different sectors for evaluating CSR. Earlier CSR reporting issued by businesses was mainly due to involuntary compliance with demands such as governmental regulations, supply chain requirements or market pressure. However, with the increasing benefits and recognition of the commercial value of such reports, more enterprises are voluntarily issuing reports to facilitate innovation, establish good communication with stakeholders, control operational risks, enhance brand value and image, and enhance the capacity for developing sustainable business. Since 2003, France has required listed companies to issue annual environmental and social reporting, becoming the first nation in the world to make CSR reporting mandatory. Beginning in 2009, Denmark required large scale enterprises to disclose CSR information in their annual reports, while

in 2009 the Norwegian government issued Report No. 10, requiring the government itself to comply with CSR standards in its code of conduct. Likewise, in February 2010 and October 2012, the United States Securities and Exchange Commission (SEC) and Canadian Securities Administrators (CSA) respectively released guidelines to listed companies related to the disclosure of carbon emission and environmental issues. Evidently, CSR reporting by international enterprises has already become the norm. The number of Chinese CSR reports has increased since 2006, from 10 in 2006, 46 in 2007, 77 in 2008 to 465 in 2009 (Shen et al. 2010). China's Application Guidelines for Enterprise Internal Control No. 4—Social Responsibilities has already been in effect for listed companies since January 1, 2010. Its objective is to guide listed companies in their implementation of CSR in response to the trend and demand for enterprises to fulfill social responsibility. In this study, Chinese CSR perspectives and factors are derived from a literature review, brain storming, expert opinions, and interviews with entrepreneurs, stock exchange government officials and other experts. They are divided into four main dimensions: safety production, product quality, environmental protection and employment promotion.

### *2.1.1 Safety production*

A lack of safety production measures and enterprise responsibility could lead to safety incidents. Enterprises should establish safety management departments and safety supervisory agencies to oversee daily safety production measures and inspect safety mechanisms, to ensure the implementation of various safety measures, strengthen routine maintenance management of production equipment and immediately eliminate hidden safety risks. Fulfilling social responsibility measures related to safety production can help enterprises reduce risks, satisfy the public perspective, quell public criticism and prepare for potential risks (Vogel 2005).

### *2.1.2 Product quality*

Poor product quality costs consumers and may substantially damage the enterprise in terms of compensation and image. Enterprises should improve their product and service quality and strive to provide the community with safe and healthy products and services which satisfy consumer needs as closely as possible. They must be accountable to society and the public, accept social supervision and assume social responsibility. Being socially responsible in terms of product quality often helps enterprises gain new value for their products, create positive consumer evaluation and reputation, substantially increase product recognition for the company, and often significantly increase the overall effectiveness of the organization (Branco and Rodrigues 2006; Luo and Bhattacharya 2006; Porter and Kramer 2006; Velaz et al. 2007). At the same time, product or service quality and value are also enhanced, which increases sales and customer satisfaction (Rego et al. 2010), especially in new markets (Goldstein 2002).

### *2.1.3 Environmental protection*

Environmental pollution can result in having to expend huge compensation for damages. Thus enterprises should establish a system for protecting the environment and conserving resources. They should take their responsibility to engage in energy conservation and emission reduction seriously, to actively develop and use energy conserving products, develop circular economics, decrease pollutant emission, and improve resource utilization efficiency.

At the same time, enterprises should also be concerned with the developmental demands of industrial restructuring, accelerating the development of new technology and transforming traditional industries to effectively change the method of development in order to meet the aims of low input, low consumption, low emission and high efficiency. Moreover, a system of supervision and inspection should be established to regularly monitor environmental pollution and resource conservation. By incorporating environmental protection into their operations, enterprises not only strengthen their environmental awareness but also enable their companies to smoothly transform into green enterprises. [Cormier and Magnan \(1999\)](#) argue that the disclosure of information such as incidents of environmental pollution and related compensations or fines will result in an outflow of company capital, and such unexpected incidents may crowd out other investments or debt repayments. [Kacperczyk \(2009\)](#) pointed out that with greater investment in environmental protection; larger enterprises can often avoid hostile takeovers and achieve long-term corporate value. In addition, [Lee \(2009\)](#) also indicated that in promoting environmental protection, energy conservation and emission reduction, managers of publicly listed enterprises can respond frequently to the interests and pressure of external stakeholders, and prove their competence in handling these demands.

#### *2.1.4 Employment promotion*

Inadequate employment and lack of concern with employee interests may damage employee motivation and affect enterprise development and social stability. On the other hand, employees hope for employers who are committed to sustainable development in the workplace, because they hope to work in enterprises that are socially responsible. Past studies indicated that socially responsible enterprises are more likely to attract high quality employees ([Greening and Turban 2002](#)) and also have greater cohesion, a stronger sense of belonging and greater productivity in the organization ([Lin 2010](#); [Pojasek 2007](#)). Employees want companies that help to maintain a good work environment and respect the human rights of its employees. When enterprises are socially responsible toward employee interests and human resource management, the following benefits commonly result: increase in job attraction, higher morale, increase in job satisfaction, decrease in turnover rate and creation of team spirit, thereby reducing the cost of recruitment and employee training ([Branco and Rodrigues 2006](#); [Chong 2009](#); [Jung et al. 2010](#); [Kang et al. 2010](#); [Zappala 2004](#)).

This study constructed a general CSR framework, as shown below:

### **3 Research design**

[Tao and Jin \(2012\)](#) have pointed out that the relationships between CSR variables are more complex and less linear than many scholars have assumed. Therefore, in this study the DEMATEL method is used to determine the various CSR dimensions and mutual effect of their sub-factors, and to construct a network of influential relationships leading to understanding their mutual impact.

#### **3.1 Building an influential network relationship with DEMATEL**

This paper seeks to understand whether factors or sub-factors interact or are independent in order to develop a complete CSR decision model. When making CSR decisions, the decision-maker has to consider the dimensions and criteria in detail and the interrelations between them.

They have to find the key criteria, and then modify them so as to enhance the overall performance of the CSR. In cases when the decision-maker has to cope with lots of changed criteria, the best solution is to determine which key criteria most affect the others and then modify these. Eventually, the results of the evaluation will become more and more precise. DEMATEL techniques have recently been considered for solving complex problems, such as those related to customer retention (Jeng and Bailey 2012), hospital performance (Afsharkazemi et al. 2013), socially responsible investments (Tsai et al. 2009), website evaluation (Tsai et al. 2010), and the management of intellectual capital (Chen and Chen 2013). DEMATEL uses matrix and related mathematical theories to calculate cause and effect for each element. This method is widely used to solve various types of complex problems and can be used to effectively understand complex structures and provide viable options for problem-solving (Tzeng et al. 2007).

The DEMATEL is divided into four steps summarized as follows:

*Step 1: Calculate the direct-influence average matrix using scores* The numbers 0, 1, 2, 3 and 4 represent scores that range from “no influence” to “very high influence”. Respondents are asked to give the degree of direct influence of each dimension/criterion on each other dimension/criterion, using the above scale. A direct relation matrix will be produced by each respondent. An average matrix  $D$  is then derived taking the mean of the same perspective/criteria in the various direct matrices from the respondents. The average matrix  $D$  is obtained with the following equation:

$$D = \begin{bmatrix} d_{11} & \cdots & d_{1j} & \cdots & d_{1n} \\ \vdots & & \vdots & & \vdots \\ d_{i1} & \cdots & d_{ij} & \cdots & d_{in} \\ \vdots & & \vdots & & \vdots \\ d_{n1} & \cdots & d_{nj} & \cdots & d_{nn} \end{bmatrix} \tag{1}$$

*Step 2: Calculate the normalizing the direct-influence average matrix* The second step is to normalize the matrix; the initial direct influence matrix  $X(X = [x_{ij}]_{n \times n})$  can be obtained by normalizing the average matrix  $D$ . In addition, matrix  $X$  can be obtained through Eqs. (2) and (3). Its diagonal is zero, and the maximum sum of row or column is one, but not all.

$$X = s \cdot D \tag{2}$$

$$s = \min \left[ 1 / \max_i \sum_{j=1}^n |d_{ij}|, 1 / \max_j \sum_{i=1}^n |d_{ij}| \right] \tag{3}$$

*Step 3: Derive the total-influence matrix* Once the normalized direct-influence matrix  $X$  is obtained, the total-influence matrix  $T$  can be obtained through Eq. (4), where  $I$  denote the identity matrix.

$$T = X + X^2 + \cdots + X^g = X(I - X)^{-1}, \quad \text{when } \lim_{k \rightarrow \infty} X^k = [0]_{n \times n}, \tag{4}$$

Explanation:

$$\begin{aligned}
 T &= X + X^2 + \dots + X^g \\
 &= X(I + X + X^2 + \dots + X^{g-1})(I - X)(I - X)^{-1} \\
 &= X(I - X^g)(I - X)^{-1}, \quad \text{then} \\
 T &= X(I - X)^{-1},
 \end{aligned}$$

when  $\lim_{k \rightarrow \infty} X^k = [0]_{n \times n}$ , where  $X = [x_{ij}]_{n \times n}$ ,  $0 \leq x_{ij} < 1$ ,  $0 < \sum_i x_{ij} \leq 1$ ,  $0 < \sum_j x_{ij} \leq 1$  and at least one column sum  $\sum_j x_{ij}$  or one row sum  $\sum_i x_{ij}$ , but not all, equals one, then we can guarantee  $\lim_{k \rightarrow \infty} X^k = [0]_{n \times n}$ .

In addition, the method finds each row sum and column sum of total influence matrix  $T$ .

$$d = (d_i)_{n \times 1} = \left[ \sum_{j=1}^n t_{ij} \right]_{n \times 1} \tag{5}$$

$$r = (r_j)_{n \times 1} = (r_j)'_{1 \times n} = \left[ \sum_{i=1}^n t_{ij} \right]'_{1 \times n} \tag{6}$$

where  $d_i$  denotes the row sum of the  $i$ th row of total influence matrix  $T$  and shows the sum of direct and indirect influences of dimension/criterion  $i$  on all other dimensions/criteria. Similarly,  $r_j$  denotes the column sum of the  $j$ th column of total influence matrix  $T$  and shows the sum of direct and indirect influences that dimension/criterion  $j$  has received from all other dimensions/criteria. We obtain the sum of all rows (vector  $d = (d_1, \dots, d_i, \dots, d_n)$ ) and the sum of all columns (vector  $r = (r_1, \dots, r_j, \dots, r_n)$ ). The vertical axis vector ( $d_i - r_i$ ) is constructed by deducting  $d$  from  $r$ , which may separate criteria into a cause group and an effect group. In general, when  $d_i - r_i$  is positive, the criterion is part of the cause group. In contrast, if vector  $d_i - r_i$  is negative, the criterion is part of the effect group. Therefore, the causal graph can be used to map the dataset for vectors  $d_i + r_i$  and  $d_i - r_i$  provided for decision-making (Tzeng and Huang 2011).

*Step 4: Analyzing the results and finding  $T_D$  and  $T_C$*  Based on the influence matrix  $T$ , each criterion  $t_{ij}$  of the influence matrix  $T$  can show network information for the degree to which criterion  $i$  affects criterion  $j$  from which the influential network relations map (INRM) can be obtained. The influence matrix  $T$  can be divided into  $T_D$  based on dimensions and  $T_C$  based on criteria.

$$T_C = \begin{matrix} & & D_1 & \dots & D_i & \dots & D_n \\ \begin{matrix} D_1 \\ \vdots \\ D_i \\ \vdots \\ D_n \end{matrix} & \begin{matrix} c_{11} \\ c_{12} \\ \vdots \\ c_{1m_j} \\ \vdots \\ c_{i1} \\ c_{i2} \\ \vdots \\ c_{im_i} \\ \vdots \\ c_{n1} \\ c_{n2} \\ \vdots \\ c_{nm_n} \end{matrix} & \begin{bmatrix} T_{11} & \dots & T_{1j} & \dots & T_{1n} \\ \vdots & & \vdots & & \vdots \\ T_{i1} & \dots & T_{ij} & \dots & T_{in} \\ \vdots & & \vdots & \ddots & \vdots \\ T_{n1} & \dots & T_{nj} & \dots & T_{nn} \end{bmatrix} & \end{matrix} \tag{7}$$

### 3.2 Research subjects

As mentioned above CSR reporting experts were interviewed. A total of 30 certified public accountants from KPMG, PricewaterhouseCoopers (PWC), Ernst & Young and Deloitte in Shanghai, Beijing, Guangzhou and several other places, and 12 professors of accounting were interviewed. The CSR dimensions and inter-dimensions, and criteria and their mutual impact were analyzed. Each interview lasted about 60 min and 42 questionnaire responses were collected.

## 4 Empirical analysis

### 4.1 Research questions

CRS reporting is often prepared for the main purpose of communicating with stakeholders and indicating CSR awareness. However, its dimensions are extensive and the content complex, so it is often not clear which factors are more critical. Therefore, using the research method delineated in Sect. 3.1, this study attempted to examine key factors from the perspective of accounting experts, and subsequently recommend priorities for improvement (Fig. 1; Table 1).

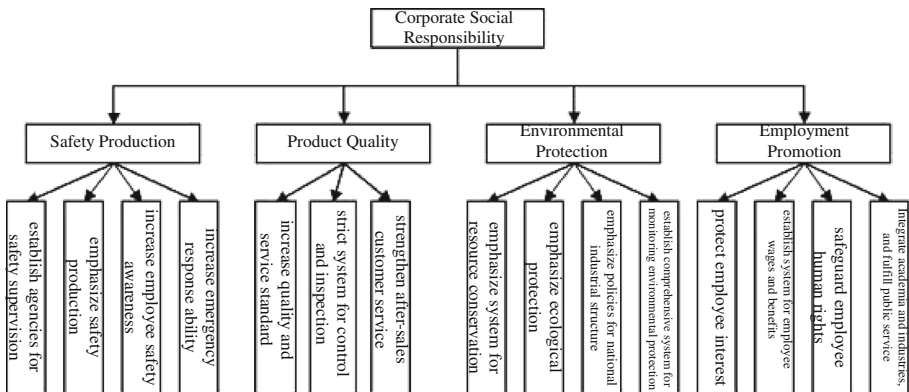
### 4.2 Description of CSR dimensions and criteria

Based on a review of the relevant literature, brain storming, expert opinion, and interviews with entrepreneurs, government stock exchange officials etc., the dimensions, criteria and description of CSR are summarized as follows:

### 4.3 Verification of the mutual relationship among dimensions and criteria using DEMATEL analysis

#### 4.3.1 Obtaining a normalization matrix

Based on expert interviews and using the research design delineated in Sect. 3.1, a direct-influence average matrix comprising four dimensions and 15 criteria was obtained. Then



**Fig. 1** Framework for corporate social responsibility



**Table 1** Descriptions of CSR dimensions and criteria

Dimension	Criteria	Criteria description	Relevant literature
Safety production	Establish agencies for safety supervision ( $a_1$ )	Establish strict safety production management systems and safety supervision agencies to oversee safety production and daily supervision and management	Cia and Zhao (2007) and Vogel (2005)
	Emphasize safety production ( $a_2$ )	Protect capital such as human, material, financial and technical assets, and ensure that all safety measures are in place	
	Increase employee safety awareness ( $a_3$ )	Adopt various methods to enhance employee safety awareness and job training, manage routine maintenance and promptly eliminate safety hazards	
	Increase emergency response ability ( $a_4$ )	In the event of safety production incidents or major production accidents, initiate contingency plans and promptly report according to relevant national regulation	
Product quality	Increase quality and service standard ( $b_1$ )	Improve product quality and service standard in production activities, provide society with products and services that are excellent in quality, safe and healthy	Sha (2012), Branco and Rodrigues (2006), Goldstein (2002), Luo and Bhattacharya (2006), Porter and Kramer (2006), Rego et al. (2010) and Velaz et al. (2007)
	Strict system for control and inspection ( $b_2$ )	Strictly control quality to prevent low quality, life and health endangering products from entering society	
	Strengthen after-sales customer service ( $b_3$ )	Properly handle consumer complaints and suggestions and protect consumer interests. Reduce or eliminate defective, hazardous products that are harmful to society	
Environmental protection	Emphasize system for resource conservation ( $c_1$ )	Develop and use energy conserving products and renewable resources, and improve resource utilization efficiency	Wei et al. (2013), Xiao and Zou (2012), Cormier and Magnan (1999), Lee (2009) and Kacperczyk (2009)
	Emphasize ecological protection ( $c_2$ )	Fulfill energy conservation and emission reduction responsibility by investing in environmental protection and technical support. Reduce energy consumption and pollutant emission level to achieve clean production	

**Table 1** continued

Dimension	Criteria	Criteria description	Relevant literature
	Emphasize policies for national industrial structure ( $c_3$ )	Pay attention to industrial restructuring development requirements. Accelerate development of high technology and transformation of traditional industries	
	Establish comprehensive system for monitoring environmental protection ( $c_4$ )	Supervise and inspect, and promptly adopt corrective measures. In the event of emergencies or major environmental pollution; initiate emergency contingency mechanism, report, manage, and investigate legal responsibility	
Employment promotion	Protect employee interest ( $d_1$ )	Labor laws entitle workers to labor rights and obligations to maintain relative job stability and promote adequate employment. Comply with the principle of labor allocation and equal pay	Branco and Rodrigues (2006), Chong (2009), Greening and Turban (2002), Jung et al. (2010), Kang et al. (2010), Lin (2010), Pojasek (2007) and Zappala (2004)
	Establish system for employee wages and benefits ( $d_2$ )	Establish a scientific system of employee remuneration and incentives to ensure reasonable standards and maintain social fairness	
	Safeguard employee human rights ( $d_3$ )	Provide employee social insurance, strengthen Workers Conference, establish trade unions and respect employees	
	Integrate academia and industries, and fulfill public service ( $d_4$ )	Help socially disadvantaged populations and support charities. Support societal training and cultivation of human capital	

using formulas (2) and (3) in Step 2 of the DEMATEL, the normalization matrix shown in Table 2 was obtained.

#### 4.3.2 Obtaining the total-influential matrix

Using the previous normalization impact matrix, the total-influential matrix was obtained through Step 3 of DEMATEL, as shown in Table 3.

#### 4.3.3 Measuring relationships among dimensions and criteria for building the INRM

The average initial direct-influence  $4 \times 4$  matrix  $D$  is obtained by pair-wise comparisons that indicate the direction of influences of dimensions on one another, and the normalized direct-influence matrix  $X$  is calculated using Eqs. (1) and (2). Then, using Eqs. (3), (5) and (6), the total-influence matrix  $T_D$  of the dimensions and the sum of total influence given and received by each dimension can be derived, as indicated in Table 4. Using Step 4 of the aforementioned

**Table 2** The normalization matrix *D*

Criteria	<i>a</i> <sub>1</sub>	<i>a</i> <sub>2</sub>	<i>a</i> <sub>3</sub>	<i>a</i> <sub>4</sub>	<i>b</i> <sub>1</sub>	<i>b</i> <sub>2</sub>	<i>b</i> <sub>3</sub>	<i>c</i> <sub>1</sub>	<i>c</i> <sub>2</sub>	<i>c</i> <sub>3</sub>	<i>c</i> <sub>4</sub>	<i>d</i> <sub>1</sub>	<i>d</i> <sub>2</sub>	<i>d</i> <sub>3</sub>	<i>d</i> <sub>4</sub>
<i>a</i> <sub>1</sub>	0	0.078	0.066	0.075	0.059	0.067	0.055	0.071	0.077	0.079	0.072	0.066	0.056	0.062	0.056
<i>a</i> <sub>2</sub>	0.076	0	0.074	0.074	0.065	0.077	0.057	0.075	0.076	0.077	0.076	0.067	0.056	0.059	0.059
<i>a</i> <sub>3</sub>	0.061	0.074	0	0.061	0.055	0.071	0.048	0.062	0.059	0.066	0.061	0.058	0.060	0.064	0.058
<i>a</i> <sub>4</sub>	0.075	0.070	0.063	0	0.065	0.062	0.046	0.076	0.073	0.078	0.071	0.067	0.052	0.056	0.053
<i>b</i> <sub>1</sub>	0.065	0.068	0.054	0.061	0	0.067	0.070	0.054	0.067	0.073	0.071	0.075	0.060	0.064	0.058
<i>b</i> <sub>2</sub>	0.068	0.071	0.067	0.061	0.066	0	0.061	0.065	0.073	0.070	0.066	0.064	0.066	0.066	0.063
<i>b</i> <sub>3</sub>	0.056	0.056	0.051	0.053	0.065	0.056	0	0.048	0.066	0.066	0.064	0.062	0.052	0.056	0.053
<i>c</i> <sub>1</sub>	0.071	0.072	0.061	0.074	0.060	0.068	0.057	0	0.075	0.074	0.067	0.070	0.060	0.058	0.057
<i>c</i> <sub>2</sub>	0.071	0.075	0.060	0.076	0.075	0.072	0.067	0.062	0	0.079	0.073	0.073	0.061	0.059	0.057
<i>c</i> <sub>3</sub>	0.077	0.082	0.065	0.075	0.072	0.073	0.065	0.066	0.077	0	0.078	0.066	0.054	0.066	0.060
<i>c</i> <sub>4</sub>	0.066	0.072	0.061	0.073	0.072	0.070	0.063	0.067	0.074	0.078	0	0.070	0.060	0.064	0.060
<i>d</i> <sub>1</sub>	0.055	0.061	0.058	0.066	0.071	0.065	0.063	0.066	0.072	0.077	0.069	0	0.064	0.065	0.065
<i>d</i> <sub>2</sub>	0.055	0.051	0.057	0.054	0.056	0.065	0.052	0.052	0.061	0.062	0.055	0.059	0	0.071	0.067
<i>d</i> <sub>3</sub>	0.056	0.055	0.060	0.049	0.059	0.061	0.046	0.058	0.061	0.060	0.060	0.064	0.066	0	0.067
<i>d</i> <sub>4</sub>	0.052	0.057	0.058	0.052	0.056	0.067	0.047	0.051	0.060	0.060	0.062	0.060	0.069	0.069	0

**Table 3** Total-influential matrix of criterion  $T_C$

Criteria	$a_1$	$a_2$	$a_3$	$a_4$	$b_1$	$b_2$	$b_3$	$c_1$	$c_2$	$c_3$	$c_4$	$d_1$	$d_2$	$d_3$	$d_4$
$a_1$	0.588	0.684	0.617	0.657	0.637	0.672	0.572	0.634	0.698	0.718	0.678	0.656	0.594	0.626	0.593
$a_2$	0.676	0.630	0.641	0.673	0.659	0.699	0.589	0.654	0.716	0.735	0.699	0.676	0.610	0.641	0.612
$a_3$	0.596	0.628	0.509	0.596	0.585	0.624	0.523	0.578	0.630	0.652	0.617	0.600	0.553	0.581	0.550
$a_4$	0.640	0.659	0.598	0.570	0.625	0.649	0.549	0.621	0.677	0.698	0.659	0.640	0.575	0.605	0.575
$b_1$	0.627	0.652	0.586	0.623	0.560	0.650	0.567	0.597	0.667	0.689	0.655	0.643	0.578	0.607	0.576
$b_2$	0.642	0.668	0.610	0.636	0.634	0.600	0.570	0.619	0.685	0.699	0.663	0.645	0.596	0.621	0.592
$b_3$	0.559	0.579	0.526	0.556	0.561	0.577	0.448	0.534	0.602	0.616	0.586	0.571	0.516	0.543	0.516
$c_1$	0.645	0.669	0.604	0.648	0.629	0.664	0.566	0.559	0.687	0.704	0.665	0.651	0.590	0.615	0.587
$c_2$	0.667	0.694	0.623	0.671	0.664	0.689	0.594	0.638	0.641	0.732	0.692	0.676	0.611	0.636	0.606
$c_3$	0.680	0.710	0.636	0.678	0.670	0.699	0.600	0.650	0.721	0.668	0.705	0.678	0.612	0.651	0.616
$c_4$	0.655	0.685	0.618	0.661	0.655	0.681	0.585	0.636	0.703	0.723	0.617	0.667	0.604	0.634	0.602
$d_1$	0.624	0.653	0.595	0.633	0.632	0.654	0.566	0.614	0.678	0.699	0.659	0.579	0.587	0.615	0.587
$d_2$	0.563	0.580	0.538	0.561	0.559	0.591	0.502	0.543	0.603	0.619	0.584	0.573	0.472	0.561	0.534
$d_3$	0.568	0.587	0.543	0.561	0.565	0.592	0.500	0.552	0.607	0.621	0.591	0.582	0.537	0.499	0.537
$d_4$	0.564	0.589	0.541	0.563	0.562	0.597	0.500	0.545	0.606	0.621	0.593	0.578	0.539	0.563	0.474

**Table 4** Total-influential matrix of  $T_C$  and the sum of the effects on the dimensions

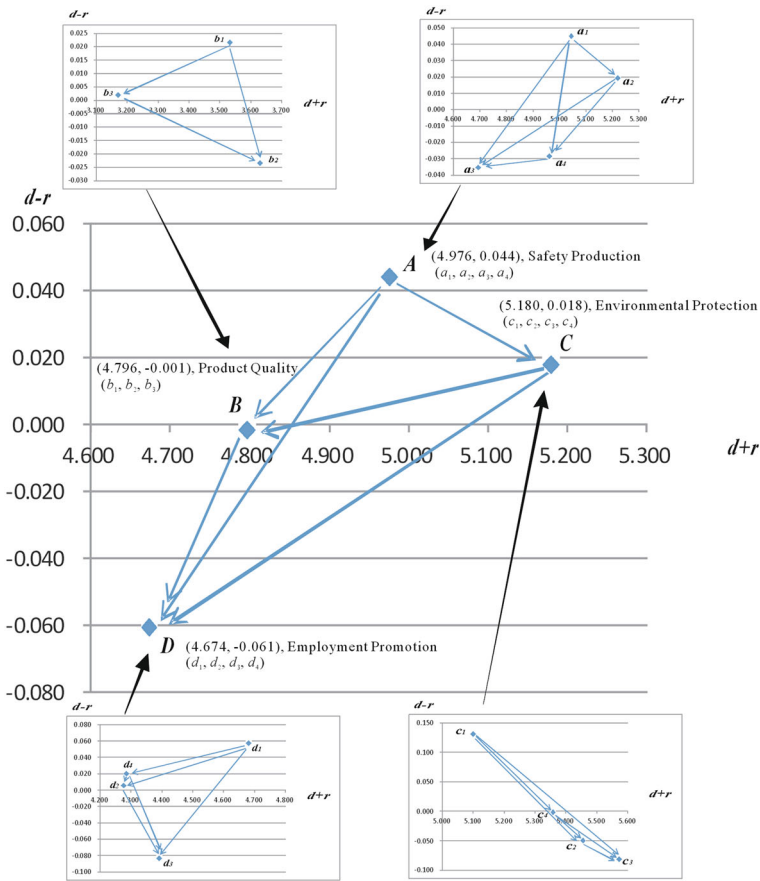
Dimensions	A	B	C	D	Sum of row ( $d_i$ )	Sum of column ( $r_i$ )	Prominence $d_i + r_i$	Relation $d_i - r_i$
A	0.6225	0.6153	0.667	0.605	2.510	2.466	4.976	0.044 (1)
B	0.6053	0.5741	0.634	0.584	2.397	2.399	4.796	-0.001 (3)
C	0.6590	0.6412	0.671	0.627	2.599	2.581	5.180	0.018 (2)
D	0.5790	0.5683	0.608	0.551	2.307	2.367	4.674	-0.061 (4)

**Table 5** The sum of influences and ranking of each criterion

Dimensions (i)/criteria (i)	Sum of row ( $d_i$ )	Sum of column ( $r_i$ )	Prominence $d_i + r_i$	Relation $d_i - r_i$	Ranking (based on relation)
<b>A</b>	<b>2.510</b>	<b>2.466</b>	<b>4.976</b>	<b>0.044</b>	
$a_1$	2.545	2.500	5.044	0.045	1
$a_2$	2.620	2.600	5.220	0.019	2
$a_3$	2.329	2.365	4.694	-0.035	4
$a_4$	2.467	2.496	4.963	-0.029	3
<b>B</b>	<b>2.397</b>	<b>2.399</b>	<b>4.796</b>	<b>-0.001</b>	
$b_1$	1.777	1.755	3.532	0.021	1
$b_2$	1.803	1.827	3.630	-0.023	3
$b_3$	1.587	1.585	3.172	0.002	2
<b>C</b>	<b>2.599</b>	<b>2.581</b>	<b>5.180</b>	<b>0.018</b>	
$c_1$	2.615	2.484	5.099	0.132	1
$c_2$	2.703	2.752	5.455	-0.049	3
$c_3$	2.745	2.826	5.571	-0.082	4
$c_4$	2.679	2.680	5.358	-0.001	2
<b>D</b>	<b>2.307</b>	<b>2.367</b>	<b>4.674</b>	<b>-0.061</b>	
$d_1$	2.369	2.312	4.681	0.057	1
$d_2$	2.141	2.135	4.276	0.006	3
$d_3$	2.155	2.238	4.392	-0.083	4
$d_4$	2.153	2.133	4.286	0.020	2

Note: This paper  $\frac{1}{n(n-1)} \sum_{i=1}^n \sum_{j=1}^n \frac{|g_{ij}^p - g_{ij}^{p-1}|}{g_{ij}^p} \times 100\% = 0.919\% < 1\%$ , i.e. significant confidence is 99.081 %, where  $p = 42$  denotes the number of experts and  $g_{ij}^p$  is the average influence of  $i$  criterion on; and  $n$  denotes number of criterion, here  $n = 15$  and  $n \times n$  matrix

DEMATEL, the sum effect of the criteria is obtained, and shown in Table 5. In addition, a diagram of influential network relations map was constructed, as shown in Fig. 2 (see Appendix for the diagram of influential network relations map). Table 4 shows that according to expert perceptions, all four dimensions (Safety Production (A), Product Quality (B), Environmental Protection (C) and Employment Promotion (D)) show a relation of mutual influence. From the relational impact illustration, it can be seen that compared to other dimensions, Safety Production (A) is the most influential dimension (greatest  $d_i r_i = 0.044$ ). In contrast, Employment Promotion (D) shows the least impact on other dimensions (smallest  $d_i r_i = -0.061$ ). For the past 20 years, China has been the world’s factory. However, its rate of production



**Fig. 2** The influential network relations map within the CSR

safety incidents has been many times greater than that of other developed countries, and has has a serious impact on social harmony and the quality of economic growth (Cia and Zhao 2007). Therefore, the dimension of safety production is more important than other CSR dimensions. The next most influential dimension is environmental protection. According to Huang et al. (2009) most enterprises are passive and do not provide adequate environmental information. Thus the environmental dimension is also becoming more important.

Table 3 shows that the criteria are mutually influencing and Table 5 shows the degree of influence. Regardless of whether the relationship is direct or indirect, “Emphasize system for resource conservation ( $c_1$ )” is the most influential criterion compared to other criteria ( $d_i r_i = 0.132$ ). Wei et al. (2013) pointed out that in the past, China had always sacrifice the environment to growth in its developmental model, but in the face of an increasingly severe ecological situation, a system that conserves resources needs to be emphasized. Given the many current problems, such as increasing environmental pollution, extensive energy consumption and imbalance between supply and demand, China must intensify environmental regulations. Moreover, to maintain rapid economic growth, development must be intensive and clean. Hence it is evident why “Emphasize system for resource conservation” has the greatest influence compared to other criteria while in contrast, “Safeguard employee human rights ( $d_3$ )” has the least impact among the criteria ( $d_i r_i = -0.083$ ).

Furthermore, from individual observation of each dimension, “Establish agencies for safety supervision ( $a_1$ )” is the most influential criteria in the “Safety Production (A)” dimension ( $d_i r_i = 0.045$ ). Management agencies that can efficiently supervise project safety can often help reduce occupational hazards and improve safety performance. The ultimate goal of safety management by supervisory agencies is to create a proactive culture of safety production. Nevertheless, since the development of safety production technology often slows down over time, improving safety production must rely on a comprehensive system of safety supervision and management that can fulfill its protective function. Hence in the safety production dimension, the “Establish agencies for safety supervision” criterion is more influential than other criteria while in contrast, “Increase employee safety awareness ( $a_3$ )” has the least impact ( $d_i r_i = -0.035$ ).

In the Product Quality (B) dimension, the “Increase quality and service standard ( $b_1$ )” criterion is the most influential ( $d_i r_i = 0.021$ ). Since improving quality and service standards are not only relevant to the consumer interests and company brand image, but as pointed out by Goldstein (2002), CSR can often help enterprises access new opportunities to increase their product value, especially in developing new markets. Moreover, Velaz et al. (2007) also indicated that improving standards of quality and service can also substantially increase a company's product recognition and reputation among consumers. This is similar to the conclusions of an earlier study conducted by Sha (2012). Thus enterprises should reward customers with quality products and services, creating and enhancing customer satisfaction. As such, in the product quality dimension, the “Increase quality and service standard” criterion is more influential than the other criteria while in contrast, “Strict system for control and inspection ( $b_2$ )” has the least impact ( $d_i r_i = -0.023$ ).

In the Environmental Protection (C) dimension, the “Emphasize system for resource conservation ( $c_1$ )” criterion is the most influential ( $d_i r_i = 0.132$ ). Xiao and Zou (2012) showed that production activities inevitably impact the environment, and causing environmental pollution often leaves the enterprise with huge environmental risks and opens them up to liability. Resource conservation systems can reduce environmental impact, making this criterion more influential, while, in contrast, “Emphasize policies for national industrial structure ( $c_3$ )” has the least impact ( $d_i r_i = -0.082$ ).

In the Employment Promotion (D) dimension, the “Protect employee interest ( $d_1$ )” criterion is the most influential ( $d_i r_i = 0.057$ ). Sha (2012) also found that during the growth stage, an enterprise's employees and customers are their most important stakeholders. Enterprises are morally responsible for employees mainly in terms of treating them well and providing them with opportunities for growth and development. Then as they expand, enterprises should become more people-oriented, making employee interests a priority. Harmonious labor relations are at the core of enterprise competitiveness, thus making this criterion more influential while in contrast, “Safeguard employee human rights ( $d_3$ )” has the least impact ( $d_i r_i = -0.083$ ).

#### 4.4 Analysis results and managerial implications

Based on data collected from the aforementioned expert interviews, this study constructed an influential network relations map using DEMATEL. Results showed that since Safety Production (A) has the greatest  $d_i r_i$  value, it implies that among the dimensions and criteria, it has the greatest direct impact. Likewise, the Employment Promotion (D) dimension has the smallest value, implying that it is most likely to be influenced by other dimensions. This study prioritized the importance of the dimensions and criteria for improvement, providing a reference for enterprises to enhance their CSR efficiency. According to their decreasing

**Table 6** The CSR improvement plan

Formula	Plan (sequence of improvement priority)
Influential network of dimensions (based on DEMATEL)	A_C_B_D_
Influential network of criteria within individual dimensions (based on DEMATEL)	A : (a <sub>1</sub> )_(a <sub>2</sub> )_(a <sub>4</sub> )_(a <sub>3</sub> ) (a <sub>2</sub> )_(a <sub>4</sub> )_(a <sub>3</sub> ) (a <sub>4</sub> )_(a <sub>3</sub> ) B : (b <sub>1</sub> )_(b <sub>3</sub> )_(b <sub>2</sub> ) (b <sub>3</sub> )_(b <sub>2</sub> ) C : (c <sub>1</sub> )_(c <sub>4</sub> )_(c <sub>2</sub> )_(c <sub>3</sub> ) (c <sub>4</sub> )_(c <sub>2</sub> )_(c <sub>3</sub> ) (c <sub>2</sub> )_(c <sub>3</sub> ) D : (d <sub>1</sub> )_(d <sub>4</sub> )_(d <sub>2</sub> )_(d <sub>3</sub> ) (d <sub>4</sub> )_(d <sub>2</sub> )_(d <sub>3</sub> ) (d <sub>2</sub> )_(d <sub>3</sub> )

relation,  $d_i r_i$ , the dimensions are ranked accordingly: A\_C\_B\_D\_, thereby making Safety Production the top priority for improvement. [Cia and Zhao \(2007\)](#) stated that the main reason for accidents during production is that during their pursuit of high yield and high profits, enterprises ignore their social responsibility. Enterprises should implement relevant safety production measures and assume the responsibility for safety production. The development of enterprises in China has matured, and since the strategy for overall economic growth model must be founded on building a harmonious society, safety production must be incorporated into the evaluation system for CSR. Safety Production is the most basic requirement of CSR. Without safety, human lives and the value of the enterprises are in danger. Therefore, among the four dimensions, improvement in safety production should be given first priority. However, in terms of prioritizing the criteria within each individual dimension, the criteria in the Safety Production (A) dimension should be ranked (a<sub>1</sub>)\_(a<sub>2</sub>)\_(a<sub>4</sub>)\_(a<sub>3</sub>). If only three criteria, (a<sub>2</sub>), (a<sub>3</sub>) and (a<sub>4</sub>), in the Safety Production (A) are taken into consideration, then the ranking should be (a<sub>2</sub>)\_(a<sub>4</sub>)\_(a<sub>3</sub>); and if only two criteria, (a<sub>3</sub>) and (a<sub>4</sub>) are considered, then the ranking should be (a<sub>4</sub>)\_(a<sub>3</sub>). [Table 6](#) shows the improvement ranking for individual criteria in each dimension.

### 5 Conclusions

This research compiled information gathered from China accounting experts to from an empirical dataset demonstrated that the new DEMATEL method can overcome the defects of the conventional MCDM method. The traditional model assumes that the criteria are independent and hierarchical in structure; however, real-world CSR frequently involves interdependent criteria. A new DEMATEL method is presented and applied to solve the interdependence and feedback problems of the CSR criteria, shifting from the “ranking” or “selection” of the most preferable alternatives to the “improvement” of CSR based on network influence relation maps. CSR report reviews have become a trend. Primarily it is the big four international public accounting firms performing this professional service. Our study explores the key factors in China’s CSR based on the perspective of accounting experts. The domain experts produced the most useful results and modeled an improvement strategy that should be pursued as part of CSR policy implementation.

Enterprises with positive public image are those that are socially responsible and have outstanding safety production records. To advance a safety production system, enterprises

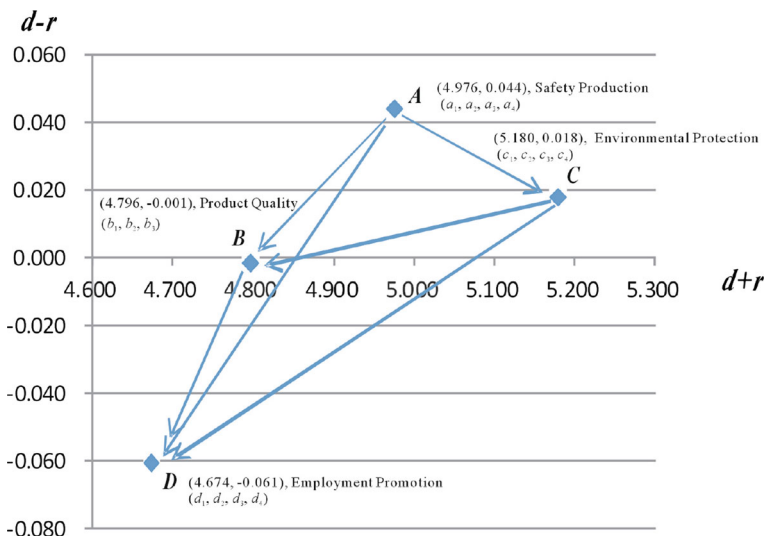


should emphasize self-restraint, demand their operational philosophy be founded on social responsibility, and their operational activities be self-regulated and controlled. Enterprises should also independently set high criteria and standards for environmental protection, and ensure better product quality inspection and safety standards, thereby protecting the interests and safety of employees and the public. In addition to being a medium of communication between enterprises and stakeholders, CSR is in fact a very important strategic tool for helping enterprises identify sustainability issues, manage risks, identify sales opportunities, set goals, appraise performance, supervise and govern, and stimulate innovation. As described in the preceding Sect. 2.1, many countries have required CSR reporting through mandates, thereby strengthening financial value as a result of direct savings in costs and enhanced market reputation. At the same time, the combining of financial statements and CSR reports further leads to an integrative report of diverse communications. In this study, accounting experts showed that the four CSR dimensions and their criteria are mutually related, that is, they are interdependent and feedback among criteria and alternatives. Strategies for improvement are described below:

1. Based on relation of the four dimensions, Safety Production (A) is the most important and the most likely to impact the other dimensions. Therefore, improvements should be made in the following order: Safety Production (A)\_Environmental Protection (C)\_Product Quality (B)\_Employment Promotion (D).
2. In terms of criteria, "Emphasize system for resource conservation ( $c_1$ )" is the most important criterion, and the most likely to impact other criteria.

**Appendix: Explanation of the INRM**

Tzeng and Huang (2011) developed a novel method of using no threshold value and a single arrow representation of the direction of impact to construct an influential network relations map. The construction of Fig. 3 is described below:



**Fig. 3** The influential network relations map within the CSR dimensions

**Table 7** Total-influential matrix by dimensions  $T_C$ 

Dimensions	A	B	C	D
A	$t_{11}$	$t_{12}$	$t_{13}$	$t_{14}$
B	$t_{21}$	$t_{22}$	$t_{23}$	$t_{24}$
C	$t_{31}$	$t_{32}$	$t_{33}$	$t_{34}$
D	$t_{41}$	$t_{42}$	$t_{43}$	$t_{44}$

**Table 8** Total-influential matrix by dimensions  $T_C$  of CSR

Dimensions	A	B	C	D
A	0.6225	0.6153	0.667	0.605
B	0.6053	0.5741	0.634	0.584
C	0.6590	0.6412	0.671	0.627
D	0.5790	0.5683	0.608	0.551

If  $t_{12} > t_{21}$  (Table 7), then the direction of impact is from A to B, that is  $A \rightarrow B$ . Using this study as example, Table 8 shows that the impact value of dimension A on dimension B is 0.6153 while the impact value of dimension B on dimension A is 0.6053. Since the impact value (0.6153) of dimension A on dimension B is greater than the impact value (0.6053) of dimension B on dimension A, the direction of impact is drawn from A to B, that is,  $A \rightarrow B$ . From pairwise comparisons of all the key factors of the dimensions, an influential network relations map can be constructed, as illustrated in Fig. 3. Likewise, an influential network relations map for every criterion within the dimension can be constructed.

## References

- Afsharkazemi, M.A., Manouchehri, J., Salarifar, M., Nasiripour, A.A.: Key factors affecting the hospital performance: a qualitative study using fuzzy logic. *Qual. Quant.* **47**(6), 3559–3573 (2013)
- Arendt, S., Brettel, M.: Understanding the influence of corporate social responsibility on corporate identity, image, and firm performance. *Manag. Decis.* **48**(10), 1469–1492 (2010)
- Branco, M.C., Rodrigues, L.L.: Corporate social responsibility and resource based perspectives. *J. Bus. Ethics* **69**(2), 111–132 (2006)
- Cia, W.C., Zhao, Y.S.: From the safety point of view about corporate social responsibility. *Ind. Saf. Health Mon.* **220**, 66–72 (2007)
- Carroll, A.B.: Managing ethically with global stakeholders: a present and future challenge. *Acad. Manag. Exec.* **18**(2), 114–120 (2004)
- Chen, I.S., Chen, J.K.: Present and future: a trend forecasting and ranking of university types for innovative development from an intellectual capital perspective. *Qual. Quant.* **47**(1), 335–352 (2013)
- Chong, M.: Employee participation in CSR and corporate identity: insights from a disaster-response program in the Asia-Pacific. *Corp. Reput. Rev.* **12**(2), 106–119 (2009)
- Cormier, D., Magnan, M.: Corporate environmental disclosure strategies: determinants, costs and benefits. *J. Acc. Audit. Finance* **14**(4), 429–451 (1999)
- Consolandi, C., Jaiswal-Dale, A., Poggiani, E., Vercelli, A.: Global standards and ethical stock indexes: the case of the Dow Jones sustainability STOXX index. *J. Bus. Ethics* **87**(1), 185–197 (2009)
- Donaldson, T., Preston, L.E.: The stakeholder theory of the corporation: concepts, evidence, and implications. *Acad. Manag. Rev.* **20**(1), 65–91 (1995)
- Du, S., Bhattacharya, C.B., Sen, S.: Maximizing business returns to corporate social responsibility (CSR): the role of CSR communication. *Int. J. Manag. Rev.* **12**(1), 8–19 (2010)
- Goldstein, D.: Theoretical perspectives on strategic environmental management. *J. Evol. Econ.* **12**(5), 495–524 (2002)
- González-Rodríguez, M.R., Díaz-Fernández, M.C., Pawlak, M., Simonetti, B.: Perceptions of students university of corporate social responsibility. *Qual. Quant.* **47**(4), 2361–2377 (2013)

- Greening, D.W., Turban, D.B.: Corporate social performance as a competitive advantage in attracting a quality workforce. *Bus. Soc.* **39**(3), 254–280 (2002)
- Griffin, J.J., Mahon, J.F.: The corporate social performance and corporate financial performance debate. *Bus. Soc.* **36**(1), 5–31 (1997)
- Handelman, J.M., Arnold, S.J.: The role of marketing actions with a social dimension: appeals to the institutional environment. *J. Mark.* **63**(3), 33–38 (1999)
- Hannan, M.T., Freeman, J.: Structural inertia and organizational change. *Am. Sociol. Rev.* **49**(2), 149–164 (1984)
- Huang, S.Y., Wu, T.H., Chi, Y.J.: A study of environmental accounting information disclosure on corporate website. *J. Acc. Corp. Gov.* **6**(1), 1–30 (2009)
- ISO.: ISO 26000 Guidance on Social Responsibility. ISO, Geneva (2010)
- Jeng, D.J., Bailey, T.: Assessing customer retention strategies in mobile telecommunications: hybrid MCDM approach. *Manag. Decis.* **50**(9), 1570–1595 (2012)
- Jones, T.M.: Instrumental stakeholder theory: a synthesis of ethics and economics. *Acad. Manag. Rev.* **20**(2), 404–437 (1995)
- Jung, H.S., Namkyung, Y., Yoon, H.H.: The effects of employees' business ethical value on person–organization fit and turnover intent in the foodservice industry. *Int. J. Hosp. Manag.* **29**(3), 538–546 (2010)
- Kacperczyk, A.: With greater power comes greater responsibility? Takeover protection and corporate attention to stakeholders. *Strateg. Manag. J.* **30**(3), 261–285 (2009)
- Kang, K.H., Lee, S., Huh, C.: Impacts of positive and negative corporate social responsibility activities on company performance in the hospitality industry. *Int. J. Hosp. Manag.* **29**(1), 72–82 (2010)
- Lee, M.P.: Does ownership form matter for corporate social responsibility? A longitudinal comparison of environmental performance between public, private, and joint-venture firms. *Bus. Soc. Rev.* **114**(4), 435–456 (2009)
- Liou, J.J.H.: New concepts and trends of MCDM for tomorrow-in honor of Professor Gwo-Hshiung Tzeng on the occasion of his 70th birthday. *Technol. Econ. Dev. Econ.* **19**(2), 367–375 (2013)
- Liou, J.J.H., Tzeng, G.H.: Comments on “Multiple criteria decision making (MCDM) methods in economics: an overview”. *Technol. Econ. Dev. Econ.* **18**(4), 672–695 (2012)
- Lin, C.P.: Modeling corporate citizenship, organizational trust, and work engagement based on attachment theory. *J. Bus. Ethics* **94**(4), 517–531 (2010)
- Luo, X., Bhattacharya, C.B.: Corporate social responsibility, customer satisfaction, and market value. *J. Mark.* **70**(4), 1–18 (2006)
- Mao, H., Zhang, Z.: A review on the theoretical studies of domestic corporate social responsibility audit: based on the analysis of domestic studies from 1993 to 2009. *J. Aud. Econ.* **25**(5), 47–53 (2010)
- McGehee, N.G., Wattanakamolchai, S., Perdue, R.R., Calvert, E.O.: Corporate social responsibility with in the U.S. lodging industry: an exploratory study. *J. Hosp. Tour. Res.* **33**(3), 417–437 (2009)
- Mittal, R.K., Sinha, N., Singh, A.: An analysis of linkage between economic value added and corporate social responsibility. *Manag. Decis.* **46**(9), 1437–1443 (2008)
- Morsing, M., Schultz, M.: Corporate social responsibility communication: stakeholder information, response and involvement strategies. *Bus. Ethics* **15**(4), 323–338 (2006)
- Nam, Y., Barnett, G.A., Kim, D.: Corporate hyperlink network relationships in global corporate social responsibility system. *Qual. Quant.* (2013). doi:[10.1007/s11135-013-9831-7](https://doi.org/10.1007/s11135-013-9831-7)
- Pojasek, R.B.: A framework for business sustainability. *Environ. Qual. Manag.* **17**(2), 81–88 (2007)
- Porter, M.E., Kramer, M.R.: Strategy & society: the link between competitive advantage and corporate social responsibility. *Harvard Bus. Rev.* **84**(12), 78–92 (2006)
- Pride, W.M., Ferrell, O.C.: *Marketing: Concepts and Strategies*. Houghton Mifflin, Boston (2006)
- Rego, A., Leal, S., Cunha, M.P., Faria, J., Pinho, C.: How the perceptions of five dimensions of corporate citizenship and their inter-inconsistencies predict affective commitment. *J. Bus. Ethics* **94**(1), 107–127 (2010)
- Robinson, M., Kleffner, A., Bertels, S.: Signaling sustainability leadership: empirical evidence of the value of DJSI membership. *J. Bus. Ethics* **101**(3), 493–505 (2011)
- Savage, G.T., Nix, T.W., Whitehead, C.J., Blair, J.D.: Strategies for assessing and managing organizational stakeholders. *Acad. Manag. Exec.* **5**(2), 61–75 (1991)
- Sha, Y.: Study about the coupling of entrepreneurial social responsibility and entrepreneurship based on the corporate life cycle. *Chin. J. Manag.* **9**(8), 1078–1083 (2012)
- Shen, H., Wan, T., Yang, S.: Current situation and evaluation of corporate social assurance in China. *J. Audit. Econ.* **25**(6), 68–74 (2010)
- Tao, W., Jin, Z.: The relationship among corporate social responsibility disclosure, media exposure and corporate financial performance. *Chin. J. Manag.* **9**(8), 1225–1232 (2012)

- Tsai, W.H., Chou, W.C., Hsu, W.: The sustainability balanced scorecard as a framework for selecting socially responsible investment: an effective MCDM model. *J. Oper. Res. Soc.* **60**(10), 1396–1410 (2009)
- Tsai, W.H., Chou, W.C., Lai, C.W.: An effective evaluation model and improvement analysis for national park websites: a case study of Taiwan. *Tour. Manag.* **31**(6), 936–952 (2010)
- Tzeng, G.H., Huang, J.J.: *Multiple Attribute Decision Making: Methods and Applications*. Taylor & Francis, London (2011)
- Tzeng, G.H., Chiang, C.H., Li, C.W.: Evaluating intertwined effects in e-learning programs: a novel hybrid MCDM model based on factor analysis and DEMATEL. *Expert Syst. Appl.* **32**(4), 1028–1044 (2007)
- Velaz, I., Sison, A.J.G., Fontrodona, J.: Incorporating CSR and stakeholder management into corporate strategy: a case study of the CAN experience 2002–2006. *Corp. Gov.* **7**(4), 434–445 (2007)
- Vogel, D.: *The Market for Virtue: The Potential and Limits of Corporate Social Responsibility*. Brookings Institution Press, Washington, DC (2005)
- WBCSD.: *WBCSD Brundtland Commission Report* (1993)
- Wei, W., Song, Y., Liu, Z.: Economic effect analysis from energy constraints and environmental regulation to FDI flow: empirical evidence from 215 cities in China. *J. Aud. Econ.* **28**(2), 106–112 (2013)
- Xiao, X., Zou, Z.: Environmental risk management and control framework of environmental liability audit in enterprise. *J. Aud. Econ.* **27**(2), 33–40 (2012)
- Yang, Y.P.O., Shieh, H.M., Tzeng, G.H.: A VIKOR technique based on Dematel ANP for information security risk control assessment. *Inf. Sci.* **232**, 482–500 (2013)
- Zappala, G.: Corporate citizenship and human resource management: a new tool or a missed opportunity? *Asia Pacific J. Hum. Resour.* **42**(2), 185–201 (2004)