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Building sustainable tourism hierarchical framework: Coordinated triple bottom line approach in linguistic preferences

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ABSTRACT

The study aims to develop a hierarchical framework for sustainable tourism considering socio-economic, socio-environmental and eco-efficiency aspects (coordinated triple bottom line). However, development of this hierarchical framework development must consider linguistic preferences and the interrelationships between the aspects and the criteria. Hence, the vague set is used to address linguistic preferences, and the interrelationships are presented with the decision-making and trial evaluation laboratory technique. Interpretive structural modeling is used to develop the sustainable tourism hierarchical framework. The results reveal that (1) socio-economics has a greater influence and (2) eco-efficiency performance does not reach the expected level because tourism firms encounter conflicts in balancing economic growth and environmental impact. This proposed hierarchical framework aims to guide the tourism industry toward sustainability. This study also proposes rewarding employees for promoting eco-processes, creating new eco-commercial links with the public and adopting an eco-organization to increase competitiveness and profitability for the practitioners.

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1. Introduction

The tourism industry is growing rapidly, generating economic growth and creating employment opportunities (Hatipoglu et al., 2016). The 2016 tourism highlights of the World Tourism Organization stated that there were 1.186 billion international tourists who generated 1.5 trillion USD in profits in 2015 worldwide. However, these tourists consume large amounts of water, energy and disposable products during their stays, causing serious pollution to the atmosphere, oceans, soil, biota, freshwater, etc. Moreover, the raw materials that are purchased for the manufacture of tourism products and for the disposal of used products have also harmed the natural environment (He et al., 2018). For example, tourists attended the 2016 Chinese national day celebration in Beijing Tiananmen Square and then left approximately five tons of trash around the square. The trash was removed by one hundred fifty workers who spent four hours cleaning the square. These cases, which are increasing in number, require more attention, and eco-innovation practices are urgently needed in the tourism industry to achieve sustainable tourism (ST) (Zolfani et al., 2015; Cui et al., 2017). Recent studies not only provide strategies to reduce negative environmental impacts but also generate working opportunities to increase social expectations and awareness.

Liu et al. (2013) reported that sustainable tourism is used to balance economic, environmental and social perspectives (Triple Bottom Line, TBL) to meet the requirements for improving people's lives (Carter and Rogers, 2008; Lozano, 2012). In addition, Dwyer et al. (2009) emphasized that tourism firms must integrate with TBL perspectives to make decisions toward ST. Although these studies strived to provide clear boundaries among TBL perspectives, the real practices have still experienced difficulty in classifying and balancing these three aspects to overcome the gap. The coordinated triple bottom line must be addressed (CTBL; socio-economic, socio-environmental and eco-efficiency) to enrich and balance the TBL perspectives. This study adopts eco-innovation practices to structure a hierarchical framework for reinforcing the CTBL's theoretical basis and to facilitate the tourism firms in developing ST.

The eco-innovation practices designed to balance the ecology

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and economy are innovative practices. For instance, Buijtendijk et al. (2018) stressed that eco-innovation assisted firms in transferring to advanced sustainability awareness. Prior studies strived to explore the operations and practices of eco-innovation to improve ST performance (Boons and Wagner, 2009; Carrillo-Hermosilla et al., 2010; Dong et al., 2014). This study adopts eco-innovation practices to structure the basis of the CTBL and generate the guidelines for tourism firms. The assessment of these eco-innovation practices is usually based on linguistic preferences. In addition, this study applied a vague set to transform the linguistic preferences into crisp values and integrated the decision-making trial and evaluation laboratory (DEMATEL) method to address the nature of the interrelationships among the criteria, and it proposes the interpretive structural modeling (ISM) method to develop a CTBL hierarchical structure.

This study aims to develop a CTBL hierarchical framework to guide the tourism industry toward sustainability. Hence, this study contributes by (1) linking eco-innovation practices to support the CTBL's theoretical basis; (2) adopting hybrid approaches to improve upon the disadvantages of a single approach when developing a hierarchical framework, thus enhancing reliability and validity; and (3) providing a guideline to lead tourism firms to improve their ST performance.

This study is organized by the following sections. The theoretical literature review is presented in the next section. Section 3 provides detailed discussions of the vague set, DEMATEL, ISM and the application procedures. Section 4 addresses the empirical results. Based on these results, significant insights and implications are addressed in section 5. Conclusions, the study limitations and possible directions for future research are stated in the final section.

2. Literature review

This section focuses on the discussion of the theoretical background for eco-innovation practices, CTBL, and the proposed method. The selected measures are included in the following discussion.

2.1. Theoretical background of eco-innovation practices

Eco-innovation is used to balance the fields of economy and ecology. Eco-innovation practices have created novel and competitively priced goods, processes, systems, services and procedures, which must satisfy human needs and improve quality of life for all people, minimize the utilization of natural resources and decrease the release of toxic substances over the entire lifecycle (Tseng et al., 2013). The Organization for Economic Cooperation and Development highlighted that eco-innovation practices are used to improve services, processes, market shares and organizations. Wu et al. (2016a) emphasized that eco-innovation practices generate differentiation by launching eco-design. The eco-innovation practices separate eco-innovation into four parts, which are eco-purchasing, eco-productions/services, eco-organization and eco-processing.

Several studies have strived to reinforce the linkage between eco-innovation practices and sustainable development (Margareta, 2013; Tseng and Bui, 2017). However, the studies have lacked discussion of how to balance the TBL perspectives. Despite Tseng et al. (2018b) attempting to develop a hierarchical model of ST from socio-cultural aspects to partially address the CTBL, the relationship between eco-innovation practices and ST still lacks involvement of the CTBL. In addition, previous studies have concentrated on launching eco-innovation to increase the different targets, products, markets and processes in terms of eco-efficiency (Rashid et al., 2014; Rocafort and Borrajo, 2016; Mavi et al., 2018). However, bridging eco-innovation with socio-environmental and socio-economic aspects is still in the infancy stage. It requires further discussion of reinforcing the entire concept of sustainability.

2.2. Coordinated triple bottom line

The concept of the TBL was proposed by Elkington (1998) from the perspectives of people, plants and profits. Subsequently, Carter and Rogers (2008) extended this concept to the economy, environment and society in terms of achieving sustainability. Effective practices require balancing economic, environmental and social perspectives simultaneously (Gimenez et al., 2012). Carriga and Mele (2004) argued that the theoretical background of TBL perspectives included corporate social responsibility and sustainability. Dwyer (2005) indicated that TBL perspectives are the core pillars of sustainability. Hence, an increasing number of have used them to evaluate sustainability (Hubbard, 2009; Lee et al., 2012). Ahi and Searcy (2015) adopted the TBL perspective to evaluate sustainability among supply chains. Pires et al. used TBL perspectives to support the current sustainable production model. Although TBL perspectives have provided a basis for assessing sustainability, some practices have encountered difficulty in categorizing the features belonging to these perspectives. Thus, Wu et al. (2018) demonstrated that TBL perspectives were insufficient to cover sustainability, and they suggested discussing CTBL, which includes socio-environmental, socio-economical and eco-efficiency aspects.

Musters et al. (1998) expressed that the socio-environmental aspect is based on a hierarchical organization of human activities, is structural as well as functional, and is concentrated on the constraints and situations of development. Morimoto (2013) reported that the socio-environmental aspect enables one to provide complete information to support decision making. Donohue and Biggs (2015) selected 23 spatially explicit indicators from the socio-environmental aspect to monitor livelihood and wellbeing. Soflaei et al. (2017) compared the sustainable development of traditional courtyard houses from the socio-environmental aspect. As aforementioned, the socio-environmental aspect refers to human survival and activities within the scope of social material and the totality of spiritual conditions.

The socio-economical aspect requires taking social and economic considerations into account. For instance, Sarycheva (2003) discovered that this aspect relates to the interaction of human society with economic activities and social developments. Song et al. (2018) attempted to explore indicators to assist firms in assessing sustainability. Palvia et al. (2018) found that the socio-economical aspect includes social contact, economic transformation, empowerment in life domains, cultural evolution, personal security and criminal use. The socio-economical aspect is related to the interactions between human society and related economic activities without sacrificing next-generation prerequisites.

The World Business Council for Sustainable Development illustrated that eco-efficiency encompasses the delivery of competitively priced goods and services that satisfy human need and that enhance quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle to a balanced level. The eco-efficiency relates to the relationship in economic activities between environmental costs or value and environmental impacts (Huppes and Ishikawa, 2005). In addition, prior studies have applied eco-efficiency to assist firms in developing sustainability among the fields of businesses, productions, services and industrial parks (Willison and Côté, 2009; Fan et al., 2017). In summary, Esquer-Peralta (2007) indicated that the concept of sustainability not only includes TBL perspectives but also must consider the aspects of the socio-environment, socio-economy and eco-efficiency. Additionally, Wu et al. (2016b) argued that

TBL perspectives are no longer sufficient to cover the entire idea of sustainability, and it must be concerned with other aspects, such as operations, resilience, the long term and stakeholders. This study attempts to take the CTBL and apply eco-innovation practices for ST.

2.3. Proposed methods

Previous studies have proposed some methods to assist the tourism industry in attaining sustainability. For instance, Torres-Delgado and Palomeque (2014) selected indicators by applying Delphi method at the local level. Zhang et al. (2015) associated nonlinear dynamic evaluation with neural networks to assess sustainable performance. Ng et al. (2017) attempted to develop eco-tourism indicators to lead the tourism industry. These prior studies presented the measures for qualitative information, but the measures were based on Likert scales. Nevertheless, these studies failed to discuss the interrelationships among the measures and failed to provide a hierarchical framework. Hence, this study proposes integrating the vague set with DEMATEL and ISM to determine the causal relationships and structure the framework as a guideline for leading firms toward improvements.

DEMATEL enables one to resolve the industry's complex and tangled problems (Shieh et al., 2010). In addition, it can compute the direct and indirect causal relationships and influence levels among measures and then generate a diagram to express the results, offering visual analysis for decision making (Lee et al., 2010). Thus, Bacudio et al. (2016) utilized DEMATEL to explore the implementation barriers of an industrial symbiosis network. Wu et al. (2017) compared the results between the fuzzy and gray DEMATELs in discovering the decisive attributes of supply chain risks and uncertainties. Tsai (2018) adopted DEMATEL to explore job satisfaction for study and development professions. These studies presented the advantages of DEMATEL, which categorizes the proposed measures into cause and effect groups, but they were unable to structure a hierarchical framework to offer a direction for improvement.

Due to this limitation, this study employs ISM to structure the framework after exploring the interrelationships among the proposed measures. ISM is used to simplify complex problems into a hierarchical structure (Cui, 2017). Wu et al. (2018) emphasized that hierarchical structure not only reduces complicated decision making, but it also explores the guidelines for assisting firms in making the improvement and strengthening theoretical bases. However, these proposed methods are required to gather the results through experts' judgments. These judgments include uncertainty and qualitative features (Kannan et al., 2014; Lin et al., 2016; Tseng et al., 2015), which musts implement the vague set to overcome these features. The vague set considers the negative evidence to more comprehensively consider and support decision making.

3. Method

This section provides the selected measures, vague set, DEMATEL and ISM and proposes an analytical procedure to enhance the understanding of applications.

3.1. Selected measures

This study selects 26 eco-innovation practices from the literature and then reports the consultation with an expert group to obtain the final measures for ensuring reliability and validity (as Table 1 shows). The expert group consists of six professors, four presidents and seven senior managers with more than seven years of working experience in the industry.

3.2. Vague set

Gau and Buehrer (1993) presented the weakness of fuzzy set theory, which only considered positive evidence by obtaining the single membership function only. This process causes negative evidence to be ignored in real decision-making problems. This study adopts the vague set, instead of the fuzzy set, theory in terms of the point-based membership function to depict the real situation. The vague set can consider positive and negative evidence, and it is expressed by an interval-based membership function to

Table 1
Selected measures.

	Eco-innovation Practices	References
C1	Increasing the efficiency of eco-processes for preserving the natural environment	
C2	Enhancing environmental awareness to increase quality of life	Wu et al. (2016a);
C3	Encouraging public participation in environmental protection	Gupta and Barua (2017);
C4	Implementing eco-labeling for the delivery of transparent information	Tseng & Bui (2017)
C5	Fulfilling social expectations by launching eco-organization	
C6	Collaborating with nongovernment organizations to improve reputation	
C7	Establishing the benchmarking practice of recycling and reuse among employees	
C8	Providing environmental knowledge courses to employees	
C9	Generating benefits from eco-production/services	
C10	Rewarding employees for promoting eco-processes	Horbach (2016);
C11	Integrating ISO standards with eco-processes to prevent risk	
C12	Applying eco-production to create value added for improving society	
C13	Offering eco-activities to increase customer satisfaction	Tseng et al. (2018a);
C14	Charging environmental maintenance fees for provided services	Wu et al. (2016a);
C15	Proposing eco-design services to satisfy market demand	Cui (2017);
C16	Reducing service waste to enhance resource utilization	Tseng & Bui (2017)
C17	Launching a tax policy to motivate the adoption of eco-purchasing	
C18	Sharing information in addressing disposal and recovery	
C19	Prioritizing the adopting of eco-processing	
C20	Adopting eco-purchasing in services that are provided	Desmarchelier et al. (2013);
C21	Creating new eco-commercial links with the public	
C22	Establishing eco-taxes	Gupta & Barua (2017)
C23	Preventing harmful material utilization	del Rosario & René (2017)
C24	Designing environmental-friendly packaging to reduce consumption	Tseng & Bui (2017)
C25	Selection of eco-friendly partners	
C26	Adopting eco-organization to increase competition and profitability	

Table 2
The corresponding vague numbers of the linguistic terms.

Linguistic Term	Corresponding Vague Number	x	y
Very Poor (NI)	$[0.1 - r \times x,\ 0.1 + r \times y]$	0.0	1.0
Poor (VL)	$[0.3 - r \times x,\ 0.3 + r \times y]$	0.5	0.5
Medium (I)	$[0.5 - r \times x,\ 0.5 + r \times y]$	0.5	0.5
Good (HI)	$[0.7 - r \times x,\ 0.7 + r \times y]$	0.5	0.5
Very Good (VHI)	$[0.9 - r \times x,\ 0.9 + r \times y]$	1.0	0.0

Note: The computation of the vague number adopts Geng et al.'s method, in which r represents the degree of hesitation of the expert.

present the vagueness of the information (Lu and Ng, 2005).

Assuming that there are series of criteria $N = n_1, n_2, \cdots n_p$, experts q undertake the assessments of these criteria through pairwise comparisons, which can be denoted as $E^q = [e^q_{ab}]_{p\times p}$. In addition, these assessments are presented in linguistic preferences. This study must transfer them into corresponding vague numbers, as shown in Table 2. Then, these corresponding vague numbers could be rewritten as $[\mathscr{g}^q_{ab}, \mathscr{h}^q_{ab}]$. The vague assessing matrix $\overline{E}^q$ is presented below.

$$\overline{E}^q = \begin{bmatrix} [\mathscr{g}^q_{11}, \mathscr{h}^q_{11}] & [\mathscr{g}^q_{12}, \mathscr{h}^q_{12}] & \cdots & [\mathscr{g}^q_{1b}, \mathscr{h}^q_{1b}] \\ [\mathscr{g}^q_{21}, \mathscr{h}^q_{21}] & [\mathscr{g}^q_{22}, \mathscr{h}^q_{22}] & \cdots & [\mathscr{g}^q_{2b}, \mathscr{h}^q_{2b}] \\ \vdots & \vdots & \ddots & \vdots \\ [\mathscr{g}^q_{a1}, \mathscr{h}^q_{a1}] & [\mathscr{g}^q_{a2}, \mathscr{h}^q_{a2}] & \cdots & [\mathscr{g}^q_{ab}, \mathscr{h}^q_{ab}] \end{bmatrix}_{p\times p} = \left[\mathscr{g}^q_{ab}, \mathscr{h}^q_{ab}\right]_{p\times p} \tag{1}$$

The benefit and cost scores can be obtained from the vague assessment matrix through the following equations.

$$B^q = \max\left[\mathscr{g}^q_{ab}, \mathscr{h}^q_{ab}\right] = max\left[\left(\mathscr{g}^q_{1b}, \mathscr{h}^q_{1b}\right), \left(\mathscr{g}^q_{2b}, \mathscr{h}^q_{2b}\right), \cdots, \left(\mathscr{g}^q_{pb}, \mathscr{h}^q_{pb}\right)\right] \tag{2}$$

$$C^q = \min\left[\mathscr{g}^q_{ab}, \mathscr{h}^q_{ab}\right] = min\left[\left(\mathscr{g}^q_{1b}, \mathscr{h}^q_{1b}\right), \left(\mathscr{g}^q_{2b}, \mathscr{h}^q_{2b}\right), \cdots, \left(\mathscr{g}^q_{pb}, \mathscr{h}^q_{pb}\right)\right] \tag{3}$$

These equations generate group utility (G^q) and individual regret (I^q).

$$G^q = \omega_t \times \left[(\overleftrightarrow{B^q,\ \alpha}) \Big/ \left(\overleftrightarrow{B^q, C^q}\right)\right], b = 1, 2, \cdots, p; t = 1, 2, \cdots, q \tag{4}$$

$$I^q = \max\mathscr{g}^q_b \times \left[(\overleftrightarrow{B^q,\ \alpha}) \Big/ \left(\overleftrightarrow{B^q, C^q}\right)\right], b = 1, 2, 3 \cdots, p \tag{5}$$

$$(\overleftrightarrow{B^q,\ \alpha}) = \left|\mathscr{g}^q_{ab} - \max\mathscr{g}^q_{ab}\right| + \left|\mathscr{h}^q_{ab} - \max\mathscr{h}^q_{ab}\right| + |\alpha - \varDelta| \tag{6}$$

$$\left(\overleftrightarrow{B^q, C^q}\right) = \left|max\mathscr{g}^q_{ab} - \min\mathscr{g}^q_{ab}\right| + \left|max\mathscr{h}^q_{ab} - \min\mathscr{h}^q_{ab}\right| + |\varDelta - \nabla| \tag{7}$$

where $\alpha = \mathscr{g}^q_{ab} + \mathscr{g}^q_{ab} \times (1 - \mathscr{g}^q_{ab} - \mathscr{h}^q_{ab})$, $\varDelta = 1 - \max\mathscr{g}^q_{ab} - \max\mathscr{h}^q_{ab}$, and $\nabla = 1 - \min\mathscr{g}^q_{ab} - \min\mathscr{h}^q_{ab}$. Thereinto, ω is the working experience weight from experts, and it must satisfy the rules $\omega \geq 0$ and $\sum_{t=1}^{q} \omega_t = 1$.

The next equation calculates the profit ratio matrix (P^q).

$$(P^q) = \tau \times [(G^q - \max G^q)/\mu] + (1 - \tau)[(I^q - \max I^q)/\pi] \tag{8}$$

where $\mu = \min G^q - \max G^q$, $\pi = \min I^q - \max I^q$, and τ is used to maximize the group utility in establishing the decision strategy. Generally, it is set at 0.5 to present normal considerations. Once each expert's profit ratio matrix (P^q) is obtained, the following equation can be used to generate the aggregating matrix (A).

$$A = \sum P^q/q = [p_{ab}]_{i\times i}, i = 1, 2, \cdots, p \tag{9}$$

3.3. Vague set -DEMATEL

Based on the aggregating matrix (A), this matrix must be normalized, and it uses the equation that Wu et al. (2017) adopted.

$$\overline{A} = A \Bigg/ \left[\max_{1\leq a\leq i} \sum_{b=1}^{i} (p_{ab})\right], a,\ b = 1, 2, \cdots, i \tag{10}$$

This normalized matrix $(\overline{A})$ must use the following equation to generate the total relation matrix $(\widehat{A})$.

$$\widehat{A} = \overline{A} \times \left(A^u - \overline{A}\right)^{-1} = \left[\widehat{p}_{ab}\right]_{i\times i} \tag{11}$$

where A^u is the identity matrix.

Consequently, summing up the rows and columns obtains the vectors θ and δ, respectively. The computation procedures are adopted by the following equations.

$$\theta = \left[\sum_{a=1}^{i} \left(\widehat{p}_{ab}\right)\right]_{i\times 1} = \left[\widehat{p}_a\right]_{i\times 1} \tag{12}$$

$$\delta = \left[\sum_{b=1}^{i} \left(\widehat{p}_{ab}\right)\right]_{1\times i} = \left[\widehat{p}_b\right]_{1\times i} \tag{13}$$

Once θ and δ are obtained, arranging $(\theta - \delta)$ as the vertical axis and $(\theta + \delta)$ as the horizontal axis transform the criteria into a cause and effect diagram. Therein, $(\theta - \delta)$ enables us to cluster the criteria into the cause $(\theta - \delta) > 0$ and effect groups $(\theta - \delta) < 0$. In addition, $(\theta + \delta)$ expresses the importance of the criteria.

3.4. Vague set - ISM

Interpretive structural modeling is an instrument to transform complex decision-making problems into a hierarchical framework (Govindan et al., 2012). To attain the hierarchical framework, the aggregating matrix must transform into total reachability matrix (A^t) with a binary code utilizing the following equations.

$$A^t = [\overline{p}_{ab}]_{i\times i}, i = 1, 2, \cdots, p \tag{14}$$

$$\text{If } \overline{p}_{ab} \geq \left(\sum p_{ab}/i \times i\right), \text{ then the value is considered to be } 1; \text{ otherwise, the value is considered to be } 0. \tag{15}$$

Then, we attain the reachability set (A^r) and antecedent set (A^n) through the following equations.

$$A^r = \{\tilde{p}_a | \overline{p}_{ab} = 1\} \tag{16}$$

$$A^n = \{\tilde{p}_b | \overline{p}_{ab} = 1\} \tag{17}$$

Adopting the following equation explores the intersection set (A^i).

$$A^i = A^r \cap A^n = [\tilde{p}_{ab}]_{i\times i} \tag{18}$$

Finally, we compute the driving power (dr) structure of the hierarchical framework using the following equation.

$$dr = \sum_{a=1}^{i} [\tilde{p}_{ab}]_{1\times i} = [\tilde{p}_b]_{1\times i} \tag{19}$$

3.5. Proposed analytical procedures

1. The proposed measures are selected from the literature to maintain content reliability. These measures discussed with experts acquire validity and ensure appropriateness. The survey instrument is developed based on these confirmed measures once the reliability and validity are confirmed.
2. By aggregating the respondents into vague numbers, each expert assessment form must be transferred into vague numbers in Table 2 and Eq. (1). The employed Eqs. (2)–(8) generate the individual profit ratio matrix. To transform the vague set into ISM and DEMATEL, the aggregating matrix plays an important role in processing the following computations using Eq. (9) to attain the aggregating matrix.
3. Eqs. (10) and (11) compute the total relation matrix once the aggregating matrix is obtained. Then, applying Eqs. (12) and (13) acquires the vectors θ and δ, respectively. Next, we arrange $(\theta - \delta)$ and $(\theta + \delta)$ as the vertical and horizontal axes into a cause and effect diagram to map the criteria. In particular, quadrants I and IV represent the driving criteria and core problem criteria, respectively.
4. Using the aggregating matrix explores the intersection set by executing Eqs. (14)–(18). The intersection set is applied to generate driving power to structure the framework using Eq. (19). The first level selects the highest driving power, and then the remaining levels repeat this step to acquire the framework.
5. This procedure compares the cause and effect diagram and hierarchical framework to identify the CTBL practices and the critical criteria.

4. Results

This section provides the background of the tourism industry in Panjin city and the analytical results.

4.1. Industrial background

Panjin city is located in southwest of Liaoning of China, which is the center of the Liaohe Delta. This area includes rich natural resources that include wetlands, hot springs, red-crowned cranes, speckled seals, water specialties and so on. This city has 16 national “A” class tourist scenic spots, and “Red Beach” is the most famous one. Due to a type of plant called “seepweed” that grows in the summer and turns red in autumn, this beach looks like it is covered by a red tarp during the autumn. In addition, river crabs and rice are the specialties of Panjin. To prevent the destruction of natural resources, farmers have adopted an ecological culture to feed the crabs and plant rice without using any chemical pesticides. This charming city generated 27.8 million USD in income with 22.7 million visitors in 2016. Hence, the rapid growth of the tourism industry has become a major source of economic support for Panjin.

Although these natural resources bring economic benefits, the environment also encounters negative impacts from these million visitors. They force the tourism industry to seek a way to maintain economic benefits, reduce negative environment impacts and fulfill the expectations of the public simultaneously. Several tourism firms have attempted to launch eco-innovation practices for ST, such as adopting eco-designs to reduce the utilization of raw materials. However, this approach lacks a framework to guide these firms in the applications and an appropriate approach for assessing performance. Hence, this study proposes hybrid methods to explore a framework as a guideline for leading firms to make improvements with the maximum effectiveness and investment efficiency.

4.2. Analytical results

1. Each expert was asked to complete the assessment based on the proposed measures. The assessment of expert 1 with the linguistic terms and the hesitate degree (HD) are presented in the Appendix in Table A1). All linguistic preferences and HDs must be converted into comparable values by being contrasted with Table 2 and by applying Eq. (1). Thus, the experts stated that the interrelationship from C2 to C1 is NI with 50% HD. The transformation process is $[0.1 - 0.5 \times 0.0,\ 0.1 + 0.5 \times 1.0] = [0.10,\ 0.60]$ (see Appendix Table A2).
2. Employing Eqs. (2)–(8) generates the profit ratio matrix, and then the aggregated matrix from the assessments of seventeen experts can be obtained by adopting Eq. (9) (see Appendix Tables A3 and A4).
3. Once the aggregating matrix is obtained, the total relation matrix can be generated by applying Eqs. (10) and (11). Then, using Eqs. (12) and (13) generates the vectors θ and δ, respectively. Therein, the θ of C1 is computed by summing all vertical values that belong to C1, which is marked in gray (see Appendix 5). δ uses the opposite method to total all of the horizontal values. Each value of $[\theta + \delta, \theta - \delta]$ is $[26.796,\ (0.786)], [26.689, 0.649], [26.047,\ 0.092], [27.071, (0.024)],$

$$[26.797, (0.597)], [25.803, (0.192)], [26.647,\ 0.283], [26.742, (0.109)],$$

$$[26.988,\ 1.347], [27.141,\ 0.484], [26.364,\ 0.119], [27.253, (1.534)],$$

$$[26.730,\ 0.049], [27.771, (0.117)], [27.158, (0.469)], [27.040,\ 0.135],$$

$$[26.656, (0.312)], [26.846, (0.408)], [26.008, (0.402)], [27.274,\ 0.751],$$

$$[27.308,\ 0.104], [25.874,\ 0.512], [25.256,\ 0.466], [26.602,\ 0.045],$$

$[26.167, (0.441)]$, *and*$[27.197,\ 0.357]$ from C1 to C26, respectively, for drawing the cause and effect diagram.

4. Based on the x, y axis, $(\theta + \delta, \theta - \delta)$ maps the measures into a diagram, as shown in Fig. 1. The results show that C2, C9, C10,

Table 3
VISM and VDEMATEL comparison.

Aspect (S)	Driving Factor (I)	Core Problem (IV)
Social-economical (S1)	C10, C21, C26	C12, C14
Social-environmental (S2)	C2, C16, C20	C1, C5, C8
Eco-efficiency (S3)	C9, C13	C4, C15, C18

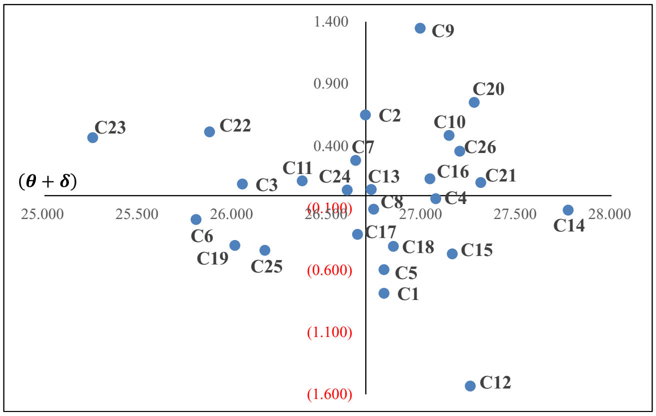

Fig. 1. Cause and effect diagram.

C13, C16, C20, and C21 belong to the driving criteria; C3, C7, C11, C22, C23, and C24 are the volunteering criteria; C6, C16, and C25 are grouped as the independent criteria; and C1, C4, C5, C8, C12, C14, C15, C17, and C18 are the core problems.

5. To structure the hierarchical framework, we must first determine the reachability matrix using Eqs. (14)–(17) (see Appendix Table A.6). The intersection set is obtained by utilizing Eqs. (18) and (19) (see Appendix Table A.7). Here, the last column marked in gray shows the driving power, which will be used to structure the hierarchical framework. As driving power 7 and 8 are the top two numbers, we arrange C10, C14 and C26 at the first level. Following this rule constructs the remaining levels, as Fig. 2 shows. Finally, the measures are grouped and named by features among the aspects, which are the social-economic, social-environmental and eco-efficiency aspects (Wu et al., 2018).
6. Table 3 is obtained by comparing the vague ISM with the vague DEMATEL. It obviously shows that the social-economic aspect stays at a higher level. Furthermore, the number of driving criteria are more than the number of core problems, also

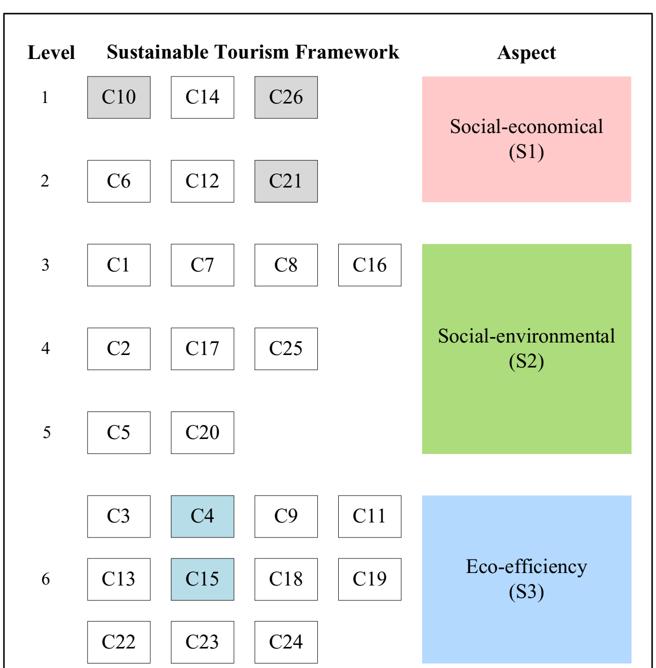

Fig. 2. The ST framework from the CTBL perspective.

confirming that the social-economic aspect has higher causal effects with impacts than the other two aspects. In the social-environmental aspect, driving criteria and core problems have the same number, showing that the social-environmental aspect possesses lower effects to influence the others. Finally, the eco-efficiency aspect contains two driving criteria and three core problems, demonstrating that the eco-efficiency aspect is the major problem for developing ST.

5. Implications

This section provides the theoretical and industrial implications to enhance understanding in theory and practice.

5.1. Theoretical implications

The analytical results revealed that the socio-economic aspect (S1) has a greater effect than the other two aspects in developing ST. Thus, rewarding employees for promoting eco-processing (C10), creating new eco-commercial links with the public (C21) and adopting eco-organization to increase competition and profitability (C26) present features that possess social and economic considerations. It is quite difficult to categorize these practices into social or economic aspects. Thus, this finding provides solid evidence to support the argument that discussion of TBL perspectives should move beyond considering the CTBL, rather than discussing the economic, environmental and social aspects only (Wu et al., 2018). It once again demonstrates that developing ST should bridge social and economic considerations through these three practices.

Furthermore, the results also discovered that eco-efficiency (S3) is the core problem when pursuing ST. The core problem is generated from two practices, including implementing eco-labeling for delivering transparent information (C4) and proposing eco-design services to satisfy market demand (C15). Although eco-efficiency can generate additional value in products or services while reducing resource consumption and environmental pollution (Peng et al., 2017), the results show that the current practices of tourism firms still have conflicts between balancing economic growth and environmental impacts.

This study attempts to discover the framework of ST from the viewpoint of CTBL, unlike previous studies from TBL perspectives. The findings confirmed that the concept of sustainability is insufficient to address economic, environmental and social aspects alone (Esquer-Peralta, 2007; Wu et al., 2016b, 2018). In addition, an increasing number of studies have encountered difficulties categorizing the indicators or practices into economic, environmental and social aspects separately. Thus, an urgent need exists to move further discussion from TBL perspectives to CTBL for sustainability.

5.2. Industrial implications

Rewarding employees for promoting eco-processes (C10) is the driving criterion for developing ST at the highest level. To incentivize employees to use the eco-process concept in their daily operations, one of the Panjin tourism firms establishes diversity objectives for consumption savings (including energy, water, paper and so on), based on the previous year's bills for each department. Once the saving consumption reaches the objective, all of the savings will convert into bonuses to be distributed to all of the employees of the department. Thus, the objective of savings in consumption will be increasingly lower until reaching the minimum value. At this time point, the employees are used to earning a bonus from these saving activities. If they want to continue to receive the bonus, then they are required to launch eco-processes or create new ways to save in consumption.

As a result of technology rapidly changing, tourism firms are unable to generate profits like traditional agencies by selling tickets or making reservations. They are required to create new eco-commercial links with the public (C21) by selling reed paints or opening galleries. Once the buyer is interested in visiting these painters or factories, tourism firms can establish a three-day, two-night trip with intellectual and cultural features. In Panjin, reed paint has been selected for the China Intangible Cultural Heritage program. However, this type of paint encounters difficulty entering the commercial market. Some tourism firms have attempted to use these paints in their offices and some scenic spots just for decoration. Inadvertently, some foreign visitors asked the tourism firms to arrange a trip to visit the painters. Hence, creating new eco-commercial links with the public might generate unexpected feedback that causes firms to attain ST.

Furthermore, adopting eco-organization to increase competition and profitability (C26) can generate a competitive advantage when pursing ST. This type of competitive advantage is solid and difficult to imitate since it is generated by the entire organization. The concept of eco-organization requires that all members among an organization have good environmental awareness and possess innovative ideas (Carter and Narasimhan, 1996). Thus, tourism firms must offer training courses to promote the environmental awareness of employees and partners and then seek creative ideas during collaboration to develop a competitive advantage.

Implementing eco-labeling to deliver transparent information (C4) and proposing eco-design services to satisfy market demand (C15) are the core problems for the Panjin tourism industry. However, these two practices belong to the effect group, which is unable to implement effective improvements by improving themselves directly. To overcome this problem, the aforementioned three practices not only provide the direction for tourism firms to pursue ST, but they can also generate positive effects to improve the core problem. Moreover, the hierarchical framework provides guidelines for the tourism industry to develop ST efficiently under resource constraints, enhancing the understanding and integration of practices from the viewpoint of CTBL.

6. Conclusions

China is attracting an increasing number of international tourists to discover its beauty and mystery. Despite the boom in the number of tourists, enabling the generation of economic growth, it has also had large negative impacts on the natural environment. The Panjin tourism industry has strived to implement eco-innovation practices to prevent the natural environment from worsening. However, a hierarchical framework enables one to guide firms in developing ST and offers an appropriate approach for assessing the performance lacking in current practices. To close these gaps, this study proposed adopting the vague DEMATEL to discover the driving criteria and core problems and the vague ISM to develop a hierarchical framework from the CTBL viewpoint.

This study makes theoretical, industrial and methodological contributions. This study provides evidence to bridge the eco-innovation practices and ST from the viewpoint of the CTBL for theoretical contributions. The result is supported by the argument of the discussion of sustainability from TBL perspectives to the CTBL. A hierarchical framework has been discovered to guide the tourism industry in developing ST, offering specific practices as an industrial contribution. These practices improved the performance effectively under limited resources and generated effects to address the core problems. The proposed hybrid method enables one to consider negative evidence and transform the qualitative data into crisp values to conduct a visual analysis for decision making.

The results reveal that an increasing number of measures cannot be categorized into economic, environmental and social aspects since they might possess features in the CTBL. Thus, if the tourism industry wants to develop ST effectively, CTBL provides a solid basis to address this issue. In particular, the social-economical aspect can generate greater effects to influence the other two aspects by rewarding employees for promoting eco-processing, creating new eco-commercial links with the public and adopting eco-organization to increase competition and profitability. In addition, the results also indicate that the performance of the eco-efficiency aspect does not reach the expected level due to the tourism firms encountering of conflicts in balancing economic growth and environmental impacts.

This study has several limitations. The selected twenty-six measures and seventeen experts may be insufficient to reflect the entire practice and all the effects of developing ST. Future studies should consider more measures and experts as they can establish a more comprehensive discussion. The evidence in this study only satisfied addressing the CTBL's independent parts, which are not considered in this discussion. Future studies must conduct extensive discussions to cover the independent parts and CTBL together. This study focused on the Panjin tourism industry only. A future study might use this hierarchical framework to demonstrate ST performance in other cities, provinces or countries. The proposed analytical procedures could be used to perform sensitivity analysis under comparison.

Acknowledgments

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Appendix

Table A.1
Assessment from expert 1.

	C1	HD_{C1}	C2	HD_{C2}	C3	HD_{C3}	C4	HD_{C4}	C5	HD_{C5}	……	C21	HD_{C21}	C22	HD_{C22}	C23	HD_{C23}	C24	HD_{C24}	C25	HD_{C25}	C26	HD_{C26}
C1	1.0	0.0	VL	0.1	NI	0.5	VHI	0.1	I	0.2	……	I	0.2	I	0.2	NI	0.4	VHI	0.1	NI	0.1	VL	0.2
C2	NI	0.5	1.0	0.0	VHI	0.2	HI	0.2	HI	0.4	……	HI	0.1	NI	0.1	HI	0.4	I	0.5	NI	0.2	NI	0.1
C3	NI	0.3	VL	0.5	1.0	0.0	HI	0.2	NI	0.4	……	VL	0.1	VHI	0.2	I	0.1	NI	0.1	VHI	0.2	HI	0.4
C4	HI	0.2	VHI	0.1	HI	0.3	1.0	0.0	VL	0.3	……	NI	0.5	HI	0.2	I	0.4	NI	0.4	VL	0.4	HI	0.2
C5	HI	0.2	HI	0.3	VHI	0.2	I	0.1	1.0	0.0	……	NI	0.5	NI	0.5	VL	0.5	VHI	0.5	NI	0.1	VHI	0.5
C6	I	0.5	NI	0.1	VL	0.5	VL	0.2	HI	0.1	……	VHI	0.5	NI	0.1	HI	0.2	VL	0.1	NI	0.3	I	0.1
C7	NI	0.2	NI	0.2	HI	0.5	NI	0.3	HI	0.4	……	I	0.2	HI	0.3	NI	0.3	HI	0.5	NI	0.2	I	0.3
C8	VL	0.2	VHI	0.2	VL	0.2	I	0.1	HI	0.1	……	HI	0.2	I	0.3	HI	0.4	I	0.2	NI	0.3	VL	0.4

(*continued on next page*)

Table A.1 (*continued*)

	C1	HD_{C1}	C2	HD_{C2}	C3	HD_{C3}	C4	HD_{C4}	C5	HD_{C5}	······	C21	HD_{C21}	C22	HD_{C22}	C23	HD_{C23}	C24	HD_{C24}	C25	HD_{C25}	C26	HD_{C26}
C9	VL	0.4	HI	0.5	HI	0.4	VL	0.2	I	0.3	······	HI	0.4	VL	0.5	NI	0.5	VL	0.1	HI	0.4	VHI	0.2
C10	HI	0.1	VL	0.3	VL	0.3	HI	0.4	NI	0.3	······	VL	0.5	I	0.2	VHI	0.5	HI	0.2	VHI	0.1	VL	0.3
C11	VL	0.4	VL	0.4	VL	0.1	HI	0.1	HI	0.2	······	VHI	0.3	HI	0.5	I	0.3	HI	0.1	VL	0.2	VHI	0.2
C12	VHI	0.1	NI	0.3	NI	0.2	VHI	0.3	VHI	0.3	······	VL	0.5	I	0.2	VHI	0.2	HI	0.5	NI	0.2	VL	0.2
C13	I	0.5	HI	0.1	NI	0.3	VL	0.2	NI	0.4	······	I	0.5	NI	0.5	HI	0.5	HI	0.2	VL	0.1	VL	0.5
C14	I	0.1	VL	0.2	VHI	0.1	I	0.2	NI	0.4	······	HI	0.4	NI	0.4	I	0.5	HI	0.5	I	0.1	VHI	0.3
C15	HI	0.1	VL	0.2	NI	0.2	I	0.2	VHI	0.2	······	VHI	0.3	HI	0.4	VL	0.2	VHI	0.4	VL	0.3	I	0.5
C16	NI	0.3	VHI	0.3	HI	0.2	NI	0.3	NI	0.4	······	VHI	0.2	HI	0.4	NI	0.2	NI	0.3	VHI	0.5	HI	0.1
C17	NI	0.5	NI	0.4	VHI	0.5	HI	0.4	VL	0.1	······	VHI	0.4	NI	0.4	HI	0.4	HI	0.4	HI	0.5	HI	0.5
C18	I	0.5	VL	0.2	VL	0.4	HI	0.4	VL	0.4	······	VHI	0.2	VL	0.2	VL	0.4	VHI	0.3	VHI	0.4	NI	0.2
C19	NI	0.4	HI	0.5	VHI	0.4	VHI	0.2	HI	0.5	······	VHI	0.4	VL	0.5	VHI	0.5	NI	0.1	NI	0.3	I	0.5
C20	VHI	0.3	VL	0.4	HI	0.3	I	0.5	NI	0.1	······	NI	0.1	VL	0.5	NI	0.4	HI	0.2	NI	0.2	I	0.3
C21	HI	0.2	I	0.5	VL	0.5	HI	0.3	VHI	0.4	······	1.0	0.0	VL	0.2	HI	0.4	HI	0.4	HI	0.4	VL	0.4
C22	I	0.3	I	0.5	I	0.5	I	0.3	VL	0.4	······	VHI	0.3	1.0	0.0	NI	0.5	VHI	0.2	NI	0.5	I	0.4
C23	VL	0.2	VHI	0.3	VL	0.3	HI	0.4	I	0.1	······	VL	0.4	VHI	0.4	1.0	0.0	HI	0.3	I	0.2	HI	0.2
C24	VL	0.3	VHI	0.4	HI	0.4	VHI	0.1	HI	0.2	······	NI	0.2	NI	0.4	VHI	0.2	1.0	0.0	VL	0.4	NI	0.5
C25	VHI	0.1	VL	0.2	VL	0.1	I	0.4	VL	0.1	······	I	0.3	I	0.4	NI	0.5	NI	0.5	1.0	0.0	VHI	0.4
C26	VHI	0.4	I	0.2	NI	0.2	NI	0.2	VHI	0.2	······	VL	0.5	VL	0.4	I	0.4	VL	0.5	NI	0.4	1.0	0.0

Table A.2
Corresponding vague numbers from expert 1.

	C1	C2	C3	C4	C5	······	C21	C22	C23	C24	C25	C26
C1	[1.00, 1.00]	[0.25, 0.35]	[0.10, 0.60]	[0.80, 0.90]	[0.40, 0.60]	······	[0.40, 0.60]	[0.40, 0.60]	[0.10, 0.50]	[0.80, 0.90]	[0.10, 0.20]	[0.20, 0.40]
C2	[0.10, 0.60]	[1.00, 1.00]	[0.70, 0.90]	[0.60, 0.80]	[0.50, 0.90]	······	[0.65, 0.75]	[0.10, 0.20]	[0.50, 0.90]	[0.25, 0.75]	[0.10, 0.30]	[0.10, 0.20]
C3	[0.10, 0.40]	[0.05, 0.55]	[1.00, 1.00]	[0.60, 0.80]	[0.10, 0.50]	······	[0.25, 0.35]	[0.70, 0.90]	[0.45, 0.55]	[0.10, 0.20]	[0.70, 0.90]	[0.50, 0.90]
C4	[0.60, 0.80]	[0.80, 0.90]	[0.55, 0.85]	[1.00, 1.00]	[0.15, 0.45]	······	[0.10, 0.60]	[0.60, 0.80]	[0.30, 0.70]	[0.10, 0.50]	[0.10, 0.50	[0.60, 0.80]
C5	[0.60, 0.80]	[0.55, 0.85]	[0.70, 0.90]	[0.45, 0.55]	[1.00, 1.00]	······	[0.10, 0.60]	[0.10, 0.60]	[0.05, 0.55]	[0.40, 0.90]	[0.10, 0.20]	[0.40, 0.90]
C6	[0.25, 0.75]	[0.10, 0.20]	[0.05, 0.55]	[0.20, 0.40]	[0.65, 0.75]	······	[0.40, 0.90]	[0.10, 0.20]	[0.60, 0.80]	[0.25, 0.35]	[0.10, 0.40]	[0.45, 0.55]
C7	[0.10, 0.30]	[0.10, 0.30]	[0.45, 0.95]	[0.10, 0.40]	[0.50, 0.90]	······	[0.40, 0.60]	[0.55, 0.85]	[0.10, 0.40]	[0.45, 0.95]	[0.10, 0.30]	[0.35, 0.65]
C8	[0.20,0.40]	[0.70, 0.90]	[0.20, 0.40]	[0.45, 0.55]	[0.65, 0.75]	······	[0.60, 0.80]	[0.35, 0.65]	[0.50, 0.90]	[0.40, 0.60]	[0.10, 0.40]	[0.10, 0.50]
C9	[0.10, 0.50]	[0.45, 0.95]	[0.50, 0.90]	[0.20, 0.40]	[0.35, 0.65]	······	[0.50, 0.90]	[0.05, 0.55]	[0.10, 0.60]	[0.25, 0.35]	[0.50, 0.90]	[0.70, 0.90]
C10	[0.65, 0.75]	[0.15, 0.45]	[0.15, 0.45]	[0.50, 0.90]	[0.10, 0.40]	······	[0.05, 0.55]	[0.40, 0.60]	[0.40, 0.90]	[0.60, 0.80]	[0.80, 0.90]	[0.15, 0.45]
C11	[0.10, 0.50]	[0.10, 0.50]	[0.25, 0.35]	[0.65, 0.75]	[0.60, 0.80]	······	[0.60, 0.90]	[0.45, 0.95]	[0.35, 0.65]	[0.65, 0.75]	[0.20, 0.40]	[0.70, 0.90]
C12	[0.80, 0.90]	[0.10, 0.40]	[0.10, 0.30]	[0.60, 0.90]	[0.60, 0.90]	······	[0.05, 0.55]	[0.40, 0.60]	[0.70, 0.90]	[0.45, 0.95]	[0.10, 0.30]	[0.20, 0.40]
C13	[0.25, 0.75]	[0.65, 0.75]	[0.10, 0.40]	[0.20, 0.40]	[0.10, 0.50]	······	[0.25, 0.75]	[0.10, 0.60]	[0.45, 0.95]	[0.60, 0.80]	[0.25, 0.35]	[0.05, 0.55]
C14	[0.45, 0.55]	[0.20, 0.40]	[0.80, 0.90]	[0.40, 0.60]	[0.10, 0.50]	······	[0.50, 0.90]	[0.10, 0.50]	[0.25, 0.75]	[0.45, 0.95]	[0.45, 0.55]	[0.60, 0.90]
C15	[0.65, 0.75]	[0.20, 0.40]	[0.10, 0.30]	[0.40, 0.60]	[0.70, 0.90]	······	[0.60, 0.90]	[0.50, 0.90]	[0.20, 0.40]	[0.50, 0.90]	[0.15, 0.45]	[0.25, 0.75]
C16	[0.10, 0.40]	[0.60, 0.90]	[0.60, 0.80]	[0.10, 0.40]	[0.10, 0.50]	······	[0.70, 0.90]	[0.50, 0.90]	[0.10, 0.30]	[0.10, 0.40]	[0.40, 0.90]	[0.65, 0.75]
C17	[0.10, 0.60]	[0.10, 0.50]	[0.40, 0.90]	[0.50, 0.90]	[0.25, 0.35]	······	[0.50, 0.90]	[0.10, 0.50]	[0.50, 0.90]	[0.50, 0.90]	[0.45, 0.95]	[0.45, 0.95]
C18	[0.25, 0.75]	[0.20, 0.40]	[0.10, 0.50]	[0.50, 0.90]	[0.10, 0.50]	······	[0.70, 0.90]	[0.20, 0.40]	[0.10, 0.50]	[0.60, 0.90]	[0.50, 0.90]	[0.10, 0.30]
C19	[0.10, 0.50]	[0.45, 0.95]	[0.50, 0.90]	[0.70, 0.90]	[0.45, 0.95]	······	[0.50, 0.90]	[0.05, 0.55]	[0.40, 0.90]	[0.10, 0.20]	[0.10, 0.40]	[0.25, 0.75]
C20	[0.60, 0.90]	[0.10, 0.50]	[0.55, 0.85]	[0.25, 0.75]	[0.10, 0.20]	······	[0.10, 0.20]	[0.05, 0.55]	[0.10, 0.50]	[0.60, 0.80]	[0.10, 0.30]	[0.35, 0.65]
C21	[0.60, 0.80]	[0.25, 0.75]	[0.05, 0.55]	[0.55, 0.85]	[0.50, 0.90]	······	[1.00, 1.00]	[0.20, 0.40]	[0.50, 0.90]	[0.50, 0.90]	[0.50, 0.90]	[0.10, 0.50]
C22	[0.35, 0.65]	[0.25, 0.75]	[0.25, 0.75]	[0.35, 0.65]	[0.10, 0.50]	······	[0.60, 0.90]	[1.00, 1.00]	[0.10, 0.60]	[0.70, 0.90]	[0.10, 0.60]	[0.30, 0.70]
C23	[0.20, 0.40]	[0.60, 0.90]	[0.15, 0.45]	[0.50, 0.90]	[0.45, 0.55]	······	[0.10, 0.50]	[0.50, 0.90]	[1.00, 1.00]	[0.55, 0.85]	[0.40, 0.60]	[0.60, 0.80]
C24	[0.15, 0.45]	[0.50, 0.90]	[0.50, 0.90]	[0.80, 0.90]	[0.60, 0.80]	······	[0.10, 0.30]	[0.10, 0.50]	[0.70, 0.90]	[1.00, 1.00]	[0.10, 0.50]	[0.10, 0.60]
C25	[0.80, 0.90]	[0.20, 0.40]	[0.25, 0.35]	[0.30, 0.70]	[0.25, 0.35]	······	[0.35, 0.65]	[0.30, 0.70]	[0.10, 0.60]	[0.10, 0.60]	[1.00, 1.00]	[0.50, 0.90]
C26	[0.50,0.90]	[0.40, 0.60]	[0.10, 0.30]	[0.10, 0.30]	[0.70, 0.90]	······	[0.05, 0.55]	[0.10, 0.50]	[0.30, 0.70]	[0.05, 0.55]	[0.10, 0.50]	[1.00, 1.00]

Table A.3
Profit ratio matrix from expert 1.

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26
C1	1.000	0.090	0.270	1.000	0.395	0.705	0.684	1.000	0.264	0.248	1.000	0.160	0.377	0.218	0.805	0.840	0.896	0.684	0.437	0.790	0.395	0.395	0.204	1.000	0.000	0.160
C2	0.270	1.000	0.885	0.656	0.815	0.336	0.123	0.579	0.331	0.684	0.805	0.101	0.026	1.000	0.353	0.092	0.427	0.429	0.899	0.899	0.739	0.000	0.796	0.466	0.083	0.000
C3	0.090	0.301	1.000	0.656	0.277	0.066	1.000	0.206	0.116	0.729	0.669	0.277	0.202	0.815	0.729	0.277	0.896	0.165	0.765	0.277	0.101	1.000	0.287	0.000	0.895	0.815
C4	0.656	1.000	0.680	1.000	0.218	0.180	0.632	0.486	0.785	0.301	0.466	0.765	0.632	0.277	0.429	0.277	0.479	1.000	0.277	1.000	0.370	0.765	0.426	0.248	0.248	0.765
C5	0.656	0.707	0.885	0.254	1.000	0.000	0.877	0.000	0.413	0.301	0.083	0.000	0.123	0.840	0.083	0.479	0.010	0.729	0.185	0.370	0.370	0.370	0.269	0.669	0.000	0.748
C6	0.418	0.000	0.238	0.066	0.739	1.000	0.772	0.439	0.289	0.466	0.669	0.160	0.333	0.277	0.165	0.899	1.000	0.391	0.899	0.815	0.748	0.000	0.741	0.090	0.165	0.353
C7	0.000	0.083	0.730	0.090	0.815	1.000	1.000	0.178	0.678	0.165	0.707	0.370	0.658	0.521	0.083	0.353	0.083	0.083	1.000	0.899	0.395	0.790	0.102	0.752	0.083	0.437
C8	0.066	0.895	0.066	0.254	0.739	0.123	0.184	1.000	0.058	1.000	0.895	0.336	1.000	0.437	0.707	0.000	0.802	0.429	0.765	0.790	0.765	0.437	0.796	0.353	0.165	0.277
C9	0.180	0.752	0.705	0.066	0.437	0.631	0.333	0.850	1.000	0.000	0.429	0.395	0.202	0.000	0.353	0.092	0.083	0.165	0.336	0.765	0.815	0.336	0.306	0.090	0.729	1.000
C10	0.631	0.195	0.123	0.705	0.185	0.705	0.123	0.393	0.785	1.000	0.353	0.336	0.289	0.277	0.429	0.092	0.927	0.729	0.370	0.521	0.336	0.395	0.722	0.684	1.000	0.218
C11	0.180	0.248	0.008	0.631	0.765	0.180	1.000	0.822	0.083	0.248	1.000	0.277	0.333	0.748	0.353	0.218	0.010	0.000	0.521	0.000	0.899	0.840	0.380	0.662	0.143	1.000
C12	1.000	0.165	0.000	0.787	0.899	0.639	0.658	0.579	1.000	0.391	0.707	1.000	0.658	0.521	0.684	0.160	0.156	0.391	0.521	0.739	0.336	0.395	1.000	0.752	0.083	0.160
C13	0.418	0.662	0.090	0.066	0.277	0.656	0.123	1.000	0.083	0.729	0.301	1.000	1.000	0.218	0.895	0.899	0.000	0.729	0.840	0.101	0.521	0.370	0.824	0.684	0.090	0.336
C14	0.254	0.143	1.000	0.295	0.277	0.377	0.772	0.103	0.083	0.707	0.083	0.395	0.000	1.000	0.669	0.395	0.802	0.248	0.815	0.765	0.815	0.277	0.472	0.752	0.316	0.899
C15	0.631	0.143	0.000	0.295	1.000	0.418	0.711	0.832	0.785	0.000	0.391	0.370	0.026	0.277	1.000	0.277	0.427	0.729	0.765	0.277	0.899	0.815	0.074	0.729	0.195	0.521
C16	0.090	0.805	0.656	0.090	0.277	0.418	1.000	0.579	0.231	0.895	0.729	0.218	0.219	0.815	0.000	1.000	0.427	0.000	0.739	0.277	1.000	0.815	0.000	0.165	0.669	0.739
C17	0.270	0.248	0.639	0.705	0.101	0.295	0.202	0.178	0.248	0.707	0.083	0.790	1.000	0.277	0.391	1.000	1.000	0.729	0.160	0.101	0.815	0.277	0.796	0.729	0.752	0.840
C18	0.418	0.143	0.180	0.705	0.277	0.680	0.658	0.879	0.628	0.752	0.729	0.748	0.772	0.748	0.391	0.521	0.479	1.000	0.092	0.336	1.000	0.160	0.204	0.805	0.729	0.092
C19	0.180	0.752	0.705	0.885	0.840	0.377	0.684	0.308	0.413	0.729	1.000	1.000	0.711	0.218	0.195	0.395	0.156	1.000	1.000	0.277	0.815	0.336	0.722	0.000	0.165	0.521
C20	0.787	0.248	0.680	0.418	0.000	0.238	0.219	0.822	0.653	0.752	0.301	0.336	0.614	0.899	0.805	0.370	0.427	0.090	0.899	1.000	0.000	0.336	0.204	0.684	0.083	0.437
C21	0.656	0.466	0.238	0.680	0.815	0.377	0.711	0.206	0.372	0.466	0.000	0.101	0.219	0.218	0.669	0.521	0.344	0.195	0.748	0.899	1.000	0.160	0.796	0.729	0.729	0.277
C22	0.336	0.466	0.418	0.336	0.277	0.377	0.605	0.579	0.636	0.083	0.707	0.101	0.772	0.748	0.895	0.899	0.323	0.805	0.000	0.765	0.899	1.000	0.306	0.895	0.331	0.479
C23	0.066	0.805	0.123	0.705	0.353	0.730	0.000	0.374	0.174	0.662	0.165	0.437	0.123	0.815	0.729	1.000	0.375	0.429	0.765	0.160	0.277	0.815	1.000	0.707	0.353	0.765
C24	0.123	0.729	0.705	1.000	0.765	0.066	0.184	0.879	0.000	0.143	0.143	0.437	0.000	0.815	1.000	0.815	0.375	0.316	1.000	0.748	0.092	0.277	1.000	1.000	0.248	0.370
C25	1.000	0.143	0.008	0.377	0.101	0.705	0.184	0.308	0.785	0.000	0.669	0.277	0.000	0.748	0.752	0.370	0.344	0.391	0.277	0.815	0.437	0.479	0.306	0.331	1.000	0.815
C26	0.705	0.353	0.000	0.000	1.000	0.123	0.061	0.907	0.058	0.301	0.090	0.521	0.202	1.000	0.669	0.101	0.115	0.331	0.218	0.000	0.336	0.277	0.426	0.301	0.248	1.000

Table A.4
Aggregating matrix.

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26
C1	1.000	0.470	0.317	0.449	0.513	0.395	0.596	0.464	0.563	0.517	0.405	0.454	0.532	0.463	0.505	0.543	0.385	0.547	0.612	0.559	0.312	0.463	0.447	0.525	0.404	0.617
C2	0.401	1.000	0.443	0.545	0.469	0.454	0.353	0.465	0.528	0.546	0.406	0.319	0.474	0.444	0.506	0.508	0.488	0.429	0.312	0.514	0.466	0.468	0.508	0.479	0.443	0.407
C3	0.361	0.329	1.000	0.376	0.454	0.410	0.524	0.503	0.447	0.333	0.562	0.471	0.370	0.529	0.449	0.500	0.492	0.432	0.619	0.404	0.470	0.443	0.436	0.496	0.423	0.478
C4	0.531	0.430	0.479	1.000	0.358	0.475	0.507	0.413	0.586	0.477	0.396	0.599	0.418	0.454	0.466	0.538	0.353	0.481	0.424	0.435	0.563	0.473	0.497	0.424	0.496	0.559
C5	0.417	0.537	0.318	0.552	1.000	0.567	0.644	0.519	0.611	0.460	0.489	0.462	0.477	0.420	0.390	0.416	0.436	0.506	0.414	0.579	0.527	0.507	0.383	0.425	0.388	0.537
C6	0.454	0.495	0.512	0.455	0.521	1.000	0.446	0.514	0.476	0.232	0.439	0.329	0.497	0.511	0.369	0.632	0.465	0.375	0.471	0.422	0.482	0.502	0.544	0.295	0.563	0.354
C7	0.394	0.455	0.528	0.424	0.532	0.498	1.000	0.447	0.437	0.344	0.437	0.450	0.430	0.551	0.475	0.453	0.417	0.440	0.498	0.531	0.430	0.477	0.465	0.522	0.454	0.416
C8	0.587	0.462	0.286	0.439	0.450	0.340	0.543	1.000	0.516	0.607	0.405	0.423	0.534	0.538	0.531	0.341	0.385	0.340	0.565	0.533	0.438	0.526	0.417	0.470	0.559	0.484
C9	0.420	0.501	0.511	0.432	0.454	0.349	0.398	0.505	1.000	0.460	0.585	0.448	0.428	0.489	0.452	0.327	0.454	0.370	0.436	0.406	0.526	0.518	0.519	0.383	0.458	0.354
C10	0.416	0.579	0.497	0.513	0.399	0.398	0.472	0.409	0.475	1.000	0.490	0.444	0.446	0.503	0.532	0.506	0.337	0.342	0.342	0.498	0.594	0.383	0.510	0.568	0.454	0.531
C11	0.345	0.457	0.363	0.466	0.446	0.469	0.443	0.436	0.444	0.516	1.000	0.445	0.447	0.712	0.455	0.413	0.617	0.394	0.441	0.316	0.514	0.467	0.462	0.428	0.417	0.528
C12	0.513	0.599	0.487	0.470	0.454	0.459	0.570	0.529	0.533	0.426	0.579	1.000	0.585	0.546	0.448	0.506	0.491	0.525	0.498	0.604	0.544	0.422	0.428	0.484	0.475	0.430
C13	0.481	0.502	0.323	0.388	0.537	0.516	0.399	0.487	0.447	0.518	0.407	0.501	1.000	0.477	0.477	0.449	0.515	0.485	0.430	0.532	0.435	0.495	0.316	0.563	0.439	0.511
C14	0.502	0.521	0.579	0.545	0.371	0.409	0.495	0.358	0.476	0.631	0.457	0.590	0.423	1.000	0.557	0.453	0.527	0.424	0.402	0.478	0.402	0.462	0.571	0.544	0.470	0.549
C15	0.571	0.481	0.461	0.395	0.590	0.371	0.368	0.438	0.663	0.532	0.486	0.461	0.522	0.558	1.000	0.421	0.585	0.523	0.421	0.486	0.422	0.420	0.427	0.527	0.427	0.512
C16	0.597	0.441	0.523	0.430	0.458	0.520	0.425	0.426	0.564	0.524	0.496	0.392	0.492	0.439	0.453	1.000	0.542	0.548	0.539	0.421	0.499	0.444	0.405	0.296	0.414	0.464
C17	0.459	0.373	0.405	0.557	0.471	0.518	0.436	0.317	0.538	0.600	0.356	0.471	0.476	0.571	0.477	0.401	1.000	0.497	0.359	0.590	0.552	0.421	0.429	0.516	0.524	0.450
C18	0.510	0.479	0.540	0.514	0.473	0.401	0.506	0.407	0.488	0.632	0.598	0.511	0.386	0.459	0.358	0.434	0.404	1.000	0.453	0.479	0.493	0.442	0.520	0.369	0.490	0.568
C19	0.429	0.496	0.409	0.477	0.412	0.509	0.538	0.474	0.467	0.546	0.498	0.514	0.531	0.345	0.395	0.546	0.414	0.578	1.000	0.449	0.436	0.333	0.393	0.561	0.364	0.404
C20	0.448	0.465	0.505	0.383	0.490	0.405	0.446	0.477	0.397	0.451	0.375	0.520	0.461	0.566	0.533	0.508	0.389	0.454	0.558	1.000	0.365	0.423	0.448	0.474	0.424	0.594
C21	0.478	0.381	0.563	0.589	0.431	0.578	0.519	0.504	0.349	0.429	0.454	0.397	0.387	0.469	0.612	0.447	0.494	0.323	0.454	0.565	1.000	0.511	0.486	0.530	0.438	0.503
C22	0.478	0.391	0.429	0.474	0.469	0.504	0.376	0.573	0.445	0.420	0.502	0.354	0.390	0.421	0.497	0.365	0.448	0.657	0.308	0.529	0.554	1.000	0.353	0.401	0.333	0.367
C23	0.379	0.517	0.497	0.434	0.368	0.402	0.428	0.531	0.330	0.440	0.377	0.424	0.488	0.376	0.394	0.508	0.348	0.447	0.328	0.391	0.433	0.523	1.000	0.436	0.497	0.501
C24	0.364	0.651	0.389	0.573	0.504	0.493	0.483	0.556	0.473	0.413	0.473	0.395	0.446	0.342	0.411	0.520	0.516	0.387	0.473	0.449	0.508	0.547	0.471	1.000	0.346	0.428
C25	0.368	0.457	0.472	0.421	0.443	0.334	0.490	0.455	0.562	0.478	0.467	0.426	0.516	0.376	0.432	0.509	0.516	0.520	0.449	0.589	0.496	0.441	0.394	0.512	1.000	0.493
C26	0.435	0.480	0.544	0.510	0.368	0.392	0.375	0.426	0.590	0.533	0.422	0.400	0.548	0.518	0.453	0.639	0.474	0.538	0.363	0.506	0.516	0.398	0.370	0.402	0.513	1.000

Table A.5
Total relation matrix.

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26
C1	0.556	0.540	0.505	0.533	0.522	0.502	0.542	0.526	0.566	0.549	0.519	0.509	0.534	0.545	0.530	0.543	0.514	0.529	0.519	0.559	0.528	0.521	0.508	0.531	0.505	0.555
C2	0.483	0.552	0.489	0.513	0.492	0.480	0.495	0.499	0.534	0.523	0.492	0.471	0.502	0.515	0.503	0.512	0.496	0.492	0.469	0.527	0.513	0.495	0.487	0.500	0.482	0.511
C3	0.478	0.499	0.530	0.497	0.489	0.475	0.507	0.500	0.525	0.504	0.503	0.482	0.492	0.520	0.497	0.509	0.495	0.491	0.492	0.516	0.511	0.491	0.479	0.500	0.478	0.514
C4	0.512	0.528	0.510	0.566	0.501	0.500	0.526	0.514	0.558	0.536	0.510	0.512	0.517	0.535	0.519	0.533	0.503	0.515	0.496	0.540	0.540	0.514	0.504	0.514	0.504	0.542
C5	0.508	0.542	0.502	0.537	0.556	0.512	0.542	0.527	0.566	0.540	0.522	0.506	0.526	0.538	0.518	0.529	0.515	0.522	0.500	0.557	0.542	0.522	0.500	0.520	0.500	0.545
C6	0.486	0.512	0.493	0.504	0.495	0.521	0.502	0.502	0.528	0.497	0.493	0.471	0.503	0.519	0.491	0.521	0.493	0.488	0.481	0.519	0.513	0.497	0.488	0.484	0.490	0.505
C7	0.488	0.516	0.501	0.509	0.502	0.489	0.551	0.503	0.532	0.512	0.500	0.487	0.504	0.529	0.506	0.513	0.496	0.499	0.489	0.534	0.515	0.501	0.489	0.509	0.488	0.517
C8	0.512	0.526	0.490	0.519	0.504	0.485	0.525	0.554	0.548	0.543	0.506	0.494	0.521	0.537	0.520	0.513	0.502	0.500	0.503	0.544	0.525	0.514	0.493	0.515	0.504	0.531
C9	0.477	0.507	0.487	0.496	0.483	0.465	0.491	0.495	0.562	0.508	0.499	0.475	0.491	0.511	0.492	0.490	0.486	0.481	0.472	0.511	0.510	0.492	0.480	0.486	0.476	0.499
C10	0.495	0.532	0.504	0.521	0.497	0.486	0.515	0.505	0.541	0.568	0.509	0.492	0.511	0.531	0.516	0.523	0.495	0.496	0.482	0.537	0.534	0.499	0.497	0.518	0.493	0.532
C11	0.482	0.514	0.486	0.510	0.493	0.485	0.506	0.500	0.531	0.524	0.541	0.485	0.504	0.540	0.503	0.508	0.510	0.493	0.482	0.515	0.520	0.498	0.486	0.500	0.483	0.524
C12	0.539	0.572	0.540	0.556	0.539	0.528	0.562	0.553	0.586	0.564	0.554	0.571	0.560	0.574	0.548	0.561	0.544	0.548	0.531	0.585	0.569	0.540	0.527	0.550	0.531	0.563
C13	0.501	0.526	0.490	0.512	0.508	0.496	0.510	0.512	0.539	0.532	0.503	0.497	0.554	0.529	0.512	0.519	0.509	0.508	0.489	0.541	0.522	0.508	0.482	0.518	0.492	0.530
C14	0.523	0.550	0.532	0.546	0.516	0.508	0.539	0.523	0.564	0.563	0.528	0.525	0.531	0.592	0.540	0.541	0.531	0.525	0.507	0.559	0.541	0.527	0.523	0.538	0.515	0.556
C15	0.524	0.542	0.517	0.529	0.529	0.501	0.525	0.525	0.574	0.551	0.526	0.510	0.534	0.553	0.569	0.533	0.531	0.528	0.504	0.555	0.538	0.519	0.507	0.532	0.507	0.548
C16	0.514	0.525	0.510	0.519	0.506	0.500	0.516	0.511	0.553	0.537	0.514	0.492	0.519	0.531	0.514	0.565	0.515	0.517	0.502	0.536	0.531	0.508	0.493	0.501	0.494	0.531
C17	0.504	0.521	0.502	0.530	0.508	0.501	0.518	0.504	0.552	0.544	0.504	0.500	0.519	0.542	0.517	0.520	0.551	0.514	0.488	0.550	0.536	0.507	0.496	0.520	0.504	0.531
C18	0.512	0.535	0.518	0.532	0.513	0.497	0.529	0.516	0.553	0.552	0.528	0.508	0.517	0.539	0.513	0.528	0.510	0.558	0.501	0.547	0.537	0.514	0.508	0.513	0.506	0.546
C19	0.492	0.521	0.492	0.514	0.494	0.491	0.516	0.506	0.536	0.529	0.505	0.493	0.513	0.514	0.501	0.521	0.496	0.511	0.528	0.529	0.517	0.491	0.484	0.513	0.481	0.517
C20	0.495	0.520	0.502	0.508	0.502	0.484	0.511	0.508	0.532	0.524	0.498	0.496	0.510	0.533	0.514	0.521	0.496	0.503	0.497	0.573	0.513	0.500	0.490	0.509	0.488	0.534
C21	0.509	0.526	0.518	0.537	0.509	0.510	0.529	0.523	0.541	0.534	0.516	0.498	0.516	0.539	0.532	0.528	0.517	0.505	0.500	0.553	0.575	0.519	0.505	0.525	0.501	0.539
C22	0.478	0.493	0.475	0.495	0.480	0.472	0.485	0.495	0.514	0.500	0.487	0.463	0.483	0.501	0.490	0.488	0.480	0.498	0.457	0.515	0.507	0.524	0.463	0.482	0.461	0.495
C23	0.459	0.492	0.471	0.481	0.462	0.455	0.478	0.482	0.494	0.491	0.467	0.458	0.481	0.486	0.472	0.489	0.463	0.472	0.449	0.494	0.487	0.477	0.502	0.474	0.464	0.495
C24	0.489	0.535	0.493	0.524	0.503	0.492	0.515	0.515	0.539	0.521	0.506	0.486	0.509	0.516	0.505	0.522	0.507	0.498	0.490	0.531	0.525	0.510	0.492	0.549	0.483	0.521
C25	0.490	0.521	0.501	0.513	0.500	0.480	0.516	0.508	0.547	0.528	0.506	0.490	0.515	0.520	0.507	0.522	0.508	0.510	0.489	0.544	0.525	0.503	0.487	0.513	0.534	0.528
C26	0.500	0.527	0.511	0.524	0.498	0.489	0.511	0.510	0.554	0.537	0.507	0.492	0.522	0.536	0.513	0.536	0.509	0.515	0.487	0.541	0.531	0.503	0.489	0.508	0.501	0.571

Table A.6
Reachability matrix.

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26
C1	1	0	0	0	1	0	1	0	1	1	0	0	1	0	1	1	0	1	1	1	0	0	0	1	0	1
C2	0	1	0	1	0	0	0	0	1	1	0	0	0	0	1	1	1	0	0	1	0	0	1	0	0	0
C3	0	0	1	0	0	0	1	1	0	0	1	0	0	1	0	1	1	0	1	0	0	0	0	1	0	0
C4	1	0	0	1	0	0	1	0	1	0	0	1	0	0	0	1	0	0	0	0	1	0	1	0	1	1
C5	0	1	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	1	0	1	1	1	0	0	0	1
C6	0	1	1	0	1	1	0	1	0	0	0	0	1	1	0	1	0	0	0	0	0	1	1	0	1	0
C7	0	0	1	0	1	1	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	1	0	0
C8	1	0	0	0	0	0	1	1	1	1	0	0	1	1	1	0	0	0	1	1	0	1	0	0	1	0
C9	0	1	1	0	0	0	0	1	1	0	1	0	0	1	0	0	0	0	0	0	1	1	1	0	0	0
C10	0	1	1	1	0	0	0	0	0	1	1	0	0	1	1	1	0	0	0	1	1	0	1	1	0	1
C11	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0	1
C12	1	1	0	0	0	0	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	0	0	0	0
C13	0	1	0	0	1	1	0	1	0	1	0	1	1	0	0	0	1	0	0	1	0	1	0	1	0	1
C14	1	1	1	1	0	0	1	0	0	1	0	1	0	1	1	0	1	0	0	0	0	0	1	1	0	1
C15	1	0	0	0	1	0	0	0	1	1	0	0	1	1	1	0	1	1	0	0	0	0	0	1	0	1
C16	1	0	1	0	0	1	0	0	1	1	1	0	1	0	0	1	1	1	1	0	1	0	0	0	0	0
C17	0	0	0	1	0	1	0	0	1	1	0	0	0	1	0	0	1	1	0	1	1	0	0	1	1	0
C18	1	0	1	1	0	0	1	0	1	1	1	1	0	0	0	0	0	1	0	0	1	0	1	0	1	1
C19	0	1	0	0	0	1	1	0	0	1	1	1	1	0	0	1	0	1	1	0	0	0	0	1	0	0
C20	0	0	1	0	1	0	0	0	0	0	0	1	0	1	1	1	0	0	1	1	0	0	0	0	0	1
C21	0	0	1	1	0	1	1	1	0	0	0	0	0	0	1	0	1	0	0	1	1	1	0	1	0	1
C22	0	0	0	0	0	1	0	1	0	0	1	0	0	0	1	0	0	1	0	1	1	1	0	0	0	0
C23	0	1	1	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	1	1	0	1	1
C24	0	1	0	1	1	1	0	1	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1	0	0
C25	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	1	1	1	0	1	1	0	0	1	1	1
C26	0	0	1	1	0	0	0	0	1	1	0	0	1	1	0	1	0	1	0	1	1	0	0	0	1	1

Table A.7
Intersection set with driving power.

C1	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	C15	C16	0	C18	0	0	0	0	0	0	0	0	4
C2	0	C2	0	0	0	0	0	0	C9	C10	0	0	0	0	0	0	0	0	0	0	0	0	C23	0	0	0	**4**
C3	0	0	C3	0	0	0	C7	0	0	0	0	0	0	C14	0	C16	0	0	0	0	0	0	0	0	0	0	**4**
C4	0	0	0	C4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C21	0	0	0	0	C26	**3**
C5	0	0	0	0	C5	C6	C7	0	0	0	0	0	0	0	0	0	0	0	0	C20	0	0	0	0	0	0	**4**
C6	0	0	0	0	C5	C6	0	0	0	0	0	0	C13	0	0	C16	0	0	0	0	0	C22	0	0	0	0	**5**
C7	0	0	C3	0	C5	0	C7	0	0	0	0	0	0	C14	0	0	0	0	C19	0	0	0	0	0	0	0	**5**
C8	0	0	0	0	0	0	0	C8	C9	0	0	0	C13	0	0	0	0	0	0	0	0	C22	0	0	0	0	**4**
C9	0	C2	0	0	0	0	0	C8	C9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**
C10	0	C2	0	0	0	0	0	0	0	C10	C11	0	0	C14	C15	C16	0	0	0	0	0	0	0	0	0	C26	**7**
C11	0	0	0	0	0	0	0	0	0	C10	C11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
C12	0	0	0	0	0	0	0	0	0	0	0	C12	C13	C14	0	0	0	C18	C19	C20	0	0	0	0	0	0	**6**
C13	0	0	0	0	0	C6	0	C8	0	0	0	C12	C13	0	0	0	0	0	0	0	0	0	0	0	0	C26	**5**
C14	0	0	C3	0	0	0	C7	0	0	C10	0	C12	0	C14	C15	0	C17	0	0	0	0	0	0	0	0	C26	**8**
C15	C1	0	0	0	0	0	0	0	0	C10	0	0	0	C14	C15	0	0	0	0	0	0	0	0	0	0	0	**4**
C16	C1	0	C3	0	0	C6	0	0	0	C10	0	0	0	0	0	C16	0	0	C19	0	0	0	0	0	0	0	**6**
C17	0	0	0	0	0	0	0	0	0	0	0	0	0	C14	0	0	C17	0	0	0	C21	0	0	C24	C25	0	**5**
C18	C1	0	0	0	0	0	0	0	0	0	0	C12	0	0	0	0	0	C18	0	0	0	0	0	0	C25	C26	**5**
C19	0	0	0	0	0	0	C7	0	0	0	0	C12	0	0	0	C16	0	0	C19	0	0	0	0	0	0	0	**4**
C20	0	0	0	0	C5	0	0	0	0	0	0	C12	0	0	0	0	0	0	0	C20	0	0	0	0	0	C26	**4**
C21	0	0	0	C4	0	0	0	0	0	0	0	0	0	0	0	0	C17	0	0	0	C21	C22	0	C24	0	C26	**6**
C22	0	0	0	0	0	C6	0	C8	0	0	0	0	0	0	0	0	0	0	0	0	C21	C22	0	0	0	0	**4**
C23	0	C2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C23	0	0	0	**2**
C24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C17	0	0	0	C21	0	0	C24	0	0	**3**
C25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C17	C18	0	0	0	0	0	0	C25	C26	**4**
C26	0	0	0	C4	0	0	0	0	0	0	0	0	C13	C14	0	0	0	0	0	C20	C21	0	0	0	C25	C26	**7**

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