# 國 立 中 央 大 學

## 企 業 管 理 研 究 所
## 博 士 論 文

# 企業社會責任決策及成本評估之整合方法與其在服務業之應用

**Corporate Social Responsibility decisions and costs evaluation-an integrated model and applications in the service industry**

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# 論 文 摘 要

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# 摘　要

雖然企業社會責任(Corporate Social Responsibility, CSR)的觀念在西方世界相當普遍, 但它也是最近幾年才逐漸受到亞洲企業的重視。許多企業選擇使用 Plan-Do-Check-Act（PDCA）管理循環方法作為選擇企業社會責任方案的決策工具, 而且也做了許多改善社會與環境的活動,然而,這些努力並沒有得到應有的效果。 最主要的原因是,現行使用 PDCA 管理循環方法來選擇企業社會責任的方案有四個錯誤的前提: 一為 PDCA 管理循環方法在選擇企業社會責任方案時, 主要是以主觀地透過界定企業的重要相關當事人來決定何種方案適合並予以執行; 二為此方法假定企業社會責任方案之間並無相互依存關係; 三為企業社會責任方案的資源是無限的; 四為缺乏企業社會責任方案的成本評估。 事實上,選擇最適的企業社會責任方案是相當困難的一件事,尤其要選擇企業社會責任方案時會受到許多因素的影響。例如對社會是否有利益,與企業的目標是否吻合,企業社會責任方案之間是否有相互依存關係,企業社會責任方案使用的資源是否有限等都會影響最適的企業社會責任方案的選擇。如果不把這些因素考慮進去, 所做出的決策恐怕只是燒錢卻無法對企業或社會做出最適的決定。

本論文企圖提出一個整合方法的模型來解決企業社會責任方案的選擇決策與成本評估問題。此整合方法結合了決策實驗室分析法(DEMATEL)，分析網路程序法(ANP), 與 0-1 整數目標規劃法(ZOGP)等方法在有限制的資源使用與有限成本下選擇

最適的企業社會責任方案。並進一步利用作業成本制(ABC)的正確成本優勢對選擇後的企業社會責任方案做成本評估。由於服務業中成本對航空業是非常重要的議題,再加上旅館業又在企業社會責任方面落後其他的觀光部門,因此本研究進而將此模型應用到台灣的一家航空公司與一家國際觀光飯店中,以呈現此模型在個案上的應用。

本文的結果顯示,包括附近交通安全暢通、聘僱無歧視、滿意的旅遊資訊提供、相關當事人滿意度提升、使用健康與當地的標章食材以及兒童福利義賣捐款與慈善奉獻等方案是目標國際觀光飯店的最適企業社會責任方案。而燃料與資源的效率性提高、運輸與服務過程安全設計、財務透明、社區自願性服務、捐款與慈善奉獻以及重視消費者權益等方案則是目標航空業的最適企業社會責任。這樣的整合模型可以提供企業於企業社會責任方案的選擇決策與成本評估時之一種科學性與適切性的方法,並可以在不同的文化與不同的當地需求下,來同時考慮企業的競爭優勢與社會福利,以便做出最合適的決策。

# Abstract

Corporate social responsibility (CSR) has become increasingly popular in the West and recently is receiving more attention by corporations in Asia. Many corporations have already chosen the Plan-Do-Check-Action (PDCA) approach to make decisions of CSR programs selection or done much to improve the social and environmental performances, yet these efforts have not been nearly as productive as they could be. Meanwhile, the prevailing methods applied by many companies for selecting CSR programs have four erroneous prerequisites: (1) To select CSR programs is only subjectively through identifying stakeholders' relation; (2) CSR programs have no interdependent relationships; (3) Resources are unlimited; (4) It is lack of the cost information of CSR programs for CSR performance evaluation. To select the best CSR programs is difficult because there are lots of multiple factors such as social benefit, corporate goals, interdependency, limited availability of CSR resources, etc., in the CSR candidates. Namely, to determine a program without considering the above factors bring about money drain in organizations. Hence, it has substantial meanings to develop an integrated model and scientific techniques to solve the decisions of CSR selection problem.

The integrated model is combined the Decision Making Trial and Evaluation

Laboratory (DEMATEL), the Analytic Network Process (ANP) and the Zero-One Goal Programming (ZOGP) methods to make optimal choice of CSR programs under limited resources and costs. It is then integrated the Activity-Based Costing (ABC) approach to assess costs of foregoing chosen programs. Since the cost is a major concerned issue for aviation businesses and the hotel industry is lagging behind other travel sectors in social responsibility tourism, both of an international tourist hotel and an airline company cases are presented to demonstrate the implementation of the proposed hybrid model.

The result shows that programs such as safety and smooth neighboring traffic improvement, non discrimination hire plan, satisfactory tourism information, stakeholders' satisfaction, healthy and certified local food supply, and charitable and philanthropic offerings for children are optimal choices for the target hotel; and fuel efficiency, safety design in transportation and service process, financial transparency, community voluntary work support, charitable and philanthropic offerings; taking account of consumer interests and rights, for the target airline company. The effective and appropriate selecting decision and costs evaluation for CSR programs attribute acquired by applying the integrated model enables corporations to achieve social benefits and corporate goals under different culture and local needs.

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# CHAPTER 1

# Introduction

## 1.1 Motivation

Corporate Social Responsibility (CSR) recently became the focus of attention after the scandals of Enron, WorldCom, Parmalat. CSR calls for corporations to take their social responsibilities as seriously as they pursue their economic objectives, and this applies to the service industries such as airline companies and international tourist hotels as to any other. Since aviation is an intensive industry in terms of both capital and labor, how to select CSR programs can influence on large levels including its image, finance, and human resources, etc. Recently, the crude oil prices are major concerned issues for aviation businesses. High fuel costs have forced major carriers to increase their ticket prices, an action that most airlines have tried to avoid (Abdelghanya et al., 2005). In addition, to improve fuel efficiency also can limit $CO_2$ emissions for environmental responsibility. Since a lot of airline companies put fuel efficiency to be a necessary company goal and an obligate CSR program, it has become a focal point to estimate the success of fuel efficiency. In order to fulfill the fuel efficiency goal and simultaneously choose optimal CSR programs, airlines companies cannot but understand the interactive relationship among CSR programs and put it into a prerequisite when making CSR program selection

decisions. They also need to know how much costs put into selected CSR programs so that they can make assessments of them further. In addition, international tourist hotels have become adept at holding themselves to account for the social responsibilities of their activities. However, Roner (2006) indicated that hotel industries are still lag behind other travel sectors in responsible tourism. More specifically, under the limited resources and increasing material prices, how to select optimal CSR programs and to evaluate their costs becomes a crucial problem for the above two service industries, especially in a global severe competitive market.

Traditional CSR thought that society and business are independent and corporate social benefit action is beyond the firm's interests and the law. However, Porter and Kramer (2006) indicated that the prevailing approaches to CSR are so fragmented and so disconnected from business and strategy as to obscure many of the greatest opportunities for companies to benefit society. If, instead, corporations were to analyze their prospects for social responsibility using the same frameworks that guide their core business choices, they would discover that CSR can be a source of competitive advantage. Porter and Kramer thought that business is not against society so that one cannot put CSR in generic ways instead of in the way most appropriate to each firm's strategy. Actually, the four components in CSR, economic, legal, ethical and philanthropic responsibilities (Carroll, 1996), can be viewed as a process that by which managers identify and accommodate the

interests of those affected by their organization's actions. Therefore, the decision to select optimal CSR programs is not whether a cause is worthy but whether it presents an opportunity to create benefit for society and simultaneously also valuable to business.

Many companies have already chosen the Plan-Do-Check-Act (PDCA) Cycle approach to select traditional or strategic CSR programs or done much to improve the social and environmental performances, yet these efforts have not been nearly as productive as they could be. To select the best CSR programs is difficult because there are lots of multiple factors such as social benefit, corporate goals, interdependency between criteria, limited availability of CSR resources, etc., in the candidate CSR programs. When we carried out some CSR programs, there exists a great amount of sharing of consultant, software, hardware and human resources among various CSR applications. Moreover, CSR programs might repeat the corporate goal or dispute over each other's resources. For instance, investments in the stakeholders' satisfaction program can be shared among several CSR programs. If the various interdependent factors among the CSR programs are not considered, the CSR programs selection decision will result in a poor allocation of resources. Namely, to make CSR programs selection without considering the above factors bring about money drain in organizations.

## 1.2 Research purposes

Since the resource and costs are limited in all industries, the aim of this paper is to offer a suitable integrated method to select optimal CSR programs for firms simultaneously valuable to competitive advantage of business and benefit to society. We also aim to illustrate how this hybrid approach can be applied to an airline company and an international tourist hotel in Taiwan.

The proposed integrated model avoids shortcomings of the prevailing method (such as PDCA Cycle) that has four erroneous prerequisites: (1) To select CSR programs is only subjectively through identifying stakeholders' relation; (2) CSR programs have no interdependent relationships; (3) Resources are unlimited; (4) It is lack of the cost information of CSR programs for CSR performance evaluation. This paper has three objectives. First, in order to provide an effective and appropriate CSR programs selection method, this study integrates the Decision Making Trial and Evaluation Laboratory (DEMATEL), the Analytic Network Process (ANP) and the Zero-One Goal Programming (ZOGP) methods to make best choice of CSR programs under limited resources and costs. Second, this paper then combines Activity-Based Costing (ABC) approach to assess costs of foregoing chosen programs for CSR programs' costs evaluation. Third, it uses two case studies to demonstrate how to use this hybrid model to choose CSR programs and two

numerical examples to evaluate programs' costs in the airline and the international tourist hotel. This model allows managers to make optimal CSR programs selection decisions and estimate accurate cost information of CSR programs.

## 1.3 Thesis structure

The rest of this paper is organized as follows.

In chapter 2, this study reviews the concepts of CSR in pertinent literatures, and also the practices in tourism and airline industries, particularly those about CSR selection cases. Besides, the limitations of the prevailing CSR programs selection methods- PDCA Cycle are presented.

In chapter 3, this paper provides a new integrated model, combining the DEMATEL, the ANP, the ZOGP, and the ABC approaches for CSR programs selection and costs evaluation. This study then introduces the methods of the DEMATEL, the ANP, the ZOGP and the ABC. The DEMATEL method helps this model to figure out the inter-relations between CSR's criteria. The inter-relations between criteria by DEMATEL are intake into the ANP calculation. Then the weight of each CSR programs acquired by the ANP result are put into the mathematical zero-one goal programming approach to explore the optimal CSR programs. Additionally, the ABC approach is introduced and

combined to the model to contribute for the accurate costs assessments.

In Chapter 4, this study takes the airline company for example to illustrate how to select optimal candidates of CSR programs and how to acquire CSR's cost information by application of this integrated model.

In Chapter 5, this paper demonstrates how to apply this model to the international tourist hotel in Taiwan to choose optimal CSR programs for corporations' competitive advantage and social benefit.

Chapter 6 is conclusion and research limitations. The thesis structure can be shown as Figure 1.

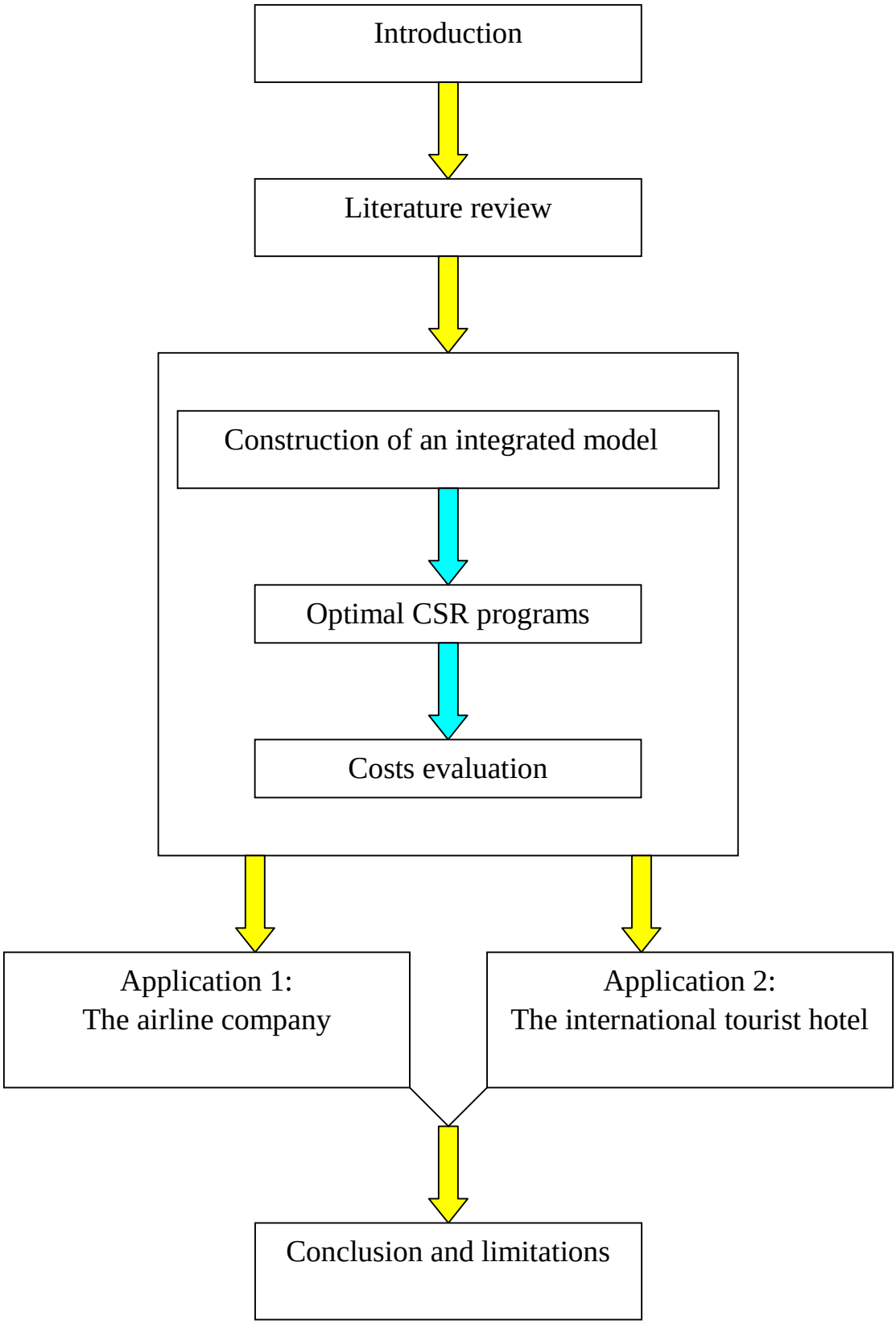



Figure 1 Thesis structure

# CHAPTER 2

# Literature review

## 2.1 Concepts of CSR

This paper uses the definition defined by the World Business Council on Sustainable Development (WBCSD): CSR is the commitment of business to contribute to sustainable economic development, working with employees, their families, the local community and society at large to improve their quality of life (World Business Council on Sustainable Development, 2000). Although some studies noted that the beginning of the academic interest in CSR could ascend to the 1850s (Smith, 2003), it is only recently that it has acquired the position it currently has within teaching and research institutions, non-governmental organizations (NGOs), corporations, governments and agencies (Garriga and Mele, 2004). Cetindamar and Husoy (2007) find that various occurrences have provided evidence for recent trends. For instance, government leaders called for greater ‘‘corporate environmental and social responsibility and accountability’’ in the Johannesburg Declaration and Plan of Implementation of the 2002 World Summit on

Sustainable Development (UN-World Summit on Sustainable Development, 2002, 2003). Similarly, the Commission of the European Communities published a Green Paper, ‘‘Promoting a European Framework for Corporate Social Responsibility,’’ in 2001 (Tencati et al., 2004). Besides, CSR Europe reported that 62% of fund managers and financial analysts have noticed a growing interest in Socially Responsible Investment (SRI) over the past serveral years (CSR Europe, 2003). Ip (2008) pointed out that although CSR awareness in Asia is rather low, CSR activities are beginning to be taken more seriously by some Asia corporations than before. Recent development of CSR in Taiwan is an example of such a trend. All these evidences show that CSR is more emphasized than before.

However, CSR research and studies in airline or air transportation industry are rare. Edwin (2006) noted that CSR research requires discussion involving the current emphasis on CSR not only in general also in aviation field specifically. He called for innovations and techniques for aviation industry to fulfill CSR. His study also found that aviation management education in university lacks a discussion of CSR. Besides, concerning about CSR programs, Bird et al. (2007) found that the market is not only

influenced by the independent CSR programs, but also the totality of these programs and that the facets that they value do vary over time. They observed that the US market has valued most firms that satisfied minimum requirements in the areas of providing employment opportunities for minorities and environmental protection but were most proactive in the area of employee-relations. Therefore, to develop a suitable technique for selecting applicable CSR programs under changeable values is very crucial for airline companies. However, there were no related studies of CSR programs selection in airlines or aviation industry.

In addition, CSR research and studies in tourism industries are also rare. Henderson (2007) emphasized that the tourism industry has particular and identifiable CSR duties outside of the business arena due to its relationship with their environments and society in spite of that it's a challenging task to recognize or exercise those CSR obligations from the investigating hotels in the Phuket island after the 2004 Indian Ocean tsunami. Her research also indicated that CSR has a valuable contribution to make tourism industries sustainable. Jones et al. (2006) also noted that CSR in the hospitality industry

has received relatively little attention from academics but the case study suggests a number of fertile grounds for future enquiry and research. They also found that the target hospitality industry has its own approach to CSR and that there are substantial variations in the nature.

Concerning about CSR choice, Porter and Kramer (2006) have indicated that each company should identify the particular set of societal problems that it is best equipped to help resolve and from which it can gain the greatest competitive advantage. Heslin and Ochoa (2008) also provided seven strategic CSR principles with 21 examples and contributed five guidelines for putting strategic CSR into action. For example, Marriott uses the concept of strategic CSR to identify their principle of cultivating needed talent and societal problem in job training for unemployment. The company provides 180 hours of paid classroom and on-the-job training to chronically unemployed job candidates and allows them to begin obtaining the experience needed to enter the rank of Marriott management. The result is both a major benefit to societies and a reduction in Marriott's cost of recruiting employees. Ninety percent of the unemployed in the training program

take jobs with Marriott. Seventy percent of program participants were still working for Marriott after one year of employment. This retention rate is almost 50% better than the hotel industry average for hourly employees (Heslin and Ochoa, 2008; Porter and Kramer, 2006). However, the academia and the business still lack a scientific and objective approach to help to identify what the best strategic CSR programs are for international hotels by taking account of different cultures and local needs.

Husted and Allen (2007) provide a comparison of three kinds of CSR concepts when they studied the value creation effects of CSR in the Spanish context. In order to clarify different concepts of CSR and to observe their shortages and advantage, the comparison of CSR concepts ( Table 1) is adapted from Husted and Allen (2007).

Table 1
A comparison of three different kinds of concepts of CSR*

| Capability | Different CSR approaches | | |
|---|---|---|---|
| | Traditional CSR | Responsive CSR | Strategic CSR |
| Technical shortage | Decision usually made only by top manager subjectively and lack of scientific decision approaches | Decision sometimes made by CSR manager or groups but lack of scientific decision approaches | Decision sometimes made by CSR manager or groups but lack of scientific decision approaches |
| Resources limitation | No restriction in resource | limited in capturing firm's value added and social benefit | limited in capturing firm's advantage and social benefit |
| Visibility | Irrelevant: Doing good is its own reward - and is profitable in the long run | Building customer and stakeholder awareness of products with CSR value added | Building customer and stakeholder awareness of products with differentiate advantage from CSR |
| Appropriability | Irrelevant: Doing good is its own reward - and is profitable in the long run | Manage stakeholder relations to mitigate existing or future harm from firm's value chain activities | Manage stakeholder relations to capture competitive advantage for the firm |
| Voluntarism | Participate in social action beyond that demanded by the firm's intersts and the law | Participate in social action beyond that demanded by the law | Participate in social action beyond that demanded by the law but also for the firm's competitive advantage |
| Centrality | Irrelevant: Doing good is tied to social need and not to core business mission | Create value via product/service innovation linked to social issues | Create value and differentiate advantage via product/service innovation linked to social issues |
| Proactivity | Anticipate change in social issues | Anticipate change in social issues | Anticipate change in social issues that bring firm competitive advantage |

*Note: some parts are adapted from Bryan et al., 2007.

The three kinds of CSR concept and strategy are introduced as follows.

1. Traditional CSR:

The traditional CSR method makes choice decision only subjectively by the top manager and still lack of scientific methods to make selection of CSR programs decision. The concepts of traditional CSR include: (1) Doing good is its own reward and is profitable in the long term; (2) Benefit society is not related with the firm's core business mission or vision; (3) Social benefit action is beyond the demand of the firm's interest and the law; (4) No limitation is to restrict the resource of CSR programs; (5) Anticipate change in the social issues. But, the shortage of traditional CSR is that no business can solve all of society's problems or bear the cost of doing so. Instead, each company should understand that resources are limited not only for its business but also for its CSR issues.

2. Responsive CSR:

The concepts of responsive CSR include: (1) Build customer and stakeholder awareness of product with CSR value added; (2) Manage stakeholder relations to mitigate existing or future harm arising from firms' value chain activities; (3) Social benefit action is beyond the demand of the law; (4) Anticipate change in the social issues. Responsive CSR comprises two elements: acting as a good corporate citizen, and mitigating the adverse effects from business activities. Companies applied responsive CSR might gain an edge, but any advantage is likely to be temporary due to lack of creating differentiate

advantage for companies.

3. Strategic CSR:

Porter and Kramer (2006) provided this concept for the shortage of the traditional and responsive CSR approaches that neglect combining the firm's competitive advantage to society benefit activities when selecting CSR practices. They provide the map of firm's value chain and competitive advantage to cope with the CSR selection problem. However, the strategic CSR is still lack of scientific and objective approaches to make CSR programs choice decision. The concept include: (1) Building customer and stakeholder awareness of product with firms' competitive advantage and societal benefit from CSR; (2) Manage stakeholder relations to capture competitive advantage for the firm; (3) Social benefit action is beyond the demand of the law but also for the firm's competitive advantage; (4) Resources for CSR programs are limited; (5) Anticipate change in the social issues that bring the firm's competitive advantage and social benefit. This concept stresses that companies should focus on the social fields which can bring societal benefit and also give firms differentiate advantages. Due to limited resources, if companies can select social issues that intersect with its particular business and leave other social agendas to those companies in other industries, NGOs, or government institutions that are better positioned to address them, corporations and society will both benefit from CSR.

## 2.2 PDCA Cycle

Internationally recognized standards such as ISO 9001 and 14001 provide best practice through a structured Plan-Do-Check-Act (PDCA) approach to risk management. The prevailing CSR method- PDCA Cycle is applied by many corporations with ISO standards adopted such as TOSHIBA, ACER, SONY, and COCA-COLA companies, etc.

The concept of the PDCA Cycle was originally developed by Walter Shewhart, the pioneering statistician who developed statistical process control in the Bell laboratories in the US during the 1930's (Shewhart, 1986). It is often referred to as 'the Shewhart Cycle'. It was taken up and promoted very effectively from the 1950s on by the famous Quality Management authority, W. Edwards Deming, and is consequently known by many as 'the Deming Wheel' (Deming, 1986). The PDCA Cycle is a checklist of the four stages which one can go through to get from 'problem-faced' to 'problem solved'. The four stages are Plan-Do-Check-Act, and they are carried out in the cycle illustrated in Figure 2. The procedures of the PDCA cycle for CSR selection method include: (1) Establishment of CSR vision; (2) Planning: identify stakeholder relations, CSR programs and choose key performance indicator; (3) Do: implement CSR activities and coordinate with the firm's present operation and management system; (4) Check: evaluate CSR performance and check whether the changes are achieving the desired result or not (5) Action: implement changes on a larger scale if the experiment is successful. This means making the changes a routine part of the firm's activity. If the firm have completed the cycle to arrive at

‘problem solved’. Go back to the ‘Plan’ stage to identify the next ‘problem faced’. If the experiment was not successful, skip the ‘Act’ stage and go back to the ‘Plan’ stage to come up with some new ideas for solving the problem and go through the cycle again.

There are three limitations in the PDCA Cycle as follows:

(1) When companies practice the ‘Plan’ procedure of PDCA Cycle, they subjectively choose CSR programs through mainly identifying relation between stakeholders instead of using a scientific method.

(2) When companies practice the ‘Do’ procedure of PDCA Cycle, they don’t consider about the inter-relationship between CSR activities. Those criteria of CSR activities might influence the decision of selecting CSR programs. If firms wouldn’t set the interdependency a premise, they might ‘do’ the wrong CSR implementation.

(3) The ‘Check’ procedure of PDCA Cycle lacks of the cost information of CSR activities for CSR performance and management evaluation.

(4) The ‘Act’ procedure of PDCA Cycle wastes times and money when the chosen CSR programs are not suitable and needed to be re-plan.

Hence, it is urgent to provide scientific methods of CSR selecting decisions and costs evaluation for CSR companies.


Figure 2 The PDCA cycle method

## 2.3 Costs evaluation of CSR programs

As Husted and Allen (2007) noted that just as all market-based projects do not create value, not all CSR programs will create value for the firm. Many CSR projects, in fact, increase costs, and although they may be positively evaluated by different stakeholder groups. This reveals that the costs evaluation of chosen CSR programs is important for those cost-sensitive industries. Husted and Allen (2007) also provided an example for explanation. The Body Shop is frequently cited as a classic case of joining products and CSR. Unfortunately, The Body Shop also found that CSR could increase costs significantly. Intent on maintaining its commitment to a broad range of local suppliers, manufacturing

costs skyrocketed, and as other firms copied its products and outsourced to Asia, profits of The Body Shop plummeted. Finally, The Body Shop company was forced to bring in management willing to put profit before CSR.

Costs evaluation can provide firms' managers to prepare for CSR performance estimations. Raz and Elnathan (1999) pointed out that the ABC approach is a suitable method to estimate projects costs. They also indicated that the linking of activities, cost drivers, and costs information gathered from ABC method allows managers to analyze potential costs change due to changes in activities. Hence, through the costs information of those chosen CSR program, managers can make adjustments of CSR activities.

# CHAPTER 3
# Construction of an integrated model

## 3.1 An integrated model

The multiple dimensional natures of CSR program choice decision call for the requirement an integrated decision making model for corporations. The integrated model is developed for selecting optimal CSR programs and assessing the costs of those chosen optimal CSR programs. At the beginning, experts who own the knowledge of CSR and target industries will be invited to identify CSR program candidates. CSR initiatives collected through literature reviews and through experts' discussion are gathered into CSR candidates' pool for identification. In doing this, experts need to identify CSR candidates not only benefit for society but also for firms' competitive advantage. Firms can not set CSR programs for suddenly philanthropic idea or outside pressure, but for the interests of society and simultaneously for competitive advantage of companies. The expert group first needs to identify which CSR programs can meet the requirements of positively influence society and also fit into the corporate strategic field through discussion.

Next, the integrated model is combined the multi-criteria decision making (MCDM) approach to those above strategic CSR candidates for CSR selecting. There are two purposes to combine the MCDM approach into the integrated model. First,

corporations can not practice every CSR candidate due to their limited resources. Second, corporations need to consider the inter-relations between criteria of CSR activities when they make decisions of CSR selection. The MCDM approach has been applied in service industries. Tsaur et al. (2002) have applied the fuzzy MCDM approach to study the service quality of airline. The MCDM approach here in the integrated model is combines the DEMATEL with the ANP and the ZOGP methods to find an optimal programs choice.

After finding optimal CSR programs and optimal resource inputs, this paper separately apply the ABC approach to calculate each program's costs in order to acquire accurate cost information. This integrated model is shown in Figure 3.

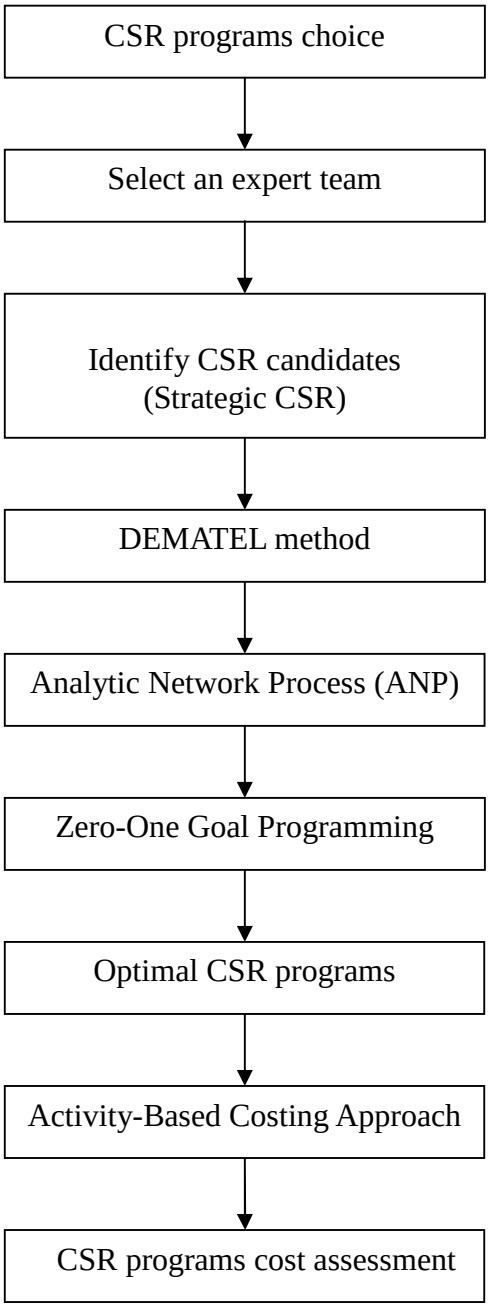



Figure 3 The integrated model of CSR decisions and costs evaluation

## **3.2** Decision Making Trial and Evaluation Laboratory method

Decision Making Trial and Evaluation Laboratory (DEMATEL) method is first introduced by the Battelle Memorial Institute through its Geneva Research Center (Fontela and Gabus, 1976). The original DEMATEL method was aimed at the social opponent and fragmental phenomena and tried to find integrated solutions. Later, researchers found that the DEMATEL method can convert the relationship between the causes and effects of criteria into an intelligible structure. It is an effective procedure for analyzing structure and relationships between components or alternatives. The DEMATEL method has been successfully applied in many fields, such as airline safety problems, marketing strategy, e-learning evaluation, control and safety, and sustainable development management systems (Liou et al., 2007; Chiu, et al., 2006; Tzeng et al., 2007; Hori and Shimizu, 1999; Tsai and Chou, forthcoming). The relationship among CSR criteria and the degree of interdependence are determined from the result of DEMATEL. The steps of DEMATEL method is explained as the following:

1 Extracting factors and investigating binary relations: We extract all the problematique factors and identify the binary relations and strength for finding the causality.

2 To derive the direct-relation matrix: If the problematique is composed of $q$ factors, $q \times q$ matrix $Z$ is obtained by comparing the binary relations and strength. $Z$ is the direct matrix. The element $z_{\alpha\beta}$ of matrix $Z$ denotes the amount of direct influence

from factor $\alpha$ to factor $\beta$. The amount of $z_{\alpha\alpha}$ is zero.

3 To normalize the direct-relation matrix $Z$: The matrix $Z$ is normalized as $Y = \lambda \cdot Z$, by using $\lambda$, we would derive the normalized matrix $Y$ where $\lambda = \frac{1}{\max\limits_{1\le\alpha\le q}(\sum\limits_{\beta=1}^{q} z_{\alpha\beta})}$

4 To derive the total relation (direct/indirect) matrix $T$: It had been proved that $\lim\limits_{\theta\to\infty} Y^{\theta} = O$ and $\lim\limits_{\theta\to\infty}(I + Y + Y^2 + \cdots\cdots + Y^{\theta}) = (I - Y)^{-1}$, where $O$ is the null matrix and $I$ is the identity matrix (Goodman, 1988). The total relation matrix $T$ can be acquired as $T = \lim\limits_{\theta\to\infty}(Y + Y^2 + \cdots\cdots + Y^{\theta}) = Y(I - Y)^{-1}$ (the proof process in Seyed-Hosseini et al., 2006). Matrix $T$ is the direct/indirect matrix. The element $t_{\alpha\beta}$ of matrix $T$ denotes the direct and indirect influence from factor $\alpha$ to factor $\beta$.

5 To obtain causal diagram: Suppose $D_{\alpha}$ represents the row sum of $\alpha^{th}$ row of matrix $T$. It shows the sum of influence dispatching from factor $\alpha$ to the other factors both directly and indirectly. Suppose $R_{\beta}$ denotes the column sum of $\beta^{th}$ column of matrix $T$, then $R_{\beta}$ represents the sum of influence that factor $\beta$ is received from the other factors. The sum of rows and columns ($D_{\alpha} + R_{\beta}$) denotes the index representing the strength of influence of both dispatching and receiving. The value of $D_{\alpha} - R_{\beta}$ indicates severity of influence for each alternative.

For example, assume that

$F=\{B, C, H, E\}$

and, $Z=\begin{array}{c} \\ B \\ C \\ H \\ E \end{array}\begin{array}{c} \begin{array}{cccc} B & C & H & E \end{array} \\ \begin{bmatrix} 0 & 4 & 6 & 0 \\ 1 & 0 & 4 & 0 \\ 0 & 3 & 0 & 2 \\ 4 & 0 & 0 & 0 \end{bmatrix} \end{array}$

$Z$ is initial direct relation weight matrix that determined according expert's knowledge. Therefore, $\lambda$ =1/10, and

$$Y=\begin{bmatrix} 0 & 0.4 & 0.6 & 0 \\ 0.1 & 0 & 0.4 & 0 \\ 0 & 0.3 & 0 & 0.2 \\ 0.4 & 0 & 0 & 0 \end{bmatrix}$$

We can obtain the total relation matrix $T$, and the total sum $D_\alpha$, $R_\beta$ as following:

$$T = Y(I-Y)^{-1}=\begin{array}{c} \\ \\ \\ \\ R_\beta \end{array}\begin{array}{c} \begin{array}{cccc} \end{array} \\ \begin{bmatrix} 0.156 & 0.762 & 0.998 & 0.200 \\ 0.173 & 0.251 & 0.604 & 0.121 \\ 0.145 & 0.436 & 0.261 & 0.252 \\ 0.462 & 0.305 & 0.399 & 0.080 \end{bmatrix} \\ \begin{array}{cccc} 0.936 & 1.754 & 2.263 & 0.653 \end{array} \end{array}\begin{array}{c} D_\alpha \\ 2.116 \\ 1.149 \\ 1.094 \\ 1.246 \\ \end{array}$$

To obtain a map of relationship between alternatives, decision-maker must set a threshold value for the influence level. Only some elements, whose influence level in matrix $T$ are higher than the threshold value, can be chosen and converted into the relationship between alternatives map. The threshold value is decided by the decision-maker or by experts through discussion (Tzeng et al., 2007). The alternatives are arranged in discounting order in terms of values of $D_\alpha + R_\beta$ and $D_\alpha - R_\beta$ in Table 2.

Table 2
The prioritization of criteria (from DEMATEL)

| Order | $D_\alpha$ | Order | $R_\beta$ | Order | $D_\alpha+R_\beta$ | Order | $D_\alpha-R_\beta$ |
|---|---|---|---|---|---|---|---|
| B | 2.116 | H | 2.263 | H | 3.357 | B | 1.180 |
| E | 1.246 | C | 1.754 | B | 3.053 | E | 0.594 |
| C | 1.149 | B | 0.936 | C | 2.903 | C | -0.604 |
| H | 1.094 | E | 0.653 | E | 1.899 | H | -1.169 |

Alternatives having more values of $D_\alpha - R_\beta$ have higher influence to another and are assumed to have higher priority called dispatcher and those having little values of $D_\alpha - R_\beta$ receiving more influence from another are assumed to have lower priority called receiver (Seyed-Hosseini et al., 2006). In similar, the value of $D_\alpha + R_\beta$ indicated degree of relation between each alternative with others and alternatives having more values of $D_\alpha + R_\beta$ have more relationship with another and those having little values of $D_\alpha + R_\beta$ have little relationship with others. Practically, the value of $D_\alpha - R_\beta$ is more effective and applicable than $D_\alpha + R_\beta$ because $D_\alpha - R_\beta$ is a good criterion for alternatives prioritization. As a result, the prioritization of alternatives in terms of $D_\alpha - R_\beta$ is as B>E>C>H. Figure 4 shows the relationship between alternatives according to Table 2. In Figure 4, alternatives B with highest value of $D_\alpha - R_\beta$ is prior to others and called master dispatcher (a dispatcher with one input). Afterward, alternative E with value of $D_\alpha - R_\beta$ is prior to others and so on. Also, alternative H with lowest value of $D_\alpha - R_\beta$ is a master

receiver. Alternative H with highest value of $D_\alpha + R_\beta$ has most relation with others (three input connections and one output connections). In addition, alternative E with lowest value of $D_\alpha + R_\beta$ has lowest relation with others (two output connections).

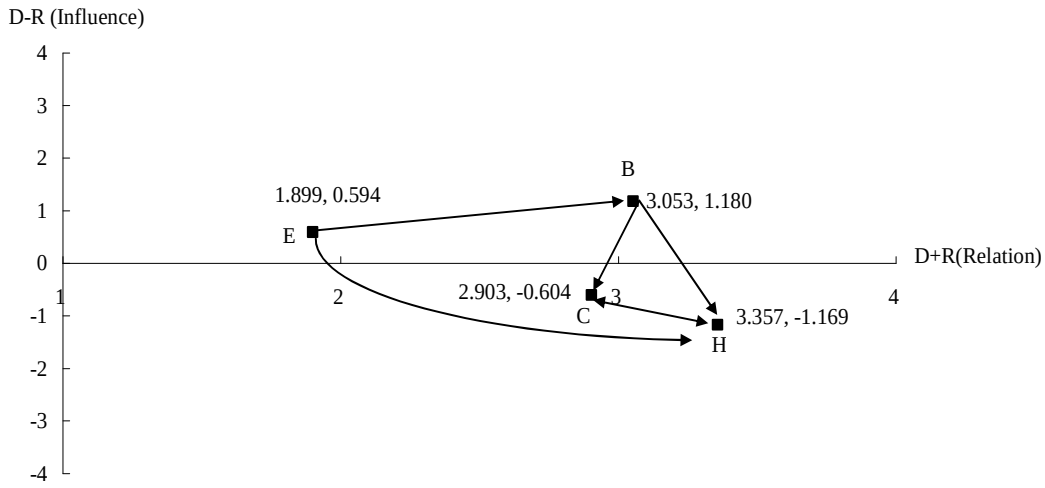



Figure 4 Map of relationship between criteria (DEMATEL)

## 3.3 Analytic Network Process method

Subsequently, we integrate DEMATEL result into Analytic Network Process (ANP) method to obtain the weight of each program. ANP method is a systematic procedure for evoking expert group opinion. To structure a network model for CSR programs selection, the DEMATEL method is a very useful tool for picturing an uncertain framework of a network structure which has interdependent relations among the criteria. Goal Programming (GP) is designed to deal with problems involving multiple conflicting

objectives. But the shortcoming of GP is the lack of a systematic approach to set priorities and trade-off among objectives and criteria (Reza et al., 1988). In order to overcome this problem, ANP is applied to set priorities for objectives and determine trade-off among them (Saaty, 1996).

ANP is an extension of the famous AHP (Analytic Hierarchy Process). Saaty (2001) developed the ANP to build for decisions-ranking priorities without making assumptions of a uni-directional hierarchical relationship among decision levels. Rather than a strict linear top-to-bottom hierarchy, the ANP model provides a loose network structure which represents a real-world decision problem. The relative importance or strength of each effect on a given element is measured on a ratio scale similar to AHP (Shyur, 2003). The major difference between ANP and AHP is that ANP can handle interdependences of higher-level elements from lower-level elements, and the independence of the elements within a level, by obtaining the composite weights through the development of a super-matrix. The super-matrix is a partitioned matrix, where each sub-matrix is composed of a set of relationships between two components or clusters in a connection network structure. Saaty (2001) recommended using ANP to solve the problem of interdependent relationships among the criteria or alternatives.

ANP consists of two stages. The first is constructing of the network. The second is calculating of the priorities of the elements. All of the interactions among the elements should be considered when building the structure of the problem (Karsak et al., 2002).

These interactions are evaluated using pairwise comparisons. A super-matrix is raised to determine the overall priorities, then obtaining the cumulative influence of every element on each other (Saaty and Vargas, 1998). Let $W_{GaCr}$ be a vector that presents the impact of the goal on the criteria, $W_{CrCr}$ is a matrix that represents the impact between each criterion, $W_{CrAl}$ be a matrix that represents the impact of the criteria on each of the alternatives, and $I$ be the identity matrix. Then, the supermatrix of a hierarchy with three levels is showed as following. Let *Ga*=Goal, *Cr*=Criteria, and *Al*=Alternatives, then we can show W as follows:

$$W = \begin{array}{c} \\ Ga \\ Cr \\ Al \end{array} \begin{array}{c} \begin{array}{ccc} Ga & Cr & Al \end{array} \\ \begin{pmatrix} I & 0 & 0 \\ W_{GaCr} & W_{CrCr} & 0 \\ 0 & W_{CrAl} & I \end{pmatrix} \end{array}$$

In order to get the supermatrix, the expert team needs to compare the criteria in whole system to form the supermatrix. This is done through pairwise comparisons by asking how much importance does a criterion have compared with another criterion with respect to our interests or preferences. The relative important value can be determined using a scale of 1 to 9 to represent equal importance to extreme importance (Saaty, 1996). After forming the supermatrix, the weighted supermatrix can be derived by transforming all columns sum to unity exactly, namely, form a stochastic matrix. This matrix means that any column of the limiting power $\lim_{k\to\infty} W^k$ gives the outcome of the cyclic interaction of the alternatives and

the criteria for obtaining the global priority vectors or called weights. Saaty (1990) proposed to utilize the consistency index (*CI*) and consistency ratio (*CR*) to verify the consistency of the comparison matrix. *CI* and *CR* are defined as follows:

$$CI = (\lambda_{\max} - n)/(n-1)$$

$$CR = \frac{CI}{RI}$$

Where $\lambda_{\max}$ is the largest eigenvalue of pairwise comparison matrix, n denotes the numbers of attributes (orders) and *RI* indicates the average consistency index over numerous random entries of the reciprocal matrices with same orders. The RI values from n = 1 to 10 be 0, 0, 0.58, 0.9, 1.12, 1.24, 1.32, 1.41, 1.45 and 1.49. If $CR \leqq 0.1$, the estimate is accepted; otherwise, a new comparison matrix is solicited until $CR \leqq 0.1$. This study applies Super Decision@ 1.6.0 software (Saaty, 2003) to calculate the priorities of CSR programs' alternatives.

## 3.4 Zero-One Goal Programming model

Goal programming was first introduced by Charnes and Cooper (Charnes et al., 1955). Goal programming has been applied in many diverse real-world problems including capital budgeting, labor planning, media planning, and defense management (Reza et al., 1988). The ZOGP model can handle the Multi-Criteria Decision Making (MCDM)

problem and attain the objectives of an organization while considering restricted resources. Therefore, the ZOGP model set priorities by ANP is very useful when make the choice decision of CSR programs under limited resources and constrained situations. The ZOGP model is described as follows.

$$Minimize\ Z = P_l(w_j d_i^+, w_j d_i^-)$$

Subject to: $\sum_j a_{ij} x_{jK} + d_i^- - d_i^+ = b_i$ for $i = 1, 2, \ldots, m$; $j = 1, 2, \ldots, n$;

$K$= indicator of industries; if $K$=$A$ = airline or $K$=$H$ = hotel;

$x_{jK} + d_r^- = 1$ for $r = m+1, m+2, \ldots, m+n$; $j = 1, 2, \ldots, n$;

$d_i^+ \geq 0$, $d_i^- \geq 0$ for $\forall_i$

$x_{jK} = 0$ or 1 for $\forall_j$

Where Z denotes the sum of the deviation from $m$ goals considered; $n$ is the pool of CSR programs from which the optimal programs are selected; $P_l$ represents a preemptive priority ( $P_1 > P_2 > P_3 >>> P_l$ ) for goal $l$; $d_i^+$ and $d_i^-$ are the positive or negative deviation variables for the selection criterion (resource) $i$; $w_j$ represents the ANP mathematical weight on the $j^{th}$ CSR program; $a_{ij}$ is CSR programs parameter $j$ of selection resource $i$; $b_i$ denotes the available resource or limitation factors that must be considered in the selection decision, and $x_j$ represents the binary variable. This paper used the LINGO@ 8.0 software to solve ZOGP problems and obtain the final optimal CSR programs.

## 3.5 Activity-Based Costing approach

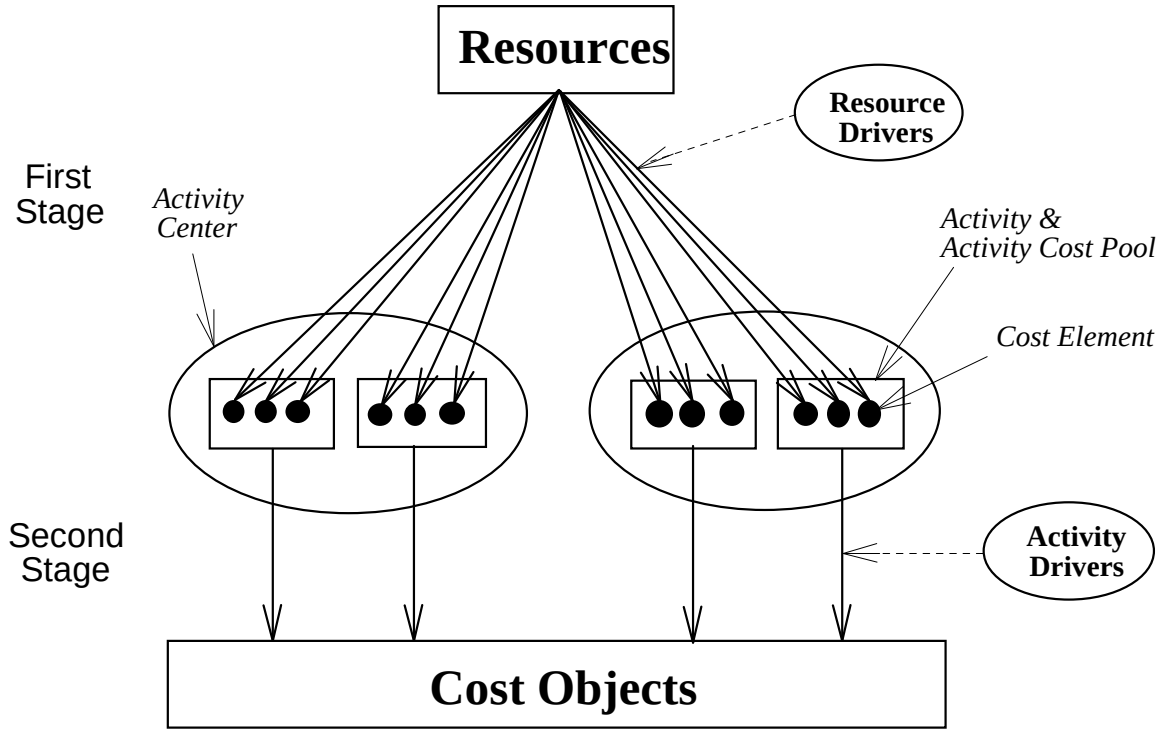
After finding the optimal CSR programs, it is very vital for corporations to evaluate the exact costs of CSR programs under a competitive markets and high fuel costs circumstances. The main advantage of ABC lies in that it provides a more accurate and real cost computation, especially in situations in which objects diversity is important and in which the indirect costs, not directly traceable to the objects, represent an important proportion of the total costs. This advantage is especially suitable for the very different CSR programs because they share resources and indirect costs together. In addition, ABC also allows a deeper level analysis of object costs by explaining the relationship between objects and activities. The improved accuracy of perception of the cost structure of objects and the continuous process improvements in the various departments of an enterprise provide the substance of activity-based management (i.e. using ABC to improve a business) (Turney, 1991).

Studies of the implementation of ABC exist in various fields. For instance, there are researches on application ABC in the service sector such as operation costs of airline industry (Tsai and Kuo, 2004), universities (Cropper and Cook, 2000), a hotel (Noone and Griffin, 1999), library service (Ellis-Newman and Robinson, 1998), distribution logistics (Pirttilä and Hautaniemi, 1995; Themido et al. 2000). In the manufacturing sector, there are studies on a manufacturing company (Spedding and Sun, 1999) and an assembly line

(Gunasekaran and Singh, 1999). Other researches on ABC implementation included a wholesale fish market (Lee and Kao, 2001), a radiotherapy unit (Lievens et al., 2003). The information achieved through ABC cost assignment can be applied for decisions concerning pricing, quoting, product mix (Tsai, 1994), joint products (Tsai, 1996b) quality improvement (Tsai, 1998), outsourcing, product design, profitability analysis, and so on (Turney, 1991). All of them agree that ABC is a useful accounting model and able to obtain more accurate information about the cost structure as long as implementing managers choose the right drivers and define activities well. Raz and Elnathan (1999) applied the ABC approach to estimate projects costs. They noted that the ABC approach, with its focus on activities as the building blocks of the entire projects, and with its definition of various levels of activities as they relate to the deliverables of the projects, is a better approach to projects costing than the traditional one. Traditional cost accounting, which mainly uses direct labor to allocate overhead costs, can systematically distort programs costs in advanced service industries' environments when overhead costs are a significant portion of overall costs. The ABC method promoted by Cooper and Kaplan (1992) provides a more accurate measure of cost because it traces indirect costs more closely with regard to the different types of activities consumed.

The ABC systems focus on the accurate cost assignment of overheads to products. In the cost assignment view, the assignment of costs through ABC occurs in two stages: cost objects (i.e., programs) consume activities, and activities consume resource costs. In

practice, this means that resource costs are assigned to various activity centers by using resource drivers in the first stage. An activity center is composed of a group of related activities, usually defined by function or process. The group of resource drivers is the factor chosen to estimate the consumption of resources by the activities in the activity centers. Every type of resource assigned to an activity center becomes a cost element in an activity cost pool. And, in the second stage, each activity cost is distributed to cost objects (CSR programs) by using a suitable activity driver to measure the consumption of activities by programs (Turney, 1992). Then, the total cost can be calculated by adding the various activities costs to a specific program. The ABC model applied to the CSR programs of the service industry is depicted in Figure 5.




Source: Turney (1991, p.97)

Figure 5 Model of ABC

# CHAPTER 4
# Application 1: The airline company

## 4.1 Profile of the China Airlines

This paper sets the China Airlines for CSR programs selection and costs assessment to be an example. The world-famous Euromoney magazine has ranked China Airlines the top company on "Corporate Governance" among all Taiwanese companies, according to its 2005 poll result and published in its October issue. The China airlines corporation also has won the second session annual CSR award offered by Global View Magazine (Global View Magazine, 2006). This company has good CSR performance in social policy and management system of corporations, transparency of financial reports, fair competition and respecting consumer interests. However, Global View Magazine pointed out that the Taiwanese industries put less effort on participating in social or community voluntary activities than other CSR activities. Besides, CSR scores of the China Airlines in employee-relations, welfare of employees and participating in social voluntary works are lower than hi-technology industries' but higher than average (Wang, 2006). This company also had high Full Loss Equivalent (FLE) ratio (the sum of the proportions of passengers killed for each fatal event) form 1979 to 2002 survey by AirSafe.com[1].

[1]http://www.airsafe.com/events/regions/asia.htm.

Undoubtedly, increasing transportation and service safety is crucial to the future image of the China Airlines company, even though it has passed the internationally recognized operational audit standards by IATA Operational Safety Audit (IOSA). Besides, according to the China Airlines (2007) annual report, the China Airlines annual fuel costs of 2006 had raised 28% than 2005's due to the global crude oil price increasing. The added costs cause this company to consider the fuel efficiency program precedential. All the problems mentioned above drive the China Airlines to rethink what optimal CSR programs should they select and how to assess CSR costs. This study offers a new integrated technique model to solve this problem.

## 4.2 Identify CSR candidates for the airline

We invite 40 experts and got response by 35 experts, who have the knowledge of CSR and the airline industries, from the China airline's managers (3 experts), vice-managers (12 experts) and engineers (20 experts) involved in the CSR programs. The China Airline doesn't make sure whether their original CSR programs from traditional CSR concepts are suitable for their company or not. The expert team designs a questionnaire in which the participants are asked to specify the objectives that the corporation should pursue when allocating resources among CSR programs. In addition, they are also asked to identify CSR candidates for social benefit and corporate advantage. There are ten CSR program

candidates that fit for requirements:

1. Fuel and resources efficiency (FE);
2. Environment protection (EP);
3. Safety design in transportation and service process (STP);
4. Financial transparency (FT);
5. Improvement in employee-relations and welfare of employees (LCR);
6. Community leisure activities (CLA);
7. Community voluntary work support (CVS);
8. Charitable and philanthropic offerings (CPO);
9. Taking account of consumer interests and rights (CIR);
10. Reasonable and fair prices (RFP).

## 4.3 CSR decisions for the airline

The steps of the proposed model are as follows: (1) Select an expert team to conduct the DEMATEL. (2) Use the DEMATEL inquiries to calculate the total relation matrix *T*, the severity of influence for each alternative, *D-R* and the degree of relation between each alternative, *D+R*. (3) Decide the threshold value through the expert team discussion. (4) Utilize the threshold value, *D+R* and *D-R* value from DEMATEL to map a relationship of interdependence among criteria for CSR programs selection. (5) Under the

former interdependence among criteria, use ANP to set priorities among objectives, namely, the priorities of CSR program candidates. The programs should be presented to the participants to obtain expert's subjective value judgments for a pairwise comparison matrix by Saaty's nine scales. (6) Apply the priorities obtained from ANP and resource constrained conditions from the China Airline to formulate a ZOGP model to evaluate considered alternatives. (7) After implementing the chosen CSR programs from above methods, assess the costs of each operating CSR program by ABC approach.

After the DEMATEL inquiry, four criteria are specified. The four criteria include organization image improvements (IM), future growth and development enhancement (GD), human resource management performance increase (HR) and stockholder interests increase (ST). The expert team used a 0-4 scale for making assessments. Once the relationships between those criteria are measured by the expert panel, the initial direct-relation matrix could be obtained (Table 3). Based on the initial direct-relation matrix, the normalized direct-relation matrix is obtained by DEMATEL formula (Table 4). Next, the total-relation matrix *T* and *D*, *R* value (Table 5) are acquired. After deciding the threshold value by experts through discussion, the relationship between alternatives map could be acquired by mapping a dataset of $D + R$ and $D - R$ (Figure 6). In Figure 6, the organization image improvement (IM) criterion with highest value of *D*-*R* is prior to others and called master dispatcher. The raising stockholder interests (ST) criterion with lowest

value of *D-R* is a master receiver. This result presents that the IM criterion is a very important influencing factor to other criteria for pursuing CSR in the airline company. And, the stockholder interests increase (ST) criterion is only affected by other criteria. The future growth and development enhancement (GD) criterion with highest value of *D+R* has most relation with others (three input connections and two output connections).

Table 3
The initial direct-relation matrix of four criteria

| | Organization Image Improvements (IM) | Future Growth and Development Enhancement (GD) | Human Resource Management Performance Increase (HR) | Raising Stockholder Interests (ST) |
|---|---|---|---|---|
| IM | 0 | 4 | 3 | 3 |
| GD | 1 | 0 | 3 | 4 |
| HR | 2 | 2 | 0 | 3 |
| ST | 1 | 3 | 1 | 0 |

Table 4
The normalized direct-relation matrix of four criteria

| | IM | GD | HR | ST |
|---|---|---|---|---|
| IM | 0 | 0.4 | 0.3 | 0.3 |
| GD | 0.1 | 0 | 0.3 | 0.4 |
| HR | 0.2 | 0.2 | 0 | 0.3 |
| ST | 0.1 | 0.3 | 0.1 | 0 |

Table 5
The total-relation matrix *T* and prioritization of four criteria

| | IM | GD | HR | ST | D | ORDER | D+R | ORDER | D-R |
|---|---|---|---|---|---|---|---|---|---|
| IM | 0.379 | 1.043 | 0.835 | 1.082 | 3.339 | GD | 5.608 | IM | 1.825 |
| GD | 0.391 | 0.580 | 0.687 | 0.956 | 2.614 | ST | 5.232 | HR | 0.060 |
| HR | 0.444 | 0.720 | 0.434 | 0.851 | 2.450 | IM | 4.854 | GD | -0.380 |
| ST | 0.300 | 0.650 | 0.433 | 0.480 | 1.863 | HR | 4.839 | ST | -1.506 |
| R | 1.514 | 2.994 | 2.389 | 2.269 | | | | | |

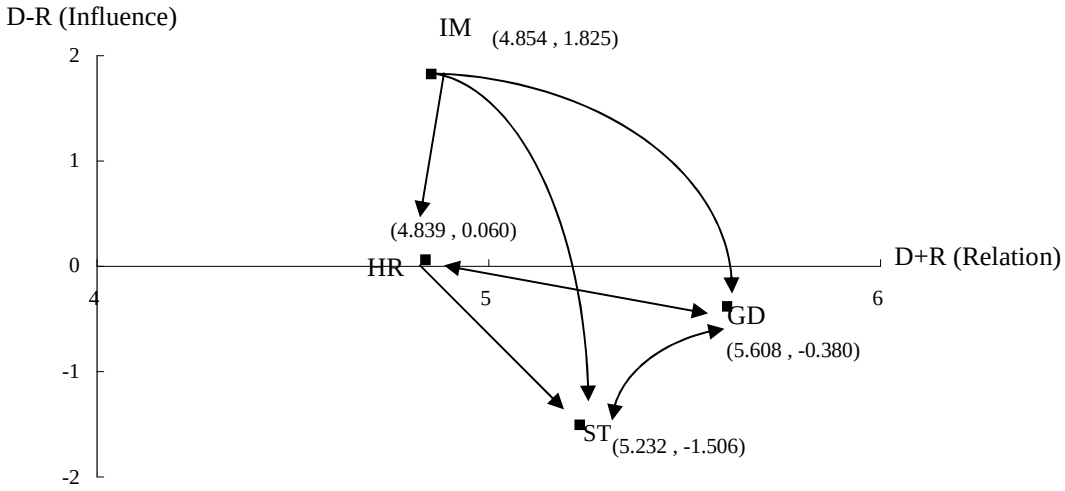



Figure 6 Relationships between four CSR criteria of the airline company

After acquiring the influence and effect relationship of CSR criteria by DEMATEL, ANP was used to set priorities among the ten candidate programs. The interdependence among the four criteria and the hierarchical framework of the ANP is shown in Figure 7. DEMATEL and ANP are combined for decision-making in acquiring CSR program priority weights. The expert group committees were asked to provide their subjective value judgments in the pairwise comparison matrix. The elements of the overall

pairwise comparison matrix were then obtained by the arithmetic average of the corresponding elements and arrived at a final priority through column stochastic as all its columns sum to unity. Saaty's Super Decision[@] are used to find a result of the eigenvalue. In ANP, the unweighted supermatrix and the weighted supermatrix are separately shown in Table 6 and Table 7.

Our final results in the ANP Phase get the priority weights ($w_j$) for each CSR program alternatives as shown in Table 8. All weights in the process of comparisons are acceptable with the consistency ratio CR<0.1. These ANP results are interpreted as follows. The highest weight of criteria in this CSR program selection is program 1 which is fuel and resources efficiency. Next is program 7 which is community voluntary work support. The improvement of employee-relations and welfare of employees (program 5) has the lowest weight. This result shows that the China Airlines CSR experts has tried to think highly of the social participation by community voluntary work support programs, but not to add effort on employee-relations and welfare of employee ones since they thought that CSR scores on the latter program in the service industry are higher than average. These weights $w_j$ will be used as priorities in goal programming formulation.

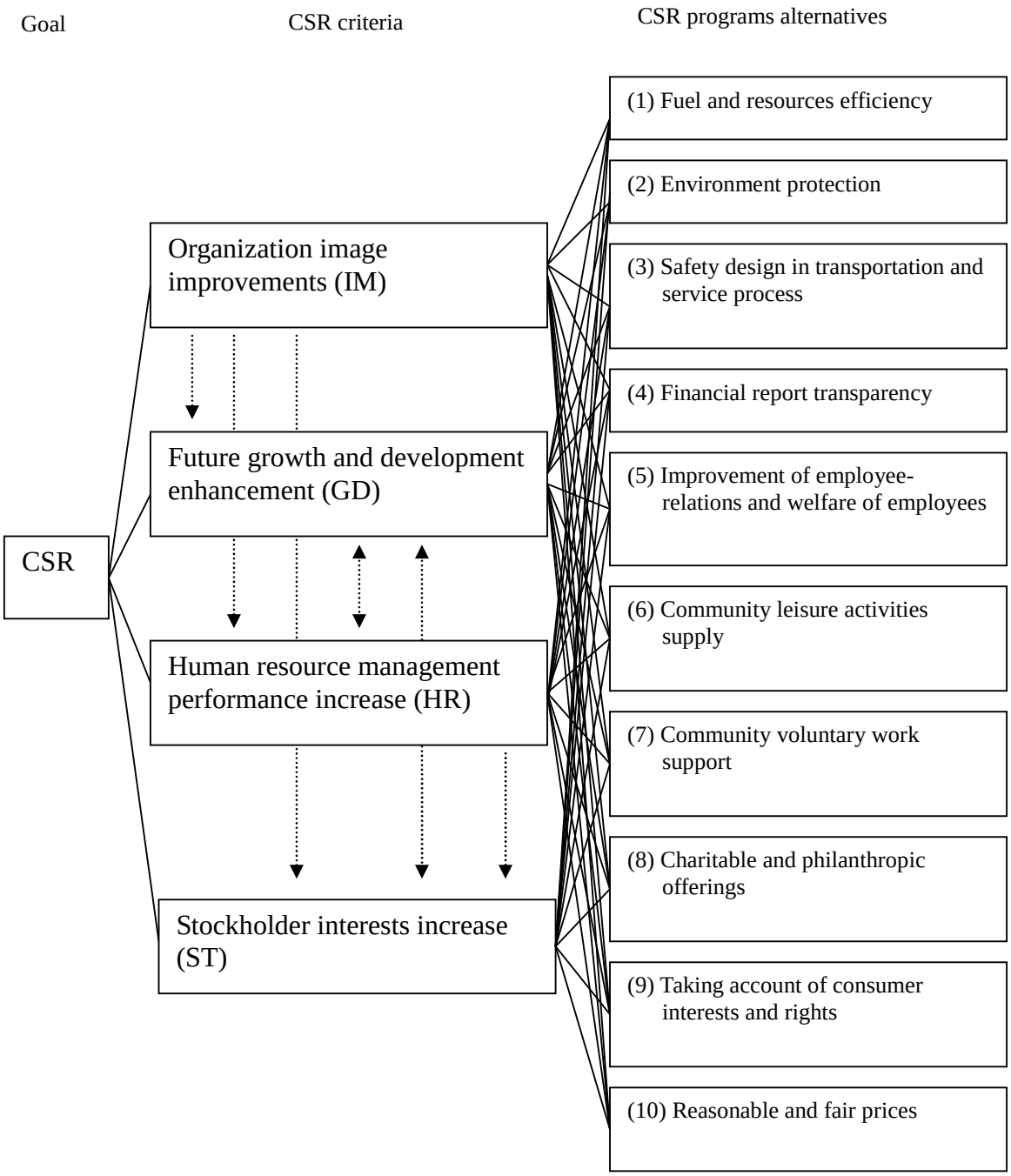



Figure 7 ANP framework of CSR programs selection in the airline company

Table 6
The unweighted supermatrix of the airline

| | | Goal | Criteria | | | | Alternatives (programs) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **CSR** | **IM** | **GD** | **HR** | **ST** | **(1) FE** | **(2) EP** | **(3) STP** | **(4) FT** | **(5)LCR** | **(6)CLA** | **(7) CVS** | **(8)CPO** | **(9)CIR** | **(10)RFP** |
| **Goal** | **CSR** | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Criteria** | **IM** | 0.65 | 0.70 | 0.00 | 0.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **GD** | 0.19 | 0.09 | 0.00 | 0.14 | 0.89 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **HR** | 0.12 | 0.14 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **ST** | 0.04 | 0.06 | 0.50 | 0.58 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Alternatives** | **(1) FE** | 0.00 | 0.21 | 0.26 | 0.10 | 0.08 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(programs)** | **(2) EP** | 0.00 | 0.13 | 0.12 | 0.09 | 0.11 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(3) STP** | 0.00 | 0.03 | 0.03 | 0.23 | 0.06 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(4) FT** | 0.00 | 0.04 | 0.04 | 0.05 | 0.08 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(5) LCR** | 0.00 | 0.04 | 0.04 | 0.03 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(6) CLA** | 0.00 | 0.13 | 0.13 | 0.17 | 0.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(7) CVS** | 0.00 | 0.17 | 0.13 | 0.20 | 0.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| | **(8) CPO** | 0.00 | 0.14 | 0.13 | 0.19 | 0.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| | **(9) CIR** | 0.00 | 0.08 | 0.05 | 0.09 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 |
| | **(10) RFP** | 0.00 | 0.04 | 0.08 | 0.06 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |

Table 7
The weighted supermatrix of the airline

| | | Goal | Criteria | | | | Alternatives (programs) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **CSR** | **IM** | **GD** | **HR** | **ST** | **(1) FE** | **(2) EP** | **(3) STP** | **(4) FT** | **(5)LCR** | **(6)CLA** | **(7) CVS** | **(8)CPO** | **(9)CIR** | **(10)RFP** |
| **Goal** | **CSR** | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Criteria** | **IM** | 0.33 | 0.35 | 0.00 | 0.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **GD** | 0.10 | 0.05 | 0.00 | 0.07 | 0.44 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **HR** | 0.06 | 0.07 | 0.25 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **ST** | 0.02 | 0.03 | 0.25 | 0.29 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Alternatives** | **(1) FE** | 0.00 | 0.10 | 0.13 | 0.05 | 0.04 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(programs)** | **(2) EP** | 0.00 | 0.07 | 0.06 | 0.05 | 0.05 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(3) STP** | 0.00 | 0.02 | 0.01 | 0.01 | 0.03 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(4) FT** | 0.00 | 0.02 | 0.02 | 0.03 | 0.04 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(5) LCR** | 0.00 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(6) CLA** | 0.00 | 0.07 | 0.07 | 0.09 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(7) CVS** | 0.00 | 0.08 | 0.06 | 0.10 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| | **(8) CPO** | 0.00 | 0.07 | 0.06 | 0.10 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| | **(9) CIR** | 0.00 | 0.04 | 0.03 | 0.04 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 |
| | **(10) RFP** | 0.00 | 0.02 | 0.04 | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |

Table 8
The ANP result of CSR candidates of the airline company*

| CSR Candidates | Results[1] | Rank |
|---|---|---|
| Fuel and resources efficiency (FE) | 0.185 | 1 |
| Community voluntary work support (CVS) | 0.163 | 2 |
| Charitable and philanthropic offerings (CPO) | 0.146 | 3 |
| Community leisure activities (CLA) | 0.139 | 4 |
| Environment protection (EP) | 0.119 | 5 |
| Taking account of consumer interests and rights (CIR) | 0.079 | 6 |
| Reasonable and fair prices (RFP) | 0.056 | 7 |
| Financial transparency (FT) | 0.046 | 8 |
| Safety design in transportation and service process (STP) | 0.034 | 9 |
| Improvement in employee-relations and welfare of employees (LCR) | 0.033 | 10 |

* Note: The results are rounded to the third place of decimal set by Super Decision@ software.

After acquiring the priority weights for each CSR program candidate, the China Airlines company needs to make optimal selection decision under organization goals and resource restrictions. This corporation has four obligatory goals for CSR implementing that is: (1) total maximum of 5,000,000 dollars for budget amounts; (2) a total yearly maximum of 9,000 hours for consultant time; (3) total maximum of 3,000 hours of training time; (4) fuel and resources efficiency (program 1) and safety design in transportation and service process (program 3) are necessary company goals and therefore are mandated programs that must be one of CSR programs selected.

In addition, there are two flexible goals. An initial allocation of budget dollars was set at $4,000,000, which could vary up to but not beyond the total maximum value of $5,000,000. Additionally, the initial allocation scheme for labor hours was set at 6,000 hours, but deviation from this allocation was permitted. Table 9 illustrates the obligatory

limitations for CSR programs selection. In Table 9, $x_{1A}$ to $x_{10A}$ represent the CSR programs alternatives. $x_{jA}$ is the binary variable for the airline company. When $x_{jA}$ = 1, then the $j^{th}$ program is selected; when $x_{jA}$ = 0, then the $j^{th}$ program is not selected. The $a_{ij}$ represents the quantity of resources $i^{th}$ required for the $j^{th}$ program. The $b_i$ is the constraint on the available resources. ANP and ZOGP are combined for decision-making in selecting CSR programs under the limitations of organizational resources.

Using the data in Table 9 and ANP results, the ZOGP model is shown in Table 10. All the formulations are explained as follows. In formulation (1), $p$ represents the preemptive priority. Equation (2) limits budgets amounts (in thousand dollars). Equation (3) limits consultant hours. Equation (4) limits maximum training hours. Equation (5) and (6) represents the obligatory program 1 and 3. Equations (7)–(16) respectively represent the selection CSR programs. Equation (17) regulates the expected budget. Equation (18) regulates labor hours. We use the LINGO$^{@}$ software to solve the above ZOGP model. The results are shown in Table 11. Six programs were chosen in the first period of CSR implementation according to the priorities of organizational objectives.

Table 9
The resource requirements and obligatory limitations of CSR programs choice

| | The resource requirements of the 10 CSR programs ( $a_{ij}$ ) | | | |
|---|---|---|---|---|
| | Budget Amounts (thousand dollars) | Consultant Hours (Hours) | Training Hours (Hours) | Labor Hours (Hours) |
| $x_{1A}$ | 2,000 | 1,500 | 600 | 1,000 |
| $x_{2A}$ | 800 | 2,000 | 400 | 900 |
| $x_{3A}$ | 800 | 2,500 | 1,000 | 1,500 |
| $x_{4A}$ | 200 | 600 | 300 | 100 |
| $x_{5A}$ | 300 | 300 | 40 | 100 |
| $x_{6A}$ | 500 | 1,000 | 700 | 1,200 |
| $x_{7A}$ | 500 | 1,000 | 700 | 1,300 |
| $x_{8A}$ | 1,000 | 100 | 20 | 300 |
| $x_{9A}$ | 400 | 800 | 200 | 600 |
| $x_{10A}$ | 400 | 600 | 40 | 100 |
| $b_i$ | 5,000 | 9,000 | 3,000 | 6,000 |

Table 10
Goal programming formulation model for CSR programs of the airline

Minimize Z= $\{ p_1(d_1^- + d_2^-),\ p_2(d_3^+ + d_4^+ + d_5^+),\ p_3(0.1851d_6^- + 0.1190d_7^- + 0.0338d_8^- + 0.0455d_9^- + 0.0335d_{10}^- + 0.1390d_{11}^- + 0.1631d_{12}^- + 0.1463d_{13}^- + 0.0792d_{14}^- + 0.0555d_{15}^-),\ p_4(d_{16}^- + d_{16}^+),\ p_5(d_{17}^- + d_{17}^+)\}$ ……..……..(1)

Subject to:

$2,000x_{1A} + 800x_{2A} + 800x_{3A} + 200x_{4A} + 300x_{5A} + 500x_{6A} + 500x_{7A} + 1,000x_{8A} + 400x_{9A} + 400x_{10A} + d_3^- - d_3^+ = 5,000$

……..……(2)

$1,500x_{1A} + 2,000x_{2A} + 2,500x_{3A} + 600x_{4A} + 300x_{5A} + 1,000x_{6A} + 1,000x_{7A} + 100x_{8A} + 800x_{9A} + 600x_{10A} + d_4^- - d_4^+ = 9,000$

……..……(3)

$600x_{1A} + 400x_{2A} + 1,000x_{3A} + 300x_{4A} + 40x_{5A} + 700x_{6A} + 700x_{7A} + 20x_{8A} + 200x_{9A} + 40x_{10A} + d_5^- - d_5^+ = 3,000$

……..…. (4)

$x_{1A} + d_1^- = 1$ ……..…….. (5)

$x_{3A} + d_2^- = 1$……..…….. (6)

$x_{1A} + d_6^- = 1$ ……..…… (7)

$x_{2A} + d_7^- = 1$ ……..…… (8)

$x_{3A} + d_8^- = 1$……..…….... (9)

$x_{4A} + d_9^- = 1$……..…….. (10)

$x_{5A} + d_{10}^- = 1$……..…….. (11)

$x_{6A} + d_{11}^- = 1$……..…….. (12)

$x_{7A} + d_{12}^- = 1$……..…….. (13)

$x_{8A} + d_{13}^- = 1$……..…….. (14)

$x_{9A} + d_{14}^- = 1$……..…….. (15)

$x_{10A} + d_{15}^- = 1$……..…….. (16)

$2,000x_{1A} + 800x_{2A} + 800x_{3A} + 200x_{4A} + 300x_{5A} + 500x_{6A} + 500x_{7A} + 1,000x_{8A} + 400x_{9A} + 400x_{10A} + d_{16}^- - d_{16}^+ = 4,000$

……..……..... . (17)

$1,000x_{1A} + 900x_{2A} + 1,500x_{3A} + 100x_{4A} + 100x_{5A} + 1,200x_{6A} + 1,300x_{7A} + 300x_{8A} + 600x_{9A} + 100x_{10A} + d_{17}^- - d_{17}^+ = 6,000$

……..…..……..... (18)

$x_{jA} = 0$ or 1, $j = 1, 2, \ldots, 10$ .

Table 11
The ZOGP model solution results

| |
|---|
| $x_{1A} = x_{3A} = x_{4A} = x_{7A} = x_{8A} = x_{9A} = 1, \quad x_{2A} = x_{5A} = x_{6A} = x_{10A} = 0,$ |
| $d_1^- = 0 \ , \quad d_2^- = 0 \ , \quad d_3^- = 100, \quad d_3^+ = 0 \ , \quad d_4^- = 2500, \quad d_4^+ = 0 \ ,$ |
| $d_5^- = 180, \quad d_5^+ = 0, \quad d_6^- = 0, \ d_7^- = 1, \quad d_8^- = 0, \quad d_9^- = 0, \quad d_{10}^- = 1, \quad d_{11}^- = 1,$ |
| $d_{12}^- = 0, \quad d_{13}^- = 0, \quad d_{14}^- = 0, \ d_{15}^- = 1, \ d_{16}^+ = 900, \ d_{17}^- = 1200, \quad d_{16}^- = d_{17}^+ = 0$ |

These chosen programs include the mandated programs 1 and 3 (fuel and resources efficiency and safety design in transportation and service process), and the other four programs 4,7,8,9 (financial transparency, community voluntary work support, charitable and philanthropic offerings, taking account of consumer interests and rights). The above CSR programs chosen by the integrated model have four substantial meanings: (1) The chosen fuel and resources efficiency program is the mandated program and also has the highest rank in ANP result. This reveals the importance of the fuel and resources efficiency program for the airline's cost advantages and simultaneously for social and environmental responsibilities; (2) The China airline can continue to develop the two programs of financial transparency and taking account of consumer interests and rights which already have good performances; (3) Both of the community voluntary work support and the charitable and philanthropic offerings programs can bring visibility through good corporate image and might need to be put more effort on; (4) The ANP rank of safety design in transportation and service process program is low might caused by that the expert group thought no need of

repetition of this program since the China Airline have invested many in safety improvements.

The total budget cost during the first implementation period was $4,900,000 for implementing six CSR programs, which included $900,000 over the flexible limit (4,000,000) but still in the range of the obligatory limits (5,000,000). There were only 6,500 consultant hours and 2,820 training hours consumed which were not fully exhausted. The six programs used 1,200 fewer hours of labor hours than the available 6,000 hours. By combining the DEMATEL, ANP approach and ZOGP model, the China Airlines company not only adequately considered the interdependencies among criteria, but also took account of the limited resources to obtain an optimal solution in selecting CSR programs.

## 4.4 ABC for costs evaluation of the airline

After selecting the optimal six CSR programs, we simulate that the ABC system is applied by the China Airlines company. In many organizations the ABC system is handled outside the main accounting system. The needs of ABC are much more detailed than the formal requirements of financial reporting, and many organizations found it to be more cost effective to carry the ABC calculation on independent PC-based software, but not integrate it to the main accounting system. The implementation of ABC requires a detailed analysis of the activities within the company and of the resources they consume. It

involves training of the employees responsible for the measurement and reporting real information. The information gathering includes physical measurement, such as number of units or number of materials use, or financial measurement, such as costs of utilities, etc. There are three reasons for applying ABC techniques to these six chosen CSR programs: (1) CSR programs can be defined as “products” containing consultant, customer relation and training activities, etc., so that ABC method can be applied by precisely measuring the activities effort. (2) To know the cost of the CSR programs for the airline company is very important to managers who can make activity amendment decision by tracing redundancy costs of activities and good management only when they got accurate program cost information. (3) ABC approach can help airline managers to estimate accurate costs of each CSR program for further performance assessments.

As a numerical illustration, a hypothetically simplified example is presented in this section. The related information of these activities is shown in Table 12, including required resources, activity level, and activity drivers of the six CSR programs. In the first stage of ABC cost assignment view, resources are traced to activities. For example, we show the labor resource costs assignment on personnel management activity in Table 13. Tsai (1996a) suggested that activities can be estimated from a work sampling method. Total labor costs traced to activities are shown in the last column of Table 13. Similarly, we can obtain the other resources units that spent on various activities. In the second stage of ABC, activity costs are traced to cost objects. In this example, the six CSR programs are used as

the cost objects. Based on the activity analysis, we can calculate a unit cost for each of the eight main activities that the six programs are engaged in. Then, each program is charged based on the rate of consumption of these activities according to the appropriate cost drivers. We select program 1 to show the allocation of indirect costs through ABC. This result appears in Table 14. The total cost of CSR program 1 (fuel and resources efficiency) is $1,648,725.61 which is much less than the fuel reduction goal ($4,925,268 in annual report).

Managers might apply ABC approach to find which activities are cost-redundant ringleaders to be adjusted. The link of activities, cost drivers, and costs allows managers to analyze potential cost changes due to change in activities. For instance, suppose that the managers are considering use of new fuel reducing technology. The costs of activities such as purchasing the required technology or personnel management (hiring relative employees) are relevant to this decision. With traditional cost accounting approach these costs are part of the general overhead and are borne by all CSR programs in the airline company. Through ABC, these costs can be estimate explicitly and allocate to the specific CSR program.

Table 12
Activity-related information for CSR programs

| Activities | Activity levels | Activity drivers | Required resources |
|---|---|---|---|
| Personnel management | • unit | • number of team members | People, materials |
| Computing infrastructure | • unit | • hours of usage | People, equipments, tools |
| Purchasing | • batch | • number of purchase order | People |
| Planning and control | • batch | • number of times | People, tools |
| Customer relations | • batch | • hours of labors | People |
| Tool and technology acquisition | • batch | • number of tools/technology | Tools, equipments |
| Training | • program/unit | • number of training members | Outsourcing, people, materials, tools |
| Consultanting | • program/unit | • hours of consultanting | Outsourcing, people, materials, tools |

Table 13
Assigning labor costs to personnel management activity

| Activities | Workers | Labor hours | Total labor hours | $/hour | Total labor costs |
|---|---|---|---|---|---|
| Personnel management | No. 1 | 880 | 2,870 | $100 | $287,000 |
| | No. 2 | 1,020 | | | |
| | No. 3 | 970 | | | |

Table 14
Allocation of indirect costs of the airline CSR programs according ABC

| Activities | Activity costs (in thousand) | | | | | | Activity drivers | Activity driver quantity | | | | | | Costs per activity | Activity Cost assignment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Labor costs | Materials | Equipments | Tools /technology | Outsourcing | Total [a] activity costs | | Program 1 | 3 | 4 | 7 | 8 | 9 | driver[b] | program 1 |
| Personnel management | 287 | 15 | | | | 302 | • number of team /members | 128 | 403 | 8 | 35 | 15 | 607 | 252.51 | 32,321 |
| Computing infrastructure | 120 | 65 | 10 | | | 195 | • hours of usage | 391 | 65 | 0 | 453 | 0 | 230 | 171.20 | 66,939 |
| Purchasing | 102 | | | | | 102 | • number of purchase order | 22 | 45 | 9 | 89 | 17 | 35 | 470.05 | 10,341 |
| Planning and control | 23 | | | 49 | | 72 | • number of times | 36 | 128 | 3 | 25 | 10 | 58 | 276.92 | 9,969 |
| Customer relations | 408 | | | | | 408 | • hours of labors | 15 | 670 | 12 | 88 | 39 | 250 | 379.89 | 5,698 |
| Tool and technology acquisition | | | 65 | 78 | | 143 | • number of tools /technology | 65 | 2 | 8 | 4 | 0 | 2 | 1765.4 | 114,753 |
| Training | 230 | 43 | | 29 | 400 | 702 | • number of training members | 45 | 120 | 12 | 59 | 12 | 503 | 934.75 | 42,064 |
| Consultanting | 12 | 55 | | 32 | 928 | 1,027 | • hours of consultanting | 120 | 43 | 200 | 643 | 20 | 540 | 655.81 | 78,697 |
| | | | | | | | | | | | | | | Total activity costs | 360,783 |
| | | | | | | | | | | | | | | Direct costs | 1,287,943 |
| | | | | | | | | | | | | | | Total costs | 1,648,726 |

Note: [a] The total activity costs are the sum of indirect labor costs, materials, equipments, tools, outsourcing costs.
[b] The cost per activity driver is equal to the total activity costs divided by the sum of activity driver quantity of program 1, 3, 4, 7, 8, 9.

# CHAPTER 5
# Application 2: The international tourist hotel

## 5.1 Profile of the Shangri-La's Far Eastern Plaza hotel

The Far Eastern Plaza hotel is a famous international tourist hotel in Taipei. This hotel is operated by the Shangri-La hotels and resorts, the world's leading Asia-based hotel group. The hotel was awarded the best hotel in Taipei prize by the Asiamoney magazine in 2007's travel poll, and the best business hotel in Taipei prize by Business Traveler magazine in 2008. Shangri-La's Far Eastern Plaza hotel is located in the heart of the city's flourishing business district of Taipei and is equipped with 420 luxury guest rooms with 53 suites, award-winning restaurants, lounges and bars. It also has a superb range of recreation and leisure facilities included spa, aromatherapy and massage services. Since the hotel industries are still lag behind other travel sectors in responsible tourism, the Shangri-La's Far Eastern Plaza hotel is the first one among the hospitality industry in Taiwan to implement CSR initiatives. Its policies and procedures for CSR are built on six areas as following.

1. The environment protection and stewardship;
2. Health and safety of customers, employees, suppliers and the public;
3. Fair employee practices and supporting biodiversity and philanthropic, cultural and civic community programs;

4. Works with local and national governments to care for orphans and other needy children;

5. Suppliers to meet local legal requirements relating to the environment, human rights and other regulatory work practices;

6. Stakeholder relations in a clear, honest, and respectful way.

However, these above CSR policies practiced by the Shangri-La's Far Eastern Plaza hotel was identified not by considering whether the CSR policies fit the requirements of society benefit and the competitive advantage field or not. Those chosen CSR procedures were also not selected by objective and scientific method. Hence, this study applies the integrated model into the international tourist hotel for optimal CSR programs choice and CSR costs assessments.

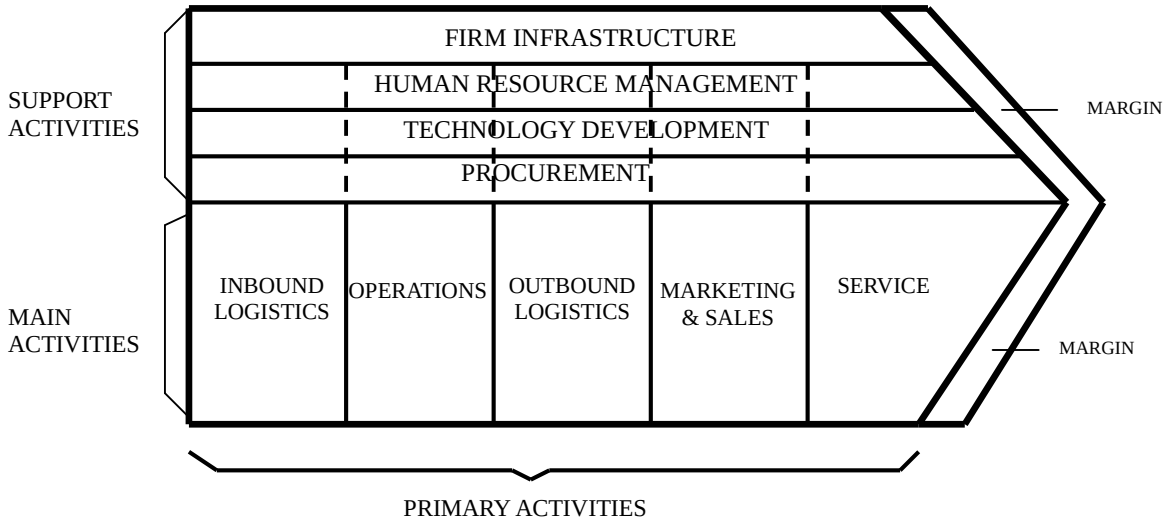
## 5.2 Identify CSR candidates for the hotel

This investigation invites 37 experts and got response by 31 experts, who have the knowledge of CSR and the hospitality industries, from different fields, such as hotel industries (10 experts), universities (8 experts), research institute (5 experts), tourism journals (4 experts) and stakeholders (4 experts). Participants are first asked to identify the important activities that might benefit society through the hotel's value chain. They use the map of generic value chain of Porter (1985) in Figure 8 to list the possible activities of operations that might positively or negatively influence society. Those possible activities of

value chain for the international tourist hotel are presented in Figure 9. Next, they need to find possible strategic fields of target hotel through the map of determinants of national advantage of Porter (1990) in Figure 10. Then experts list those possible strategic fields in Figure 11.

Finally, experts identify which possible activities (in Figure 9) could overlap with the possible strategic fields (in Figure 11) and could transform value chain activities to benefit society while reinforcing strategy as candidates for the next MCDM application. Namely, experts need to categorize social issues in the company's external environment that affect the underlying drivers of competitiveness in the locations where the company operates. There are nine CSR programs' candidates that fit for requirements:

1. Nearby environments protection and the sanitary vicinity improvement (EP);
2. Safety and smooth neighboring traffic improvement (ST);
3. Non discrimination hire plan(NDP);
4. Community voluntary work and leisure activities support (CLV);
5. Charitable and philanthropic offerings for children (CP);
6. Satisfactory tourism information (TI);
7. Stakeholders' satisfaction plan (SS);
8. Healthy and certified local food supply (HF);
9. R&D cooperation with local related tourism departments of Universities (RND);




Source: Porter (1985, p.37)

Figure 8 The generic value chain

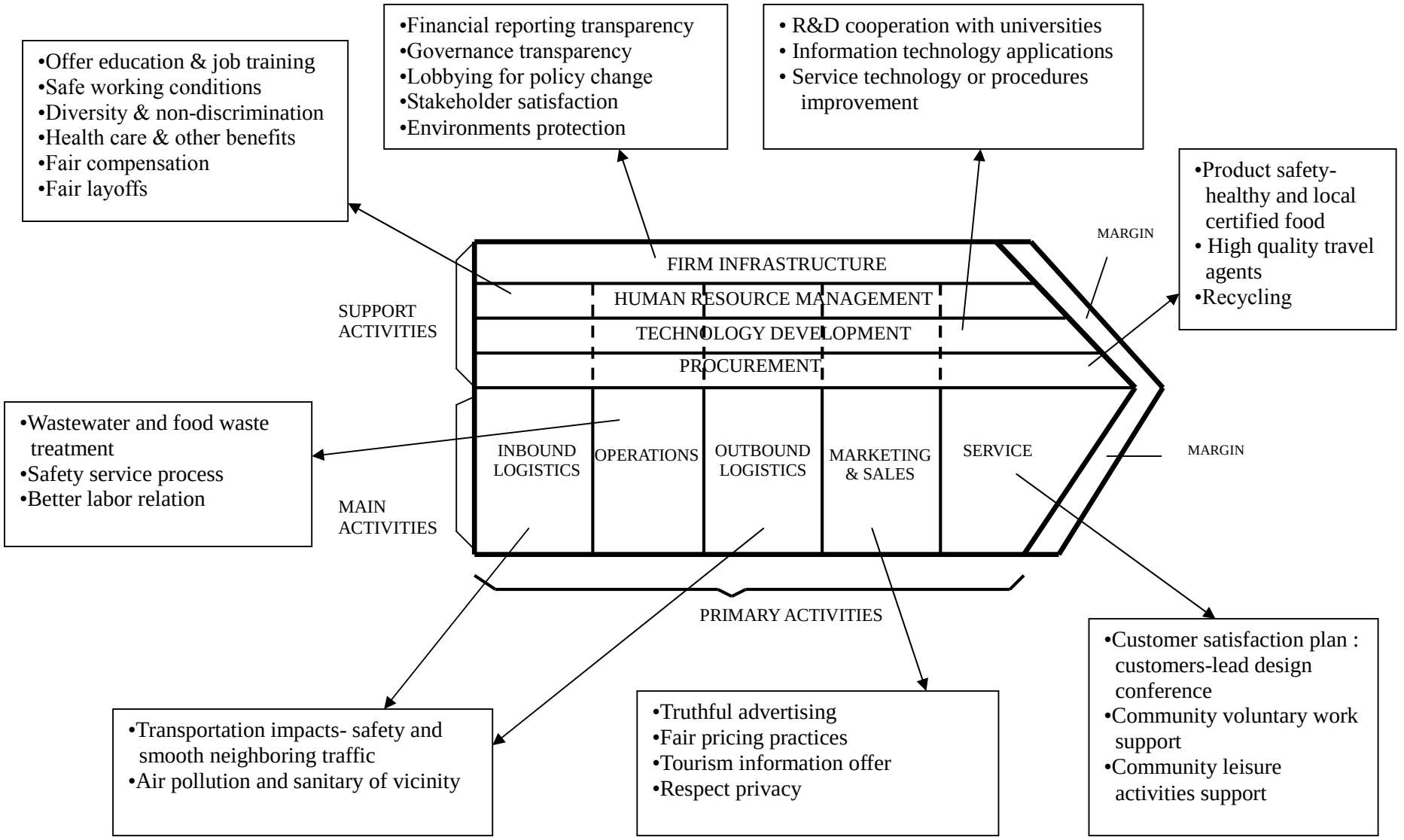
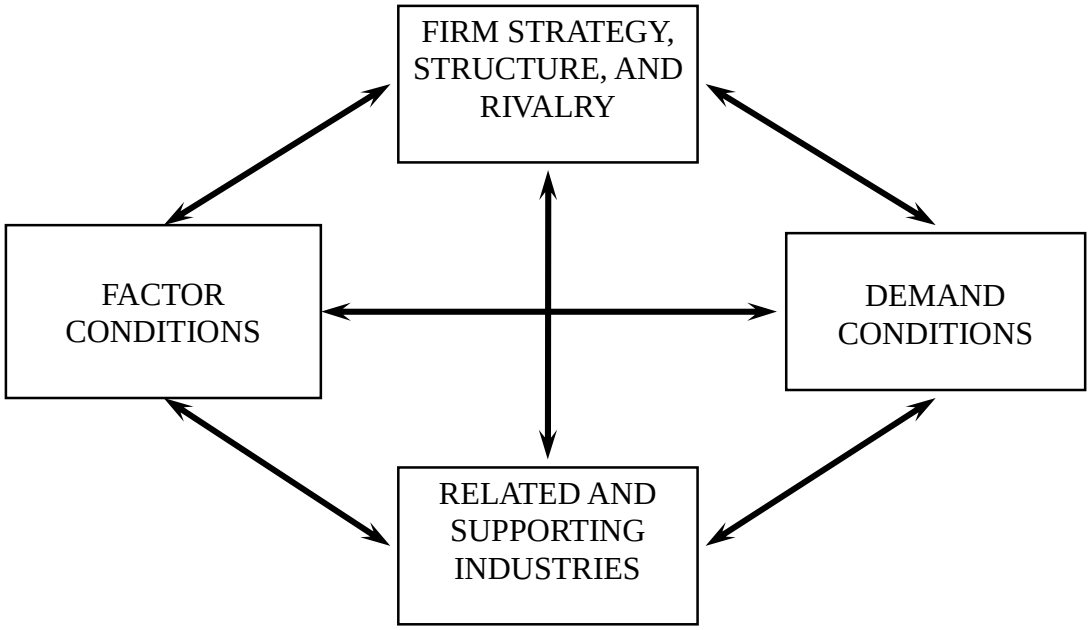



Figure 9 The value chain activities of the international tourist hotel




Source: Porter (1990, p.72)

Figure 10 The determinants of national advantage

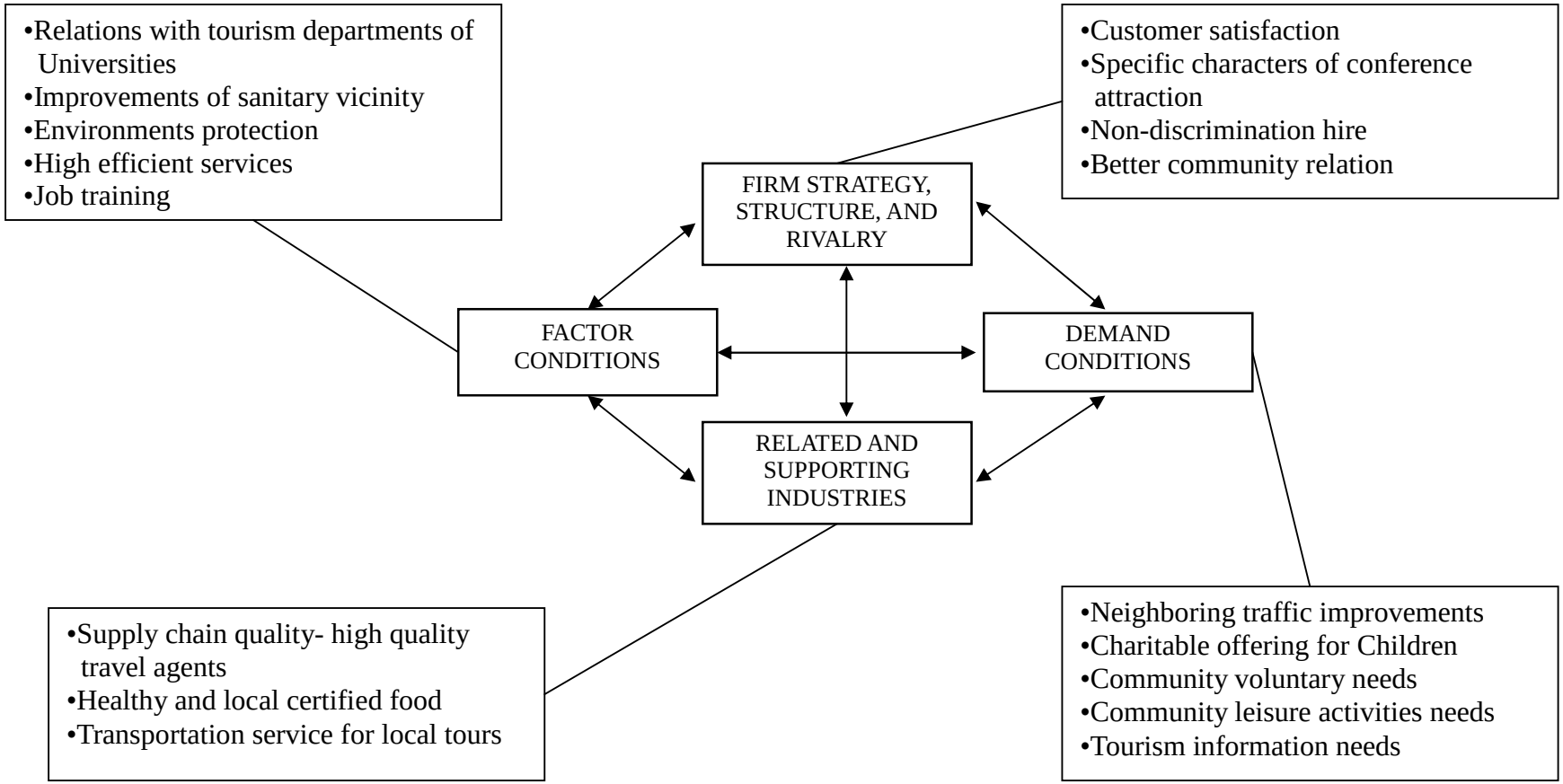



Figure 11 The determinants of competitive advantage of the hotel

## 5.3 CSR decisions for the hotel

The expert group also specified the criteria of costs and differentiation advantage that the corporation should pursue when allocating resources among CSR programs. The costs and differentiation advantage criteria are specified as organization image (IM), future growth and development (GD), human resource management performance (HR) and stockholder interests (ST). The study used a 0-4 scale for making assessments for these criteria. Once the relationships between these criteria had been measured by the expert panel, the initial direct-relation matrix can be obtained (Table 15). Based on the initial direct-relation matrix, the normalized direct-relation matrix was obtained using DEMATEL (Table 16). Then, the relation matrix $T$ and $D$, $R$ values are shown in Table 17. After deciding the threshold value from experts through discussion, the relationship between criteria map was found by mapping a dataset of $D + R$ and $D – R$ (Figure 12). The IM criterion with highest value of $D$-$R$ is prior to others and is called the master dispatcher. The ST criterion with lowest value of $D$-$R$ is a master receiver. The results indicate that the organization image (IM) is also a major influence on other criteria in pursuing CSR in the Shangri-La's Far Eastern Plaza hotel. And, the ST criterion is only affected by other criteria. The GD criterion with highest value of $D$+$R$ has most relationships with others.

After applying DEMATEL, the interdependence among the four criteria and the hierarchical framework of the ANP is shown in Figure 13. ANP method is applied to set priorities among the programs. DEMATEL and ANP are combined for decision-making in

acquiring priority weights of CSR candidates. The expert group was asked to provide their value judgments in the pairwise comparison matrix and the elements of the overall matrix were then obtained by the arithmetic average of the corresponding elements to arrive at a final priority with all columns summing to unity. The ANP unweighted and weighted supermatrices are shown in Tables 18 and 19. The results of the ANP phase with the priority weights and ranks for each CSR candidate are presented in Table 20. All weights in the process of comparisons are acceptable with the consistency ratio CR<0.1. The largest weight is, the stakeholders satisfaction plan (SS), followed by the second rank; the healthy and certified local food supply (HF) and the third; the satisfactory tourism information (TI) program. The non discrimination hire plan and the charitable and philanthropic offerings for children (CP) plan have the lowest and second lowest weight separately. These weights are used as priorities in goal programming formulation.

Table 15
The initial direct-relation matrix of four criteria for the hotel

| | Organization Image (IM) | Future Growth and Development (GD) | Human Resource Management Performance (HR) | Stockholder Interests (ST) |
|---|---|---|---|---|
| IM | 0.000 | 4.000 | 3.333 | 3.333 |
| GD | 1.667 | 0.000 | 3.000 | 4.000 |
| HR | 2.000 | 1.667 | 0.000 | 3.000 |
| ST | 1.000 | 3.000 | 1.000 | 0.000 |

Table 16
The normalized direct-relation matrix of four criteria

| | IM | GD | HR | ST |
|---|---|---|---|---|
| IM | 0.000 | 0.375 | 0.312 | 0.312 |
| GD | 0.156 | 0.000 | 0.281 | 0.375 |
| HR | 0.187 | 0.156 | 0.000 | 0.281 |
| ST | 0.094 | 0.281 | 0.094 | 0.000 |

Table 17
The total-relation matrix *T* and prioritization of four criteria

| | IM | GD | HR | ST | D | ORDER | D+R | ORDER | D-R |
|---|---|---|---|---|---|---|---|---|---|
| IM | 0.385 | 0.923 | 0.786 | 1.000 | 3.094 | GD | 5.069 | IM | 1.564 |
| GD | 0.442 | 0.517 | 0.648 | 0.889 | 2.494 | ST | 4.676 | GD | -0.081 |
| HR | 0.411 | 0.569 | 0.356 | 0.723 | 2.059 | IM | 4.624 | HR | -0.114 |
| ST | 0.292 | 0.566 | 0.383 | 0.411 | 1.653 | HR | 4.232 | ST | -1.370 |
| R | 1.530 | 2.575 | 2.173 | 3.023 | | | | | |

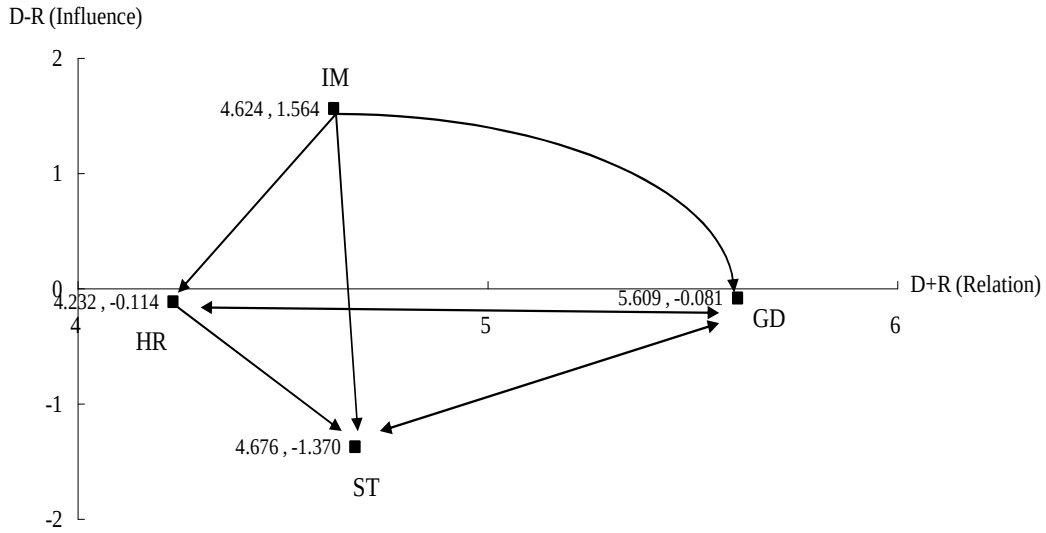



Figure 12 Map of relationship between the four criteria of the hotel

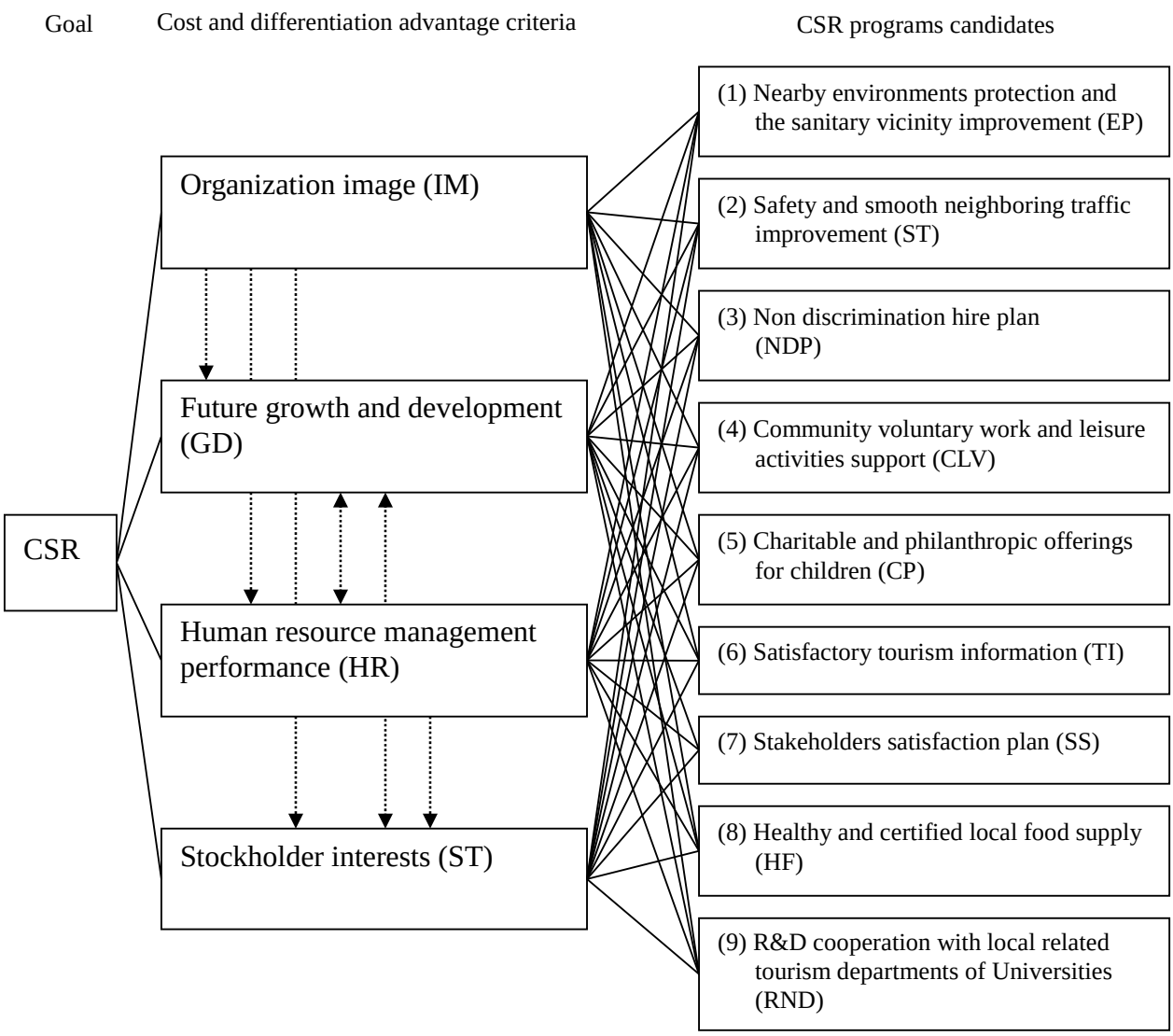



Figure 13 ANP framework of international tourist hotels' CSR programs selection

Table 18
The unweighted supermatrix of the hotel

| | | Goal | Criteria | | | | CSR program candidates | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **CSR** | **IM** | **GD** | **HR** | **ST** | **(1) EP** | **(2) ST** | **(3) NDE** | **(4) CLV** | **(5)CP** | **(6)TI** | **(7) SS** | **(8)HF** | **(9) RND** |
| **Goal** | **CSR** | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Criteria** | **IM** | 0.57 | 0.00 | 0.45 | 0.45 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **GD** | 0.21 | 0.00 | 0.00 | 0.80 | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **HR** | 0.15 | 0.00 | 0.80 | 0.00 | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **ST** | 0.07 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **CSR program** | **(1) EP** | 0.00 | 0.07 | 0.07 | 0.07 | 0.08 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **candidates** | **(2) ST** | 0.00 | 0.11 | 0.09 | 0.10 | 0.09 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(3) NDE** | 0.00 | 0.02 | 0.02 | 0.02 | 0.02 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(4) CLV** | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(5) CP** | 0.00 | 0.03 | 0.02 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(6) TI** | 0.00 | 0.16 | 0.13 | 0.15 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| | **(7) SS** | 0.00 | 0.34 | 0.36 | 0.32 | 0.32 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| | **(8) HF** | 0.00 | 0.20 | 0.24 | 0.24 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 |
| | **(9) RND** | 0.00 | 0.05 | 0.05 | 0.06 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |

Table 19
The weighted supermatrix of the hotel

| | | Goal | Criteria | | | | CSR program candidates | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **CSR** | **IM** | **GD** | **HR** | **ST** | **(1) EP** | **(2) ST** | **(3) NDE** | **(4) CLV** | **(5)CP** | **(6)TI** | **(7) SS** | **(8)HF** | **(9) RND** |
| **Goal** | **CSR** | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Criteria** | **IM** | 0.28 | 0.00 | 0.23 | 0.23 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **GD** | 0.10 | 0.00 | 0.00 | 0.40 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **HR** | 0.07 | 0.00 | 0.40 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **ST** | 0.00 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **CSR program** | **(1) EP** | 0.00 | 0.03 | 0.03 | 0.03 | 0.04 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **candidates** | **(2) ST** | 0.00 | 0.06 | 0.04 | 0.05 | 0.04 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(3) NDE** | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(4) CLV** | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(5) CP** | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **(6) TI** | 0.00 | 0.08 | 0.07 | 0.08 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| | **(7) SS** | 0.00 | 0.17 | 0.18 | 0.16 | 0.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| | **(8) HF** | 0.00 | 0.10 | 0.12 | 0.12 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 |
| | **(9) RND** | 0.00 | 0.02 | 0.02 | 0.03 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |

Table 20
The ANP result of CSR candidates of the hotel*

| CSR Candidates | Results[1] | Rank |
|---|---|---|
| Stakeholders satisfaction plan (SS) | 0.339 | 1 |
| Healthy and certified local food supply (HF) | 0.225 | 2 |
| Satisfactory tourism information (TI) | 0.150 | 3 |
| Safty and smooth neighboring traffic improvement (ST) | 0.097 | 4 |
| Nearby environments protection and the sanitary vicinity improvement (EP) | 0.070 | 5 |
| R&D cooperation with local related tourism departments of Universities (RND) | 0.050 | 6 |
| Community voluntary work and leisure activities suppor (CLV) | 0.028 | 7 |
| Charitable and philanthropic offerings for children (CP) | 0.023 | 8 |
| Non discrimination hire plan (NDP) | 0.017 | 9 |

* Note: The results are rounded to the third place of decimal set by Super Decision@ software.

After finding the priority weights for each CSR program, the hotel optimizes selection decisions under goals of cost and differentiation advantage and resource restrictions. It has four obligatory goals: remaining within a budget of $18 millions; 5,000 hours of annual consultants' time; 4,000 hours of training; and a mandated program: charitable and philanthropic offerings for children plan. In addition, there are two flexible goals. An initial allocation of budget dollars was set at $10 million, but cannot exceed the $18 million and an initial allocation of labor hours 6,000 hours, with some variation allowed. Table 21 shows the resource requirements of CSR candidates, where $x_{jH}$ are the alternatives and binary variables - if $x_{jH}$ = 1, then the $j^{th}$ program is selected and if $x_{jH}$ = 0 it is not. The quantity of resources $i^{th}$ required

for the $j^{th}$ program is represented by $a_{ij}$ and $b_i$ is the resource constraint. ANP and ZOGP are combined for decision-making in selecting CSR programs. Using data in Table 21 and ANP results, the ZOGP model and results are shown in Table 22. In formulation (1), $p$ represents the preemptive priority. Equation (2) limits budgets amounts (in $ thousand). Equation (3) limits consultant hours while Equation (4) limits maximum training hours. Equation (5) represents the obligatory program 5. Equations (6) to (14) represent the selection CSR programs. Equation (15) constrains the expected budget and (16), labor hours. Six programs were chosen in the first period of CSR implementation along the lines of the priorities of the organizations objectives. These include the mandated program 5 (charitable and philanthropic offerings for children plan), and the other programs 2,3,6,7,8 (safety and smooth neighboring traffic improvement; non discrimination hire plan; satisfactory tourism information; stakeholders' satisfaction plan; healthy and certified local food supply). The above CSR programs chosen by the integrated model have five substantial meanings: (1) The safety and smooth neighboring traffic program may help to improve the traffic jam caused by annual computer exhibition in the Taipei world trade center nearby and to make lodgers feel convenient ; (2) Offering satisfactory

tourism information and stakeholders' satisfaction is not only committed to supply tourism information and meaningful dialogue or relevant actions with all stakeholders in a clear, honest, and respectful way, but also committed to gain satisfaction of all stakeholders and customers. Specific characters of conference attraction also bring differentiate advantage for customer's satisfaction; (3) The healthy and certified local food plan can provide differentiation advantage for hotel's dinning since the food service market in Taipei has been very competitive; (4) The non discrimination hire plan may bring the image that the international tourist hotel respects different culture and is committed to offer fair employment opportunities; (5) The international tourist hotel could continue to develop the program of charitable and philanthropic offerings for children which already have good performances

Table 21
The resource requirements and obligatory limitations of CSR candidates of the hotel

| | The resource requirements of the 9 CSR candidates ( $a_{ij}$ ) | | | |
|---|---|---|---|---|
| | Budget Amounts (thousand dollars) | Consultant Hours (Hours) | Training Hours (Hours) | Labor Hours (Hours) |
| $x_{1H}$ | 3,000 | 1,000 | 1,000 | 1,500 |
| $x_{2H}$ | 2,000 | 700 | 900 | 1,000 |
| $x_{3H}$ | 500 | 600 | 500 | 400 |
| $x_{4H}$ | 1,000 | 900 | 1,500 | 2,000 |
| $x_{5H}$ | 1,500 | 100 | 400 | 500 |
| $x_{6H}$ | 2,000 | 800 | 500 | 800 |
| $x_{7H}$ | 3,500 | 1,000 | 1,200 | 1,800 |
| $x_{8H}$ | 5,000 | 900 | 200 | 300 |
| $x_{9H}$ | 9,000 | 500 | 200 | 600 |
| $b_i$ | 18,000 | 5,000 | 4,000 | 7,000 |

Table 22
Goal programming formulation model and results for CSR candidates of the hotel

Minimize Z= { $p_1(d_1^-)$, $p_2(d_2^+ + d_3^+ + d_4^+)$, $p_3(0.070d_5^- + 0.097d_6^- + 0.017d_7^- + 0.028d_8^- + 0.023d_9^- + 0.151d_{10}^- + 0.339d_{11}^- + 0.225d_{12}^- + 0.050d_{13}^-)$, $p_4(d_{14}^- + d_{14}^+)$, $p_5(d_{15}^- + d_{15}^+)$} ..... (1)

Subject to:

$3,000x_{1H} + 2,000x_{2H} + 500x_{3H} + 1,000x_{4H} + 1,500x_{5H} + 2,000x_{6H} + 3,500x_{7H} + 5,000x_{8H} + 9,000x_{9H} + d_2^- - d_2^+ = 18,000$ .....(2)

$1,000x_{1H} + 700x_{2H} + 600x_{3H} + 900x_{4H} + 100x_{5H} + 800x_{6H} + 1,000x_{7H} + 900x_{8H} + 500x_{9H} + d_3^- - d_3^+ = 5,000$ .....(3)

$1,000x_{1H} + 900x_{2H} + 500x_{3H} + 1,500x_{4H} + 400x_{5H} + 500x_{6H} + 1,200x_{7H} + 200x_{8H} + 200x_{9H} + d_4^- - d_4^+ = 4,000$ ..... (4)

$x_{5H} + d_1^- = 1$ ..... (5)

$x_{1H} + d_5^- = 1$ ..... (6)

$x_{2H} + d_6^- = 1$ ..... (7)

$x_{3H} + d_7^- = 1$ ..... (8)

$x_{4H} + d_8^- = 1$ ..... (9)

$x_{5H} + d_9^- = 1$ ..... (10)

$x_{6H} + d_{10}^- = 1$ ..... (11)

$x_{7H} + d_{11}^- = 1$ ..... (12)

$x_{8H} + d_{12}^- = 1$ ..... (13)

$x_{9H} + d_{13}^- = 1$ ..... (14)

$3,000x_{1H} + 2,000x_{2H} + 500x_{3H} + 1,000x_{4H} + 1,500x_{5H} + 2,000x_{6H} + 3,500x_{7H} + 5,000x_{8H} + 9,000x_{9H} + d_{14}^- - d_{14}^+ = 10,000$ ..... . (15)

$1,500x_{1H} + 1,000x_{2H} + 400x_{3H} + 2,000x_{4H} + 500x_{5H} + 800x_{6H} + 1,800x_{7H} + 300x_{8H} + 600x_{9H} + d_{15}^- - d_{15}^+ = 6,000$ ..... (16)

$x_{jH}$ = 0 or 1, $j$ = 1, 2, …, 9.

Results:

$X_{2H} = X_{3H} = X_{5H} = X_{6H} = X_{7H} = X_{8H} = 1$, $X_{1H} = X_{4H} = X_{9H} = 0$, $d_1^- = 0$, $d_2^- = 3500$, $d_3^- = 900$, $d_3^+ = 0$, $d_4^- = 300$, $d_4^+ = 0$, $d_5^- = d_8^- = d_{13}^- = 1$, $d_6^- = d_7^- = d_9^- = d_{10}^- = d_{11}^- = d_{12}^- = 0$, $d_{14}^+ = 4,500$, $d_{15}^- = 1200$, $d_{14}^- = d_{15}^+ = 0$

## 5.4 ABC for costs evaluation of the hotel

Finally, this paper applied the ABC method to evaluate the costs of those chosen CSR programs. This result appears in Table 23. Taking the program of safety and smooth neighboring traffic improvement plan for example, we can estimate its costs shown in the final row of Table 23. The total cost of CSR program of safety and smooth neighboring traffic improvement is $1,004,181. Managers of the international tourist hotel can use the cost information estimated by ABC to further evaluate CSR performance and identify value added activities of CSR.

Table 23
Allocation of indirect costs to the hotel's CSR programs according ABC*

| Activities | Activity costs (in thousand) | | | | | | Activity drivers | Activity driver quantity CSR programs | | | | | | Costs per activity driver[b] | Activity Cost assignment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Labor costs | Materials | Equipments | Tools /technology | Outsourcing | Total[a] activity costs | | 2 | 3 | 5 | 6 | 7 | 8 | | program 2 |
| Purchasing | 150 | 800 | | | | 950 | • number of purchase order | 30 | 44 | 23 | 280 | 44 | 420 | 1129.61 | 33,888 |
| Computing infrastructure | 120 | 280 | 20 | | | 420 | • hours of usage | 240 | 20 | 0 | 43 | 80 | 20 | 1042.18 | 250,124 |
| Training | 332 | 62 | | 37 | 500 | 931 | • number of training members | 65 | 120 | 33 | 50 | 140 | 150 | 1668.46 | 108,450 |
| Planning and control | 30 | | | 50 | | 80 | • number of times | 45 | 70 | 12 | 70 | 10 | 67 | 291.97 | 13,139 |
| Stakeholders relations | 430 | | | | | 430 | • hours of labors | 15 | 80 | 70 | 12 | 330 | 23 | 811.32 | 12,170 |
| Technology acquisition | | | 75 | 132 | | 207 | • number of tools /technology | 70 | 2 | 30 | 4 | 95 | 55 | 808.59 | 56,602 |
| Consulting | 48 | 330 | | 54 | 890 | 1,322 | • hours of consultanting | 220 | 43 | 130 | 150 | 190 | 200 | 1416.93 | 311,726 |
| Personnel management | 220 | 122 | | | | 342 | • number of team /members | 133 | 90 | 35 | 65 | 220 | 86 | 543.72 | 72,315 |
| | | | | | | | | | | | | | Total activity costs | | 858,413 |
| | | | | | | | | | | | | | Direct costs | | 145,768 |
| | | | | | | | | | | | | | Total costs | | 1,004,181 |

Note: [a] The total activity costs are the sum of indirect labor costs, materials, equipments, tools, outsourcing costs.
[b] The cost per activity driver is equal to the total activity costs divided by the sum of activity driver quantity of program 2, 3, 5, 6, 7, 8.

# CHAPTER 6
# Conclusion and limitations

## 6.1 Conclusion

This study offers an integrated model to solve the problem of selection decisions and costs evaluation of CSR programs. This paper also intends to show how this model can be applied through the service industry such as the China Airlines company and the Far Eastern Plaza hotel. Actually, to provide a practical application of selecting CSR programs and offer a numerical example for ABC approach implementation in the airline and the international tourist hotel contributes to setting a model of CSR program selection and costs evaluation for meeting CSR goals. The result shows that the organization image criterion is the major dispatch for satisfying CSR goals of both of the airline and the international tourist hotel. However, this paper also implies that (1) the China Airline could put much effort on those chosen CSR activities including fuel and resources efficiency and safety design in transportation and service process, financial transparency, community voluntary work support, charitable and philanthropic offerings, and taking account of consumer interests and rights; (2)the Far Eastern Plaza hotel could put much effort on those chosen CSR activities including neighboring traffic improvement, non discrimination hiring, charitable and philanthropic offerings for children, offering satisfactory tourism information, stakeholders' satisfaction planning, and supplying healthy and certified local

food, which can reach its CSR and competitive advantage levels. Moreover, this integrated model is the first time to be applied to the CSR programs selection decision in service industry. It is also the first thesis to integrate scientific model and the competitive advantage concept to make CSR choice. The model can helps managers to make CSR decisions through more scientific techniques and through taking account of firms' competitive advantage, interdependent criteria, limited resources, and cost factors under different cultures and local needs. In this manner, a better decision can be made.

## 6.2 Limitations

However, this model of investigation is not without limitations. Since difference of experts' knowledge and ability for CSR programs are difficult to be measured hence we give each expert the same weight. Second, the mandated programs during ZOGP process are requested by the targeted company but not necessarily indispensable programs. Hence, there might be a paradox existed that the mandated programs are chosen after the application but have very low ANP ranks. Third, this thesis assumes that the dependent relations between CSR programs are reflected on the criteria of CSR candidates. Hence, there is only the interdependency between criteria investigated by DEMATEL.

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