應用模糊理論衡量策略執行力與利害關係群體之績效

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摘　要

本研究以知識基礎來整合邏輯與語言、學習、文化、權力以及倫理等五構面，係驅動於領導者的邏輯思考、組織成員與利害關係群體之溝通，以及不斷學習分享個人知識，透過文化力量來收集與累積知識以提升策略執行力。藉由四家台灣企業之個案分析，來建構策略執行力與利害關係群體績效的架構。研究結果發現，以知識基礎經濟的策略執行力五構面與利害關係群體績效有正面影響，不論製造業 A1 與 A2 公司以及服務業 A3 與 A4 公司的策略執行力與利害關係群體績效均呈現正面影響的關係。

關鍵詞：策略執行力、知識基礎經濟、利害關係群體績效

Applying Fuzzy Logic to Measure Strategy Implementation and Stakeholders' Performance

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Abstract

The knowledge-based of strategy implementation is the integrated five-views including logic and language, learning, culture, politics, ethics dimensions. It derives from the leaders' logical thinking, and communication from the organizations members and stakeholders. With continued learning and sharing of individual knowledge, and accumulate the collective knowledge with cultural force enhance executive of organization. A framework of strategy implementation linked to stakeholders' performance has been produced which formed the basis for four Taiwanese companies. Some of the more significant findings of the survey were that: a descriptive account leans towards with knowledge-based economy to promote strategy implementation and stakeholders' performance. The results were consistent with the positive influence between strategy implementation and stakeholders' performance as companies A1 and A2 which belonged to manufacturing industries and companies A3 and A4 which belonged to service firms, in terms of industry characteristics.

Keywords: strategy implementation, knowledge-based economy, stakeholders' performance

I. Introduction

The measurement of firms' success has conventional been limited to the satisfaction of and creation of wealth for one stakeholder namely also the shareholder, yet in reality the stakeholder is not the shareholder. The economic and social goal of the firm is to create and distribute enhanced wealth and value to all its primary stakeholder groups, without favoring one group at the expense of others [1]. Post, Preston and Sachs [2] pointed out that the stakeholder view emphasizes, an ideal stakeholder relationship produces long-term competitive advantages. Therefore, this view focuses that stakeholder connection are relational rather than transactional only. The term 'stakeholders' could be defined as any group or individual who can affect, or is affected by, the achievement of a corporation's purpose [3]. Freeman's [3] writing popularized the term "stakeholders" to describe the entities and interests that are involved in the operations of the firm, because the path-dependent nature of firm-stakeholder relation [4]. This study tries to explore how promoting strategy implementation with integrated five-views [5] can be linked to stakeholders' performance further to emphasize stakeholder playing an essential role in the firm because the key to effective implementation of stakeholder management as a core competence [2].

The ideas of critical systems thinking, which evolved in the early 1980s in the work of Jackson, Mingers, and Ulrich, are based on a critical awareness of the strengths and weaknesses of different methods and methodologies, enables the most apt ones to be selected to explain a wide range of problem issues better than a single method can [6]. Its objectives are to cultivate systemic debate on social ends and power relationships. Furthermore, it leads to the recognition of methodological pluralism [7, 8]. The pluralistic approach has proposed by, integrated five-views including the logic and language view (LLV), the learning view (LV), the cultural view (CV), the political view (PV), and the ethical view (EV) to overcome current deficiencies of the strategic planning as organizational knowledge-based resources to promote strategy implementation [5] and link to improve performance [9]. And in a wide sense is about creating mutual trust with stakeholders and a caring society [2, 5]. An organization, therefore, has to consider organizational issues of ethics and concerns about corporate social responsibility (CSR) to achieve the organization's long-term objectives [4, 10, 11, 12]. The ideas of ethics and CSR are used interchangeably that to promote ethical conduct that leads to the potential for an ethical advantage: better reputation, sales, market share and profits [13]. Instrumental stakeholder theory [14] further confirms how CSR contributes to the bottom line through its favorable influence on the firm's relationships with important stakeholders. The overall logic is that CSR (e.g., philanthropy) increases the trustworthiness of a firm and so strengthens relationships with important stakeholders (e.g., increases customer and employee satisfaction), which decreases transactions and so leads to financial benefit [4]. Toward this end, this study modifies "the stakeholders' expectation and corporate social issues matrix" [15] by fuzzy if-then rules to measure stakeholders' performance with adapting from [2] who propose three dimensions: "resource-based" including shareholders, employees and customers; "industry structure" including suppliers, competitors and management; "social political arena" including government and local communities. In turn, stakeholder roles are introduced in Table 1.

These indicators, which evaluate the performance of the organization in satisfying stakeholder expectations related to corporate social issues including economics, environment, discrimination, personnel, products, community involvement, co-opetition are illustrated in Table 2.

Table 1. Stakeholder roles

Stakeholder groups	Extended enterprise aspects/ characteristics	Roles and impacts
Resource-base		
Shareholders	Ownership; credit and financing networks; debt and equity markets	Source of capital (debt/equity); capital cost and risk management
Employees	Recruitment and training; outsourcing; contract and temporary employment	Development of human capital; team production; collaboration in the workplace
Customers	Downstream links and distribution; advertising	Reputation and brand loyalty; repeat purchase; collaborative problem- solving; new products-services
Industry structure		
Suppliers	Physical, informational, and financial links in the supply chain	Network efficiencies; collaboration on cost reduction and technology
Competitors	Collaborative ownership and management; information networks	Supplements firm's own capacity and resources; stabilizes firm market position
Management	Interacts with units of the in multiple levels and roles	Creates collaborative and/or conflicting incentives and behaviors among diverse elements of the enterprise network
Social political arena		
Government	Operating within multiple jurisodictions; multiple issues of national sovereignty; cooperation with United Nations agencies	Possibilities for adaptive integration and/or conflict
Local communities	Relationships with numerous and diverse constituencies	Mutual support and/or inter- jurisdictional conflict; "license to operate" in local venues

(Source: Adapted from [2, p.11])

Table 2. Corporate social issues

Economics: • Profitability • Market share • Customer loyalty, goodwill • Financial stability	Environment: • Pollution control • Repair of environment • Recycling of waste material
Discrimination: • Minority employment • Employment of women • Equal opportunities • Minority business partners	Personnel: • Occupational health and safety • Salary level • Training; education • Counselling
Products: • Safety • Quality • Product improvement	Community involvement: • Community activities • Public health • Education; arts
Co-opetition: • Joint ventures • Strategic alliance • Licensing • Franchising	

(Source: Adapted from [15, p.100])

Mintzberg [16] argued the core of strategic planning focuses on scientific thinking. Essentially, to practice the strategic planning of a company, it is necessary to link strategy to its people and its implementation process [17] cause the challenge in strategy implementation is motivating people to actually contribute their ideas and knowledge to make them available to others [18, 19] because explicit and tacit knowledge about stakeholders is a essential source of competitive advantage [2]. For example, the knowledge networks linkage the firm with its human resources. Knowledge about customers includes guides marketing efforts and creates opportunities for collaboration and so on.

The logic and language view focuses on logical thinking and communication of strategy implementation by sharing the knowledge, skills and experience of employees, and others in the value chain such as suppliers, distributors, and advertising agents. The learning view is concerned with emergence and generalization of ideas from people's learning process so as to launch strategy implementation. Such ideas are combined when they move across boundaries of time, space, division,

organization or stakeholders. The cultural view focuses on the style people's conduct in an organization. It integrates the habits, attitudes, behaviors and core values, shared by the individuals and groups which constitute the organization to promote strategy implementation. The political view explains the distribution and use of power and leadership throughout the organization. Bossidy and Charan noted, "This is not inspiration through exhortation or speechmaking. These leaders energize everyone by the example they set," [17, p.29] for enhancing organizational strategy implementation. The ethical view illustrates that a company has a social responsibility to do the right thing, based on Porter and Kramer's [20] four arguments: moral obligation, sustainability, license to operate, and reputation, to make people understand CSR which is very important to fulfill strategy implementation. These relationships are the potential assets that managers must manage, and they are the ultimate sources of organizational wealth [2].

This study, therefore, attempts to explore knowledge-based: integrated five-views to improve strategy implementation link to stakeholders' performance by fuzzy logic and proposes two objectives as follows:

1. Recognizing Taiwanese companies need to transform production-based economy to knowledge-based economy for promoting strategy implementation.
2. Promoting strategy implementation in line with stakeholders' performance with stakeholders' expectations and corporate social issues.

II. The Nature and Characteristics of Knowledge-based: Integrated Five-views

The research in stakeholder performance and strategy implementation will be explained first. In turn, a review of the literature on strategic management reveals that Mintzberg's [21] five Ps for strategy: plan, perspective, pattern, position, and ploy.

1. The research of stakeholder performance and strategy implementation

In the past, the success of a company was measured in economic aspect only; however, this has changed somewhat recently to include social and environmental facets [20, 22, 23]. Porter and Kramer [20] emphasized that stakeholder satisfaction has it backwards. What needs to be measured is social impact in a company for conferring a competitive advantage. Some studies pointed out that have linked positive financial performance with an organization's commitment to the social and environment issues [20]. Stakeholders' expectations were satisfied with the social and environmental practice of the organization it is inclined to enjoy the company's success [24, 25, 26].

As strategy implementation progresses, managers should be to understand internal operational data and external the business environment [19]. A successful strategy implementation has two key points: understand the management cycle that links strategy and operations, and know what tools to apply at each stage of the cycle. Therefore, a holistic sustainable business performance is the provision of long-term optimal economic, social, and environmental returns for the customers, employees, suppliers, community, shareholders and stakeholders of a company [27]. In order to reinforce managerial perceptual strategic planning, stakeholder perceptions of present business performance are measured in a stakeholder performance appraisal (SPA) to provide reliable predictors of future business performance.

Stakeholder performance appraisal was used to measure stakeholder perceptions of business performance for reinforcing managerial perceptual strategic planning [27]. In each appraisal a survey

of a representative sample of customers, employees, suppliers, community, and shareholders of a business is undertaken to measure perceptual present business performance on a 0-10 numerical rating scale based on stakeholder impressions, feelings, experiences, or what they have heard about the business, in terms of the following economic (including provision of value for money products; profitability; return on investment), social (including customer, employee, supplier, community, shareholder relationships; ethical standards) and environmental (including environmental preservation; sustainable resource use) indicators.

The performance data are averaged into social, environmental and economic performance, which are averaged into the stakeholder performance index (SPI). SPI can be considered to be a perceptual measure of present holistic sustainable business performance revealing the outcome of present stakeholder relationship marketing strategies. The CEO of the business is asked to rate their perception of business's future ROI (next 12 months) in relation to the average percentage return in the financial market on a 0-10 numerical rating scale, which provides a standardized measure of perceptual future business financial performance. The SPA results from regression analysis to show that stakeholder perceptual business sustainable business performance reflected in the SPI are reliable predictors of future reflected in ROI.

An overall assessment of how the company is performing and such measures consider a range of issues relating to the various stakeholder groups that are considered essential for the company success [23]. Based on how stakeholders are executing in relation to the company – shareholders provide finance, suppliers provide materials and services, employees create the goods and services for customers who offer the profit to give the shareholders a dividend and fund the operation and expansion of the company. It should also be noted that all these stakeholders belong to the general community that allows the corporation to exist [27].

2. From five Ps to integrated five-views

Strategy is a plan for the future as Ansoff [28] proposes in the strategic planning, which focuses on forecasting, sets objectives and allocates resources. Rather, its discipline should be derived from the minds of the people who implement strategy and who identify customers' needs and the strengths and weaknesses of resources in companies. Boddy and Paton [29] note that strategy needs to be governed by integrating different views. Strategy is a perspective which looks at an individual leader's perspective, so there is a lack of discussion about what the cognitive process of strategy-making is. Thus, the logic and language view is proposed to promote interaction of the idea and cognition of strategy in organizations. Strategy is a pattern looking at past behavior. However, the learning view is a shifting process, leading to the decomposition of strategy and incoherence. The dynamic capability approach sees strategy as a collective learning process [18] as Post et al. [2] pointed out that successful stakeholder management in strategic management also involves learning. This study suggests cohering learning and knowledge by integrating the cultural view.

Strategy is a position for the assertion of the external marketplace. However, Porter's [30] position view overemphasizes competitive, but it neglects cooperative, perspective strategies as forces of organizational culture. Strategy is a ploy to try to outwit organizational competitors. However, the macro political view points out, an organization may cooperate with competitors instead of engaging in head-to-head competition. Moreover, strategy should further consider stakeholders' expectations, as Post et al. [2] pointed out the stakeholder view emphasizes the role of stakeholder relationships in the

creation of organizational wealth.

This study argues, therefore, that strategy is also about achieving partners' expectations, as an ethical view. Various partners' expectations can interact and influence organizational decision-making, then becoming a strategy. Leaders have to consider stakeholders' expectations for pursuing more effective strategy implementation by means of stakeholders' support. To reduce political conflict, this research proposes an ethical view based on Lao-Tzu's idea as a strategy. Recently, the ethical topic has become a mainstream issue in company's strategy. For example, Chinese fake medicines poison milk powder and lead-containing toys, had impacts on consumers, and further harms companies' reputations and the image of their country. Porter and Kramer [20] warned that if a firm fails to identify evolving social effects of tomorrow, it may risk its survival in the future. Therefore, the ethical view is not only concerned with individuals and groups within organizations but also pays attention to interdependence between an organization and its environment. The interdependence between a firm and society takes two forms: a firm has impact on society by its operations, and external social situations also influence corporations. CSR interprets the obligations of the firm to the firm's stakeholders, who are affected by its organizational strategy and practices [10, 20], and many firms have identified CSR can be profitable [10]. Business ethics is a guideline principle for organizational policy and behavior; thus, an ethical idea is a precondition in order to promote strategy implementation.

3. Transforming production-based economy to knowledge-based economy by integrated five-views

Formal strategic planning, as Cummings and Daellenbach [31] note, is a sequence of steps, determining models, analysis, methods, objectives, the long term, policy and decisions that rule the acquisition and allocation of resources to fulfil organizational aims. However, strategy can emerge without any formal strategic planning, despite the finding by Glaister and Falshaw [32], and there is even less commitment to the strategy implementation.

Basically, a company tries to make a distinction with competitors, but this is simpler said than done [18] because successful strategy implementation depends on people's behavior which leaders need to identify and foster, and possibly to make specific changes in behavior. The traditional management science based on Taylor's time-and-motion studies, which aims to promote efficiency by controlling individuals' behavior and compelling employees to comply with management dictates. Rather, people's logic thinking and communication, and sharing learning of knowledge, integrating knowledge with cultural force, glamorous leadership style, and ideal interaction of stakeholders' relationships are integrated in the strategic planning.

In a knowledge-based economy, knowledge sharing is the main priority in the learning view because employees apply knowledge in their work process [18, 31] and are dependent on the trust, commitment and ideas of company employees [33] which is in line with the idea of ethical view: trust → commitment → empowerment → implementation. Innovation is the main challenge of the knowledge-based economy; it requires the exchange of ideas and depends on trust in people [33]. People's intangible activities of creating and sharing knowledge can enhance strategy implementation capabilities. Unlike the production-based economy (land, labor, and capital) knowledge is locked in people's minds and it will not be decreased by being shared with other departments and stakeholders. As Kaplan and Norton argue, "There is no greater waste than a good idea used only once. Most organizations have to go through a cultural change to shift individuals from hoarding to sharing their

local knowledge. No asset has greater potential for an organization than the collective knowledge possessed by all its employees" [18, p.63]. In other words, the highest aim in a firm should not be to satisfy shareholders but to motivate and inspire employees. Hamel and Prahalad [34] argue that emphasizing shareholder wealth encourages ethical falls rather than innovation. These ideas support the argument of this study that the strategic planning has to abandon out-dated thinking and adopt knowledge sharing (as in the learning view) through collective knowledge (the cultural view) and change organizational culture depending on the leadership style (the political view). Eventually, integration of the ethical view tries to seek stakeholders' support for launching strategy implementation. The differences between the strategic planning and the integrated five-views, from basic objective to economy-orientation, are shown in Table 3.

Table 3. Strategic planning versus integrated five-views

	Strategic planning (Production-based economy)	Integrated five-views (Knowledge-based economy)
Basic objective	Make a distinction	Make a distinction and make it happen simultaneously
Emphasis on	Strategy formulation	Strategy implementation
Starting point	Strategy orientation and resource allocation	Link strategic orientation and operation orientation to integrate resources
Role of departments	Functional distinction in different departments	Functional complementarity in different departments
Strategic budgets	With strategic budgets as a means of control	Combine planned spending procedures with innovative opportunities
Organizational infrastructure	A hierarchy of action programs	An organic flexible organizational structure for strategic moves
Economy-orientation	Production-based economy focuses on time-and-motion studies with hand.	Knowledge-based economy emphasizes on integrating sharing, creating and accumulating knowledge with hand and mind tandem.

III. Methodology

Almeida [35] launched an interpretation of single industry studies in the resource-based view. Single industry offers a particularly essential context for deeply examining resources critical to the industries and markets in question. Additionally, more in-depth case studies have been adopted to collect interview data by [36, 37]. Moreover, Yin [38] argues that case studies, as experiment, are generalizable to theoretical propositions rather than populations, while being used with multiple-case studies. Therefore, four companies including two manufacturing industries and two service firms were selected as case study in this study. A set of criteria for inclusion in the sample was formulated and is shown in Table 4.

Table 4. Sample criteria

Sample Criteria
(1) The company must be independent.
(2) The company has been running for five years at least.
(3) The company is a manufacturing industry or service firm.
(4) Manufacturing industries are divided into two groups in terms of capital and the numbers of employees; service firms are divided into two groups in terms of sales and the numbers of employees.

The details are discussed as follows.

1. The company must be independent: Independent means that the organizations can entirely decide

their own strategies rather than receive strategies from their headquarters.

2. The company has been running for five years at least: This means that the company has robust finances and has been running for a period of time. Small to medium sized enterprises are easily established but if the company lacks the capability to deal with contingencies or emergencies, they are easily closed. Therefore, this study required that these companies have been running for five years.

3. The company must be a manufacturing industry or service firm: From Directorate General of Budget, Accounting and Statistics (DGBAS) Executive Yuan, Taiwan, it can be seen that manufacturing industries and service firms account for approximately 98.68% of GDP, in 2008. Therefore, manufacturing (including hi-tech) and service firms were chosen as the focus of this study.

4. Basically, manufacturing industries possess fixed assets such as land and buildings, plant and machinery, and fixtures and fittings. In contrast, service firms do not usually possess land and buildings or plant and machinery. This study, therefore, looks at capital for manufacturing industries, and sales for service firms. Manufacturing industries with capital less than 80 million New Taiwan dollars (NT) or fewer than 200 employees are called small to medium sized enterprises. Those with more than 80 million NT and more than 200 employees are called big corporations. Service firms with sales of less than 100 million NT or fewer than 50 employees are called small to medium sized enterprises. Those with sales exceeding 100 million NT and more than 50 employees are called big corporations (Adopted from Directorate General of Budget, Accounting and Statistics, Executive Yuan, Taiwan, briefly called DGBAS Executive Yuan, Taiwan).

IV. Fuzzy logic

Crisp logic involves two values such as strategy formulation/strategy implementation and competition/cooperation. The logic has two main concepts – the concept of contradiction: a thing cannot be itself and something else; and the concept of excluding the middle: a thing is one of two mutually exclusive things. This idea has been criticized in the management field, with the advice that leaders should consider "Both/And" rather than "Either/Or." Kosko [39] points out that by definition a system boundary is neither wholly of the system nor wholly not the system. Rather, it belongs to some degree to the system. Similarly, a novel logic would integrate the some degree of strategy implementation with integrated five-views. Bojadziev and Bojadziev [40] mention that fuzzy logic includes three main elements: fuzzy sets, membership functions and production rules. Fuzzy sets have variable boundaries between 0 and 1 as a membership function. Production rules are a list of logic fuzzy if-then statements that represent human knowledge and describe the complex non-linear behavior of the system being controlled [39]. Fuzzy logic helps in describing, analysing, understanding and eventually working with the paradoxical and chaotic nature of social systems [41]. Moreover, Klir and Yuan [42] explains that one of the simplest and best estimate ways to represent uncertainty is to specify a range of possible values as a triangular fuzzy numbers (TFN). Therefore, fuzzy if-then rules and TFN were applied in this study for tackling vague language of stakeholders' performance in organizations. The strategic planning and integrated five-views have been measured at [5].

V. Evaluating of stakeholders' performance by combining corporate social issues and stakeholders' expectations

Three senior managers were asked to evaluate the organization's current implementation for each

corporate social issue using five linguistic variables: very poor (VP), poor (P), moderate (M), good (G) and very good (VG), and to measure the fulfilment of stakeholders' expectations by five linguistic variables: un-related (UNR), poor (P), moderate (M), good (G) and very good (VG) in every company. There were two inputs: corporate social issues and stakeholders' expectations have mentioned in Table 1 and Table 2, and one output: stakeholders' performance by the same membership functions, as shown in Figure 1. A decision table of if-then rules for stakeholders' performance as shown at Table 5 and are designed to produce a consequence (5×5=25), different outputs as shown in Table 6.

At the end of the fuzzy logic inference, the result is given as a linguistic variable value. To use this value for comparisons or ranking, it has to be translated into a numerical value. This step is called defuzzification. Commonly, there are three methods of defuzzification as follows.

•Mean of maximum method (MMM). This is a simple formula but not very accurate.

•Height defuzzification method (HDM). This is a generalization of the mean of maximum method.

•Centre of area (COA) method. This method of defuzzification, perhaps the most popular, is quite natural from the point of view of common sense. This method first cuts the membership function at the degree of validity of the respective term. The areas under the resulting functions of all terms are then superimposed. Balancing the resulting area gives the compromising value [44]. The COA, therefore, will be used for defuzzification in the thesis. According to Hellendoorn and Thomas [45] propose that the centroid method calculates defuzzification via the following formula (1), the defuzzification of the five membership functions is shown in formula (2).

$$\overline{S}_j = \frac{\int_{-\infty}^{\infty} x\mu_{\hat{x}_i}(x)dx}{\int_{-\infty}^{\infty} \mu_{\hat{x}_i}(x)dx} \tag{1}$$

$\mu(CIS) or \mu(SE) or \mu_{agg}(SP)$
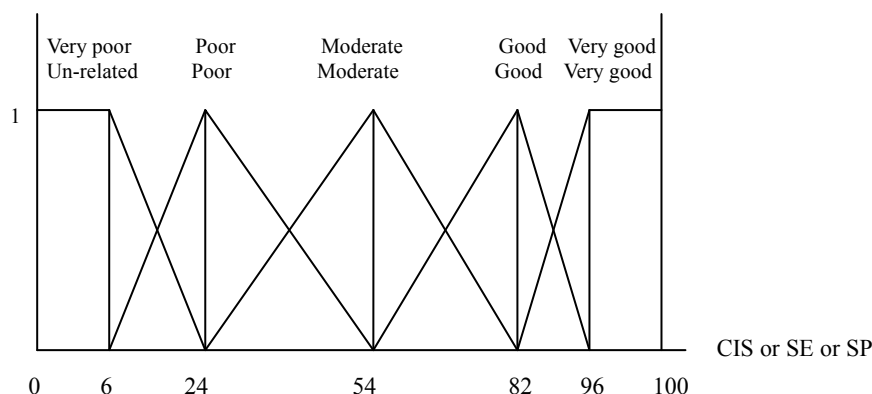
Figure 1. The membership function of CIS, SE and SP

[Note: Corporate social issues (CIS), Stakeholders' expectations (SE), Stakeholders' performance (SP)]

Table 5. Decision table: If-then rules for stakeholders' performance

stakeholders' performance		Corporate social issues				
		VP	P	M	G	VG
Stakeholders' expectations	UNP	VP	VP	P	M	M
	P	VP	P	P	M	M
	M	P	P	M	G	G
	G	M	M	G	G	VG
	VG	M	M	G	VG	VG

(Source: [43,p.376] ; [40, p.133])

Table 6. Twenty-five if-then rules for stakeholders' performance

Rules	If: Condition			Then
	Stakeholders' expectations	corporate social issues	Operator ∧ (min)	stakeholders' performance Operator ∨ (max)
Rule 1	VG	VG	Min {VG, VG}=VG1	Max{VG1, VG2, VG3}=VG
Rule 2	VG	G	Min{VG, G}=VG2	
Rule 3	G	VG	Min{G, VG}=VG3	
Rule 4	M	VG	Min{M, VG}=G1	Max{G1, G2, G3, G4, G5}=G
Rule 5	G	G	Min{G, G}=G2	
Rule 6	VG	M	Min{VG, M}=G3	
Rule 7	M	G	Min{M, G}=G4	
Rule 8	G	M	Min{G, M}=G5	
Rule 9	P	VG	Min{P, VG}=M1	Max{M1, M2, M3, M4,M5, M6, M7, M8, M9}=M
Rule 10	P	G	Min{P, G}=M2	
Rule 11	M	M	Min{M, M}=M3	
Rule 12	VG	P	Min{VG, P}=M4	
Rule 13	P	VG	Min{P, VG}=M5	
Rule 14	UNR	VG	Min{VP, VG}=M6	
Rule 15	UNR	G	Min{VP, G}=M7	
Rule 16	VG	VP	Min{VG, VP}=M8	
Rule 17	G	VP	Min{G, VP}=M9	
Rule 18	VP	M	Min{VP, M}=P1	Max{P1, P2, P3, P4, P5}=P
Rule 19	P	M	Min{P, M}=P2	
Rule 20	M	P	Min{M, P}=P3	
Rule 21	P	VP	Min{P, VP}=P4	
Rule 22	P	P	Min{P, P}=P5	
Rule 23	UNR	P	Min{VP, P}=VP1	Max{VP1, VP2, VP3}=VP
Rule 24	P	VP	Min{P, VP}=VP2	
Rule 25	UNR	VP	Min{VP, VP}=VP3	

(The centroid value of very weak×the area of very weak according to its degree) + (The centroid value of weak×the area of weak according to its degree) + (The centroid value of moderate×the area of moderate according to its degree) + (The centroid value of strong×the area of strong according to its degree) + (The centroid value of very strong×the area of very strong according to its degree) ÷ (the area of very weak according to its degree + the area of weak according to its degree + the area of moderate according to its degree + the area of strong according to its degree + the area of very strong according to its degree)　　　　　　　　　　　　　　　　　(2)

In turn, COA is used to identify the strengths or weaknesses degree of individual corporate social issues and stakeholders' expectations with formula (2) and Figure 1. Finally, if-then rules were applied following Mamdani and Assilian's [46] method and COA was used as defuzzication to produce stakeholders' performance with membership function $\mu_{agg}(SP)$.

This study defines the rule of inference as a composition conjunction-based rule expressed by operation ∧ (min). Then the outputs of the application rules, called firing, have to be aggregated in order to produce one control output with membership function $\mu_{agg}(SP)$. It is natural to use for aggregation the operator ∨ (max) for stakeholders' performance as shown in Table 6.

VI. A framework of strategic planning with people-independent and integrated five-views with people-dependent

A knowledge-based economy emphasizes people-dependent interaction to share, create, and accumulate knowledge for promoting strategy implementation. As Kaplan and Norton [47] propose, corporations can exploit their scope to create enterprise-level value from activities related to human capital development and to knowledge management such as communicating knowledge and best practices throughout diverse organizational units because intangible assets can account for 80% of an organization's value in today's knowledge economy, the corporate benefit from effective cross-unit collaboration is a huge driver of enterprise-level synergies. On the other hand, strategy planning with people-independent is belonging to production-based economy. These two dimensions can be presented in the context of the strategic planning and the integrated five-views, as shown in Table 7.

Table 7. A framework of strategy formulation with production-based economy and strategy implementation with knowledge-based

	Strategic Planning	Integrated 5-views					
		Logic and language view	Learning view	Cultural view	Political view	Ethical view	
People-independent	Production-based economy with scientific thinking, emphasizing people's efficiency						Strategy formulation
People-dependent		Knowledge-based economy with organic thinking, emphasizing people's interaction to share, create, accumulate knowledge for promoting strategic management					Strategy implementation
		Solving problems with people's dialogue	Learning and accumulating experience, know-how and skills to share people in the workplace.	Cohering people's beliefs and value to build people's trust and commitment behaviors.	Negotiating people's conflicts and facilitating to people's centripetal force to implement strategy.	Emphasizing on corporate social responsibility, especially, stakeholder management for promoting strategy implementation.	

VII. The Results of Case Study

1. Result of corporate social issues, stakeholders' expectations and stakeholders' performance

The result of case study investigation from the four companies was an evaluation of their fulfilment of corporate social issues and stakeholders' expectations for stakeholders' performance. These will be explained as follows.

Based on the literature review from [15] and [2], the stakeholders' expectation and corporate social issues matrix are combined to evaluate the stakeholders' performance with regard to each key stakeholder and for each corporate social issue. Three senior managers from every company have to apply the five linguistic variables to fill a set of ratings from 0 to 100 in the survey table of corporate social issues and stakeholders' expectations, as shown in Appendix 3. In turn, TFN are used to measure the survey data and COA is used to calculate defuzzication and further obtain evaluations of individual social issues, and individual implementation in fulfilling stakeholders' expectations. Finally, stakeholders' expectations and corporate social issues are combined to measure stakeholders'

performance with fuzzy if-then rules.

Company A1

In respect of social issues, company A1 scored better on co-opetition, "good to the degree 0.62 and very good to the degree 0.38", than on the other social issues. However, the personnel system, obtained with a rating of "moderate to the degree 0.31 good to the degree 0.69," was rated significantly lower. Company A1 seems to be effective in its treatment of the co-opetition issue. In particular, it adopts the idea of "just in time" to cooperate with its stakeholders. In relation to management of stakeholders' expectations was "good to the degree 0.88 and very good to the degree 0.12." Suppliers were "good to the degree 0.71 and very good to the degree 0.29." And customers were "good to the degree 0.92 and very good to the degree 0.08." The company seems to be effective in the treatment of management, suppliers and customers' expectations. However, treatment of government, which obtained "moderate to the degree 0.67 and good to the degree 0.33," was rated lower, suggesting a need for improvement in this aspect, as shown in Table 8.

Table 8. Stakeholders' performance for company A1

Corporate social issues items	Ratings of stakeholders' expectations								Ratings of corporate social issues
	Resource-based			Industry structure			Social political arena		
	Shareholders	Employees	Customers	Suppliers	Competitors	Management	Government	Local communities	
Economics G 0.91;VG 0.09 →0.787	M →0.03 (area=1.713) S →0.97 (area=21.0102) COA=0.755			M →0.029 (area=1.657785) S →0.971 (area=20.9765) COA=0.755			M →0.3 (area=14.805) G →0.7 (area=19.075) COA=0.668		M 0.07; G 0.93 →0.735 .
Environment G 0.08; VG 0.92 →0.787									
Discrimination M 0.26; G 0.74 →0.677									
Personnel M 0.31; G 0.69 →0.666									
Products G 1.0 →0.773									
Community involvement M 0.18; G 0.82 →0.697									
Co-opetition G 0.62; VG 0.38 →0.821									
Individual stakeholders' expectations	G 1.0 →0.773	M 0.14 G 0.86 →0.708	G 0.92; VG 0.08 →0.787	G 0.71; VG 0.29 →0.811	M 0.29 G 0.71 →0.670	G 0.88; VG 0.12 →0.791	M 0.67; G 0.33 →0.603	M 0.04; G 0.96 →0.749	Stakeholders' Performance was M 0.07; G 0.9 →0.7349
Stakeholders' expectations	M 0.1; G 0.9 →0.723								

(Note : →G 0.9 represents good to the degree 0.9).

Company A2

In regard to social issues, company A2 scored well on economics, obtaining "good to the degree 0.67 and very good to the degree 0.33". In contrast, community involvement was "poor to the degree 0.5 and moderate to the degree 0.5," and the personnel system was "moderate to the degree 0.49 and good to the degree 0.51," which needed to improve. Obviously, the company neglected community involvement, and needs to improve training and education of personnel.

In relation to local communities and employees of stakeholders' expectations were "moderate to the degree 0.43 and good to the degree 0.57," and "moderate to the degree 0.42 and good to the degree 0.58," respectively as shown in Table 9. Thus, company A2 needed to improve its performance in fulfilling local communities' and employees' expectations.

Table 9. Stakeholders' performance for company A2

Corporate social issues items	Ratings of stakeholders' expectations								Ratings of corporate social issues
	Resource-based			Industry structure			Social political arena		
	Shareholders	Employees	Customers	Suppliers	Competitors	Management	Government	Local communities	
Economics G 0.67;VG 0.33 →0.815									
Environment M 0.13;G 0.87 →0.712									
Discrimination M 0.01;G 0.99 →0.767									
Personnel M 0.49; G 0.51 →0.635	M →0.31 (area=15.2055) G→0.69 (area=18.9543) COA=0.666			M →0.24 (area=12.252) G →0.76 (area=19.7828) COA=0.681			M →0.4 (area=18.58) G →0.6 (area=17.61) COA=0.650		M 0.32; G 0.68 → 0.664
Products M 0.01; G 0.99 →0.767									
Community involvement P 0.5; M 0.5 →0.418									
Co-opetition M 0.24; G 0.76 →0.681									
Individual stakeholders' expectations	M 0.39; G 0.61 →0.652	M 0.42; G 0.58 →0.647	M 0.07; G 0.93 →0.735	M 0.31; G 0.69 →0.666	M 0.17; G 0.83 →0.699	M 0.35; G 0.65 →0.659	M 0.37; G 0.63 →0.655	M 0.43; G 0.57 →0.645	Stakeholders' performance was M 0.31; G 0.68 → 0.6659
Stakeholders' expectations	M 0.31; G 0.69 → 0.667								

(Note: →P 0.5 represents poor to the degree 0.5)

Company A3

There were significant corporate social issues in environment, rated "good to the degree 0.02 and very good to the degree 0.98" because the company is a service firm, so it is easy to control environmental influence and the leaders have a good idea about environmental protection. Conversely, there were two social issues on which more awareness is needed, because community involvement was

"moderate to the degree 0.52 and good to the degree 0.48" and co-opetition was "moderate to the degree 0.52 and good to the degree 0.48." Therefore, service firms have to pay attention to cooperating with suppliers and customers to boost their competitive advantage and they also should be involved in community activities.

In terms of stakeholders' expectations, customers obtained "good to the degree 0.67 and very good to the degree 0.33," suggesting they were better treated than others. This company needed to more aware of shareholders ("moderate to the degree 0.46 and good to the degree 0.54"), as shown in Table 10.

Table 10. Stakeholders' performance for company A3

Corporate social issues items	Ratings of stakeholders' expectations								Ratings of corporate social issues
	Resource-based			Industry structure			Social political arena		
	Shareholders	Employees	Customers	Suppliers	Competitors	Management	Government	Local communities	
Economics M 0.19; G 0.81 →0.694	M →0.11 (area=6.028) G →0.89 (area=20.7548) COA=0.719			M →0.1 (area=5.5) G →0.9 (area=20.88) COA=0.723			M →0.1 (area=5.5) G →0.9 (area=20.88) COA=0.723		M 0.14; G 0.86 →0.707
Environment G 0.02; VG 0.98 →0.953									
Discrimination M 0.03; G 0.97 →0.761									
Personnel M 0.22; G 0.78 →0.686									
Products G 0.88; VG 0.12 →0.791									
Community involvement M 0.52; G 0.48 →0.631									
Co-opetition M 0.52; G 0.48 →0.631									
Individual stakeholders' expectations	M 0.46; G 0.54 →0.640	M 0.15; G 0.85 →0.708	G 0.67; VG 0.33 →0.815	M 0.04; G 0.96 →0.479	M 0.18; G 0.82 →0.697	G 1.0 →0.773	M 0.03; G 0.97 →0.761	M 0.19; G 0.81 →0.694	Stakeholders' Performance was M 0.11; G 0.86 →0.694
Stakeholders' expectations	M 0.11; G 0.89 → 0.719.								→0.7186

Company A4

Company A4 had significant corporate social issues in products, with "good to the degree 0.57 and very good to the degree 0.43". The president of company A4 mentioned that the company always provides on time delivery of goods and maintains good product quality to customers. However, community involvement, moderate to the degree 0.75 and good to the degree 0.25, needed to be improved in this company.

In regard to stakeholders' expectations in company A4, customers, with "good to the degree 0.69 and very good to the degree 0.31," were in the best position because it could cater for the main

customers needs. However, it is worth noting that performance in relation to shareholders was rated "moderate to the degree 0.49 and good to the degree 0.51" and in relation to local communities was "moderate to the degree 0.65 and good to the degree 0.35," as shown in Table 11. This company perhaps needed to improve its strategy-making in fulfilling these stakeholders' expectations, in particular, in the shareholders' and local communities' areas.

Table 11. Stakeholders' performance for company A4

Corporate social issues items	Ratings of stakeholders' expectations								Ratings of corporate social issues
	Resource-based			Industry structure			Social political arena		
	Shareholders	Employees	Customers	Suppliers	Competitors	Management	Government	Local communities	
Economics G 0.86; VG 0.14 →0.793	M →0.17 (area=9.027) G →0.83 (area=20.3682) COA=0.699			M →0.15 (area=8.04) G →0.85 (area=20.57) COA=0.706			M →0.55 (area=23.1) G →0.45 (area=14.56) COA=0.626		M 0.12; G 0.88 → 0.715
Environment M 0.04; G 0.96 →0.749									
Discrimination M 0.15; G 0.85 →0.708									
Personnel M 0.07; G 0.93 →0.735									
Products G 0.57; VG 0.43 →0.826									
Community involvement M 0.75; G 0.25 →0.594									
Co-opetition M 0.15; G 0.85 →0.708									
Individual stakeholders' expectations	M 0.49; G 0.51 →0.635	M 0.1; G 0.9 →0.723	G 0.69; VG 0.31 →0.813	M 0.08; G 0.92 →0.731	M 0.22; G 0.78 →0.686	M 0.24; G 0.76 →0.681	M 0.45; G 0.55 →0.642	M 0.65; G 0.35 →0.611	Stakeholders' Performance was M 0.12; G 0.74 → 0.7129
Stakeholders' expectations	M 0.26; G 0.74 → 0.677								

　　Stakeholders' expectations of company A1 were "moderate to the degree 0.1 and good to the degree 0.9"; corporate social issues were "moderate to the degree 0.07 and good to the degree 0.93." Furthermore, based on if-then rules for stakeholders' performance from Table 12, this study gained that company A1 was G=0.9, G=0.1, G=0.07, and M=0.07 with operation min. In turn, to aggregate the control output presented M=0.07, G=0.9 with operation max. Defuzzification with COA, the stakeholders' performance for company A1 was 0.7349.

　　Similarly, for company A2, four rules were calculated G=0.68, G=0.31, G=0.32, and M=0.31 and aggregate the control output presented M=0.31 and G=0.68, then stakeholders' performance was 0.6659. In turn, stakeholders' performance for companies A3 and A4 were 0.7186 and 0.7129, respectively.

Table 12. The degree of the truth of the "if" parts for companies A1-A4

Company A1	
Rule 5: Min(SE=0.9, CSI=0.93)=G=0.9	Max{0.9, 0.1, 0.07}=G=0.9
Rule 7: Min(SE=0.1, CSI=0.93)=G=0.1	
Rule 8: Min(SE=0.9, CSI=0.07)=G=0.07	
Rule 11: Min(SE=0.1, CSI=0.07)=M=0.07	Max{0.07}=M=0.07
Stakeholders' performance= $\dfrac{0.533 \times 3.9165 + 0.773 \times 20.79}{3.9165 + 20.79} = 0.7349$	
Company A2	
Rule 5: Min(SE=0.69, CSI=0.68)=G=0.68	Max{0.68, 0.31, 0.32}=G=0.68
Rule 7: Min(SE=0.31, CSI=0.68)=G=0.31	
Rule 8: Min(SE=0.69, CSI=0.32)=G=0.32	
Rule 11: Min(SE=0.31, CSI=0.32)=M=0.31	Max{0.31}=M=0.31
Stakeholders' performance= $\dfrac{0.533 \times 15.19 + 0.773 \times 18.8632}{15.19 + 18.8632} = 0.6659$	
Company A3	
Rule 5: Min(SE=0.89, CSI=0.86)=G=0.86	Max{0.86, 0.11, 0.14}=G=0.86
Rule 7: Min(SE=0.11, CSI=0.86)=G=0.11	
Rule 8: Min(SE=0.89, CSI=0.14)=G=0.14	
Rule 11: Min(SE=0.11, CSI=0.14)=M=0.11	Max{0.11}=M=0.11
Stakeholders' performance= $\dfrac{0.533 \times 6.0288 + 0.773 \times 20.5798}{6.028 + 20.5798} = 0.7186$	
Company A4	
Rule 5: Min(SE=0.74, CSI=0.88)=G=0.74	Max{0.74, 0.26, 0.12}=G=0.74
Rule 7: Min(SE=0.26, CSI=0.88)=G=0.26	
Rule 8: Min(SE=0.74, CSI=0.12)=G=0.12	
Rule 11: Min(SE=0.26, CSI=0.12)=M=0.12	Max{0.12}=M=0.12
Stakeholders' performance= $\dfrac{0.533 \times 6.54 + 0.773 \times 19.5878}{6.54 + 19.5878} = 0.7129$	

In conclusion, this study found that company A1 had the best stakeholders' performance obtainment "moderate to the degree 0.07 and good to the degree 0.9 → 0.7349," locating it in the first position. The stakeholders' performance of company A3 was "moderate to the degree 0.11 and good to the degree 0.86 → 0.7186," placing it in the second position. The stakeholders' performance of company A4 was "moderate to the degree 0.12 and good to the degree 0.74 → 0.7129." The lowest ranked was company A2 with "moderate to the degree 0.31 and good to the degree 0.68 → 0.6659."

In terms of industry characteristics, this study found that there was a positive influence between strategy implementation and stakeholders' performance, as companies A1 and A2 which belonged to manufacturing industries and companies A3 and A4 which belonged to service firms as shown in Table 13.

Table 13. Comparing strategy implementation and stakeholders' performance for companies A1-A4

Company	Strategic planning	Strategy implementation	Stakeholder groups			Stakeholders' performance
			Resource-based	Industry structure	Social political arena	
A1	0.836	0.717	0.755	0.755	0.668	0.7349
A2	0.803	0.645	0.666	0.681	0.650	0.6659
A3	0.777	0.661	0.719	0.723	0.723	0.7186
A4	0.753	0.634	0.699	0.706	0.626	0.7129

(Source: The amount of strategic planning and strategy implementation came from [5])

VIII. Conclusion

These following conclusions may be drawn from the foregoing: Strategies mostly fail because they are not implemented well as Bossidy and Charan's [17] viewpoint. For Taiwanese companies has been over-concerned with taking a strategic planning, and too little concerned with strategy implementation in line with the integrated five-views as shown in Table 13. As many strategic scholars emphasized that the people processes is more important than either the strategy or operations processes [17, 19, 33]. Therefore, this study suggests that Taiwanese companies have to transform production-based economy by sharing, creating integrating and accumulating knowledge with people's hand and mind tandem for promoting strategy implementation [2, 19] as shown in Table 3 and Table 7.

Table 13 showed that strategy implementation of companies A1-A4 were 0.717, 0.645, 0.661, and 0.634, and stakeholders' performances of companies A1-A4 were 0.7349, 0.6659, 0.7186 and 0.7129, respectively. The results revealed the positive influence between strategy implementation and stakeholders' performance, which companies A1 and A2 as manufacturing industries and companies A3 and A4 as service firms, respectively. In addition it is worth mentioning that companies A1, A2 and A4 did not conduct an ideal social political arena of stakeholders' groups compared with company A3 as Smith assertion of business leaders in the U.K., should "balance and trade off the competing claims of customers, suppliers, employees, investors and the communities which it operates" [10, p.71]. Therefore, Taiwanese companies should be concerned with stakeholders' cooperation and CSR for strategy implementation successfully in line with Smith [10, p.56] advocated, "some firms may find that there is a compelling business case for making a substantial commitment CSR." For Taiwanese companies, greater attention to CSR may even be inescapable and the challenge is developing CSR initiatives consistent with a strategic purpose, deciding on their form and scope, and overcoming major potential obstacles to their strategy implementation.

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Appendix 1: Five linguistic variables for measuring the stakeholders'
performance with stakeholders' performance and corporate social
issues

Senior managers	Very poor	Poor	Moderate	Good	Very good
(A1)	(0,0,20)	(16,16,40)	(38,53,68)	(65,90,90)	(85,100,100)
(A1)	(0,0,18)	(15,15,40)	(35,53,70)	(67,90,90)	(88,100,100)
(A1)	(0,0,15)	(14,14,37)	(38,54,70)	(68,90,90)	(89,100,100)
(A2)	(0,0,19)	(18,18,39)	(40,55,69)	(70,90,90)	(89,100,100)
(A2)	(0,0,20)	(21,21,40)	(42,56,70)	(72,90,90)	(91,100,100)
(A2)	(0,0,19)	(18,18,39)	(40,55,69)	(70,90,90)	(89,100,100)
(A3)	(0,0,15)	(14,14,39)	(37,54,71)	(70,90,90)	(88,100,100)
(A3)	(0,0,18)	(15,15,40)	(38,53,68)	(65,90,90)	(89,100,100)
(A3)	(0,0,17)	(15,15,39)	(37,51,65)	(64,88,88)	(85,100,100)
(A4)	(0,0,20)	(18,18,40)	(38,53,68)	(65,88,88)	(85,100,100)
(A4)	(0,0,18)	(15,15,40)	(35,53,70)	(68,90,90)	(88,100,100)
(A4)	(0,0,15)	(14,14,37)	(35,53,70)	(65,88,88)	(88,100,100)
Aggregated average expression	(0,0,18)	(16,16,39)	(38,54,69)	(67,90,90)	(88,100,100)
Defuzzification	18/3 = 6	(16+16+39)/3 =24	(38+54+69)/3 =54	(67+90+90)/3 =82	(88+100+100)/3 =96

Appendix 2: Operation Stakeholder Performance with Stakeholders Expectations and Corporate Social Issues

Company A1:

<u>Corporate Social Issues</u>

(1) Economics= (68+88+94)/3= 83.3

The degree of very good level is $\dfrac{83.3-82}{96-82}=\dfrac{X}{1}\to X=0.09$,

The degree of good level is 1-0.09=0.91

One base in the area of good level is $\dfrac{X}{28}=\dfrac{0.09}{1}\to X=2.52$ ， 2.52+1.3= 3.82

The other base in the area of good level is 96-54= 42

The area of good level $=\dfrac{\langle 3.82+42\rangle\times 0.91}{2}=20.8481$

One base in the area of very good level is （100-96）+（96-83.3）=16.7

The other base in the area of very good level is 100-82= 18

The area of very good level $=\dfrac{\langle 16.7+18\rangle\times 0.09}{2}=1.5615$

Applying the formula (2) of COA= (The centroid value of very poor×the area of very poor according to its degree) + (The centroid value of poor×the area of poor according to its degree) + (The centroid value of moderate×the area of moderate according to its degree) + (The centroid value of good×the area of good according to its degree) + (The centroid value of very good×the area of very good according to its degree) ÷ (the area of very poor according to its degree + the area of poor according to its degree + the area of moderate according to its degree + the area of good according to its degree + the area of very good according to its degree)

$\therefore COA=\dfrac{0+0+0+20.8481\times 0.773+1.5615\times 0.96688}{0+0+0+20.8481+1.5615}=0.787$

Where the operation of centroid value including 0.773 and 0.96688, please see Appendix 4.

Similarly, the other operation values are the same as above:

(2) Environment= 83.3,　 $\therefore$ COA= 0.787

(3) Discrimination= 74.7

$\dfrac{20.7}{28}=\dfrac{X}{1}\to X=0.74$ ， 1-0.74= 0.26 ， $\dfrac{X}{30}=\dfrac{0.74}{1}\to X=22.2$

The area of moderate level $=\dfrac{\langle 22.2+20.7+58\rangle\times 0.26}{2}=13.117$

$$\frac{X}{14} = \frac{0.26}{1} \rightarrow X = 3.64$$

$$\text{The area of good level} = \frac{\langle 3.64 + 7.3 + 42 \rangle \times 0.74}{2} = 19.5878$$

$$\therefore COA = \frac{\langle 0.533 \times 13.117 + 0.773 \times 19.5878 \rangle}{13.117 + 19.5878} = 0.677$$

(4) Personnel= 73.3

$$\frac{19.3}{28} = \frac{X}{1} \rightarrow X = 0.69 \text{ , } 1\text{-}0.69 = 0.31 \text{ , } \frac{X}{30} = \frac{0.69}{1} \rightarrow X = 20.7$$

$$\text{The area of moderate level} = \frac{\langle 20.7 + 19.3 + 58 \rangle \times 0.31}{2} = 15.19$$

$$\frac{X}{14} = \frac{0.31}{1} \rightarrow X = 4.34$$

$$\text{The area of good level} = \frac{\langle 4.34 + 8.7 + 42 \rangle \times 0.69}{2} = 18.9888$$

$$\therefore COA = \frac{\langle 0.533 \times 15.19 + 0.773 \times 18.9888 \rangle}{15.19 + 18.9888} = 0.666$$

(5) Products= 82 ，　　　$\frac{42 \times 1}{2} = 21 \rightarrow \therefore COA = \frac{21 \times 0.773}{21} = 0.773$

(6) Community= 77 ，

$$\frac{23}{28} = \frac{X}{1} \rightarrow X = 0.82 \text{ , } 1\text{-}0.82 = 0.18 \text{ , } \frac{X}{30} = \frac{0.82}{1} \rightarrow X = 24.6$$

$$\text{The area of moderate level} = \frac{\langle 24.6 + 23 + 58 \rangle \times 0.18}{2} = 9.504$$

$$\frac{0.18}{1} = \frac{X}{14} \rightarrow X = 2.52$$

$$\text{The area of good level} = \frac{\langle 2.52 + 5 + 42 \rangle \times 0.82}{2} = 20.3032$$

$$\therefore COA = \frac{\langle 0.533 \times 9.504 + 0.773 \times 20.3032 \rangle}{9.504 + 20.3032} = 0.697$$

(7) Co-opetition= 87.3 ，

$$\frac{8.7}{14} = \frac{X}{1} \rightarrow X = 0.62 \text{ , } 1\text{-}0.62 = 0.38 \text{ , } \frac{X}{28} = \frac{0.38}{1} \rightarrow X = 10.64$$

$$\text{The area of Good level} = \frac{\langle 10.64 + 5.3 + 42 \rangle \times 0.62}{2} = 17.9614$$

$$\text{The area of very good level} = \frac{\langle 8.7 + 4 + 18 \rangle \times 0.38}{2} = 5.833$$

$$\therefore COA = \frac{\langle 0.773 \times 17.9614 + 0.96688 \times 5.833 \rangle}{17.9614 + 5.833} = 0.821$$

Based on above data of (1) (2) (3) (4) (5) (6) (7) operate the **corporate social issues** value. The degree of moderate level is 0.07; the degree of good level is 0.93, further based on the area from moderate level and good level

$$\therefore \text{COA of } \textbf{\underline{corporate social issues}} = \frac{0.533 \times 3.9165 + 0.773 \times 20.79}{24.7065} = 0.735 .$$

Stakeholders Expectations

Resource-based

(1) Shareholders= 82 ，　∴ COA= 0.773

(2) Employee= 78 ，　　　∴ COA= 0.708

(3) Customers= 83.3 ，　∴ COA= 0.787

Based on above data of (1) (2) (3) operate the *resource-based* value

$$(83.3+82+78)/3=81.1 \rightarrow \frac{82-81.1}{82-54} = \frac{X}{1} \rightarrow 28X = 0.9 \qquad \therefore X = 0.03,$$

$$1-0.03=0.97 \rightarrow \frac{0.97}{1} = \frac{X}{30} \rightarrow X = 29.1 ,$$

So, the area of moderate level$= \dfrac{(29.1 + 27.1 + 58) \times 0.03}{2} = 1.713$

$\qquad X/98-82 = 0.03/1 \rightarrow X=0.42 ，\qquad 82-81.1 = 0.9$

So, the area of good level$= \dfrac{(0.42 + 0.9 + 42) \times 0.97}{2} = 21.0102$

$$\therefore \text{COA of } \textbf{\textit{resource-based}} = \frac{0.533 \times 1.713 + 0.773 \times 21.0120}{22.7232} = 0.755$$

Industry structure

(4)Suppliers= 86 ，　　　∴ COA= 0.811

(5) Competitors= 74 ，　∴ COA= 0.670

(6) Management= 83.7 ，∴ COA= 0.791

Based on above data of (4) (5) (6) operate the i*ndustry structure* value

$$(86+83.7+74)/3=81.2 \rightarrow \frac{0.8}{28} = \frac{X}{1} \rightarrow X = 0.029$$

$$1-0.029=0.971 \rightarrow \frac{0.971}{1} = \frac{X}{30} \rightarrow X = 29.13 , \quad 81.2-54=27.2$$

So, the area of moderate level$= \dfrac{(29.13 + 27.2 + 58) \times 0.029}{2} = 1.657785$

$\qquad 0.029/1=X/14 \rightarrow X=0.406 ，\qquad 82-81.2=0.8$

The area of good level= $\dfrac{(0.8 + 0.406 + 42) \times 0.971}{2} = 20.9765$

$\therefore$ COA of *industry structure* = $\dfrac{1.657785 \times 0.533 + 20.9765 \times 0.773}{22.634285} = 0.755$

Social political arena

(7) Government= 66.3， $\therefore$ COA= 0.603

(8) Local communities= 81， $\therefore$ COA= 0.749

Based on above data of (7) (8) operate the *social political arena* value

$(81+66.3)/2=73.7 \rightarrow \dfrac{82 - 73.7}{28} = \dfrac{X}{1} \rightarrow X = 0.3$

$1-0.3=0.7 \rightarrow \dfrac{0.7}{1} = \dfrac{X}{30} \rightarrow X = 21$，   73.7-54= 19.7

So, the area of moderate level= $\dfrac{(21 + 19.7 + 58) \times 0.3}{2} = 14.805$

$X/14=0.3/1 \rightarrow X=4.2$，   82-73.7=8.3

The area of good level= $\dfrac{(4.2 + 8.3 + 4.2) \times 0.7}{2} = 19.075$

$\therefore$ COA of *social political arena* = $\dfrac{14.805 \times 0.533 + 19.075 \times 0.773}{33.88} = 0.668$

Based on above data of *resource-based, industry structure* and *social political arena*, namely, (1) (2) (3) (4) (5) (6) (7) (8) operate the stakeholders' expectations value. Therefore, the degree of moderate level is 0.1; the degree of good level is 0.9, further based on the area from moderate level and good level

$\therefore$ COA of **stakeholders expectations**= 0.723.

Finally, we use the data of **corporate social issues** and **stakeholders expectations** to measure stakeholders' performance, four rules are fired, as shown in the matrix as follows:

Stakeholders' performance		Corporate social issues	
		M=0.07	G=0.93
Stakeholders' expectations	M=0.1	Rule 11= Min(M=0.1, M=0.07) $\rightarrow$ M=0.07	Rule 7= Min(M=0.1, G=0.93) $\rightarrow$ G=0.1
	G=0.9	Rule 8 = Min(G=0.9, M=0.07) $\rightarrow$ G=0.07	Rule 5= Min(G=0.9, G=0.93) $\rightarrow$ G=0.9

Based on above matrix, stakeholders' performance can be measured with max {M=0.07; G=0.9, 0.1, 0.07} $\rightarrow$ **Stakeholders' performance** is {M=0.07; G=0.9}$\rightarrow$
$\therefore$ COA= 0.7349.

Appendix 3: The Survey Table of Corporate Social Issues and Stakeholders' Expectations

The survey table for measurement of corporate social issues

	Very poor	Poor	Moderate	Good	Very good
Economics:					
Profitability	——	——	——	——	——
Market share	——	——	——	——	——
Customer loyalty and goodwill	——	——	——	——	——
Financial stability	——	——	——	——	——
Environment:					
Pollution control	——	——	——	——	——
Repair of environment	——	——	——	——	——
Recycling of waste material	——	——	——	——	——
Discrimination:					
Minority employment	——	——	——	——	——
Employment of women	——	——	——	——	——
Equal opportunities	——	——	——	——	——
Minority business partners	——	——	——	——	——
Personnel:					
Occupational health and safety	——	——	——	——	——
Salary level	——	——	——	——	——
Training; education	——	——	——	——	——
Counseling	——	——	——	——	——
Products:					
Safety	——	——	——	——	——
Quality	——	——	——	——	——
Product improvement	——	——	——	——	——
Community involvement:					
Community activities	——	——	——	——	——
Public health	——	——	——	——	——
Education; arts	——	——	——	——	——
Co-opetition:					
Joint ventures	——	——	——	——	——
Strategic alliance	——	——	——	——	——
Licensing	——	——	——	——	——
Franchising					

The survey table for measurement of stakeholders' expectations

	Un-related	Poor	Moderate	Good	Very good
Suppliers:					
Economics	——	——	——	——	——
Environment	——	——	——	——	——
Discrimination	——	——	——	——	——
Personnel	——	——	——	——	——
Products	——	——	——	——	——
Community involvement	——	——	——	——	——
Co-opetition	——	——	——	——	——
Management:					
Economics	——	——	——	——	——
Environment	——	——	——	——	——
Discrimination	——	——	——	——	——
Personnel	——	——	——	——	——
Products	——	——	——	——	——
Community involvement	——	——	——	——	——
Co-opetition	——	——	——	——	——
Local communication:					
Economics	——	——	——	——	——
Environment	——	——	——	——	——
Discrimination	——	——	——	——	——
Personnel	——	——	——	——	——
Products	——	——	——	——	——
Community involvement	——	——	——	——	——
Co-opetition	——	——	——	——	——
Government:					
Economics	——	——	——	——	——
Environment	——	——	——	——	——
Discrimination	——	——	——	——	——
Personnel	——	——	——	——	——
Products	——	——	——	——	——
Community involvement	——	——	——	——	——
Co-opetition	——	——	——	——	——
Customers:					
Economics	——	——	——	——	——
Environment	——	——	——	——	——
Discrimination	——	——	——	——	——

Personnel	——	——	——	——	——
Products	——	——	——	——	——
Community involvement	——	——	——	——	——
Co-opetition	——	——	——	——	——
Shareholders:					
Economics	——	——	——	——	——
Environment	——	——	——	——	——
Discrimination	——	——	——	——	——
Personnel	——	——	——	——	——
Products	——	——	——	——	——
Community involvement	——	——	——	——	——
Co-opetition	——	——	——	——	——
Employees:	——	——	——	——	——
Economics	——	——	——	——	——
Environment	——	——	——	——	——
Discrimination	——	——	——	——	——
Personnel	——	——	——	——	——
Products	——	——	——	——	——
Community involvement	——	——	——	——	——
Co-opetition					
Competitors:					
Economics	——	——	——	——	——
Environment	——	——	——	——	——
Discrimination	——	——	——	——	——
Personnel	——	——	——	——	——
Products	——	——	——	——	——
Community involvement	——	——	——	——	——
Co-opetition	——	——	——	——	——

Appendix 4: The operation of centroid value and trapezoid area
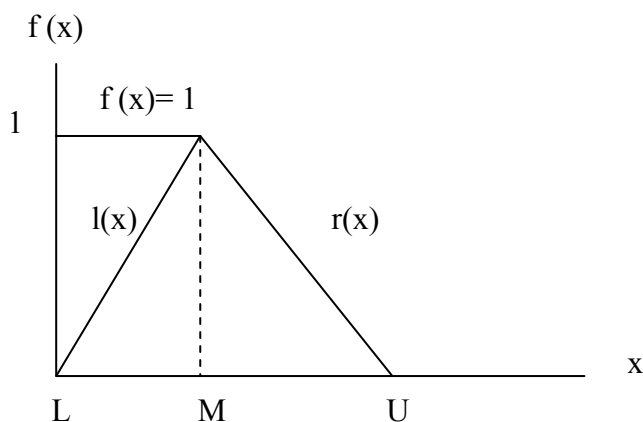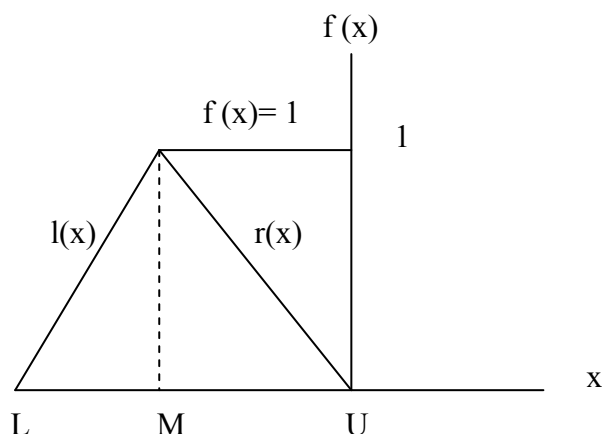
(1) The operation of centroid value

Figure 1 The membership functions of trapezoidal fuzzy numbers
for centroid value

If we set $l(x) = f(x) = \dfrac{x-L}{M-L}$; $r(x) = f(x) = \dfrac{U-x}{U-M}$, then the centroid value of trapezoidal fuzzy numbers as follows:

$$\frac{\int_L^M x \times (1)dx + \int_M^U x(\frac{U-x}{U-M})dx}{\int_L^M (1)dx + \int_M^U (\frac{U-x}{U-M})dx} = \frac{\left.\frac{x^2}{x}\right|_L^M + \frac{1}{U-M}\left[\frac{x^2}{2}U - \frac{x^3}{3}\right]_M^U}{(M-L) + \frac{1}{U-M}\left[U \times x - \frac{x^2}{2}\right]_M^U}$$

$$= \frac{\frac{1}{2}\left[M^2 - L^2\right] + \frac{1}{U-M}\left[(\frac{U^3}{2} - \frac{U^3}{3}) - (\frac{M^2 \times U}{2} - \frac{M^3}{3})\right]}{(M-L) + \frac{1}{U-M}\left[(U^2 - \frac{U^2}{2}) - (U \times M - \frac{M^2}{2})\right]}$$

When L=0, M= 0.25, U= 0.5, then the centroid value of trapezoidal fuzzy numbers is equal to

$$\frac{\frac{1}{2}\left[0.25^2 - 0^2\right] + \frac{1}{0.5-0.25}\left[(\frac{0.5^3}{2} - \frac{0.5^3}{3}) - (\frac{0.25^2 \times 0.5}{2} - \frac{0.25^3}{3})\right]}{(0.25-0) + \frac{1}{0.5-0.25}\left[(0.5^2 - \frac{0.5^2}{2}) - (0.5 \times 0.25 - \frac{0.25^2}{2})\right]}$$

$$= \frac{0.03125 + 4(0.010405)}{0.25 + 4(0.03125)} = 0.19432 \approx 0.19$$

Figure 2 The membership functions of trapezoidal fuzzy numbers
for centroid value

If we set $l(x) = f(x) = \dfrac{x-L}{M-L}$; $r(x) = f(x) = \dfrac{U-x}{U-M}$, then the centroid value of trapezoidal fuzzy numbers as follows:

$$\frac{\int_L^M x \times (\frac{x-L}{M-L})dx + \int_M^U x \times (1)dx}{\int_L^M (\frac{x-L}{M-L})dx + \int_M^U (1)dx} = \frac{\frac{1}{M-L}\left[\frac{x^3}{3} - \frac{L \times x^2}{2}\right]_L^M + \frac{x^2}{2}\Big]_M^U}{\frac{1}{M-L}\left[\frac{x^2}{2} - L \times x\right]_L^M + (U-M)}$$

$$= \frac{\frac{1}{M-L}\left[(\frac{M^3}{3} - \frac{M^2 \times L}{2}) - (\frac{L^3}{3} - \frac{L^3}{2})\right] + \frac{1}{2}(U^2 - M^2)}{\frac{1}{M-L}\left[(\frac{M^2}{2} - L \times M) - (\frac{L^2}{2} - L^2)\right] + (U-M)}$$
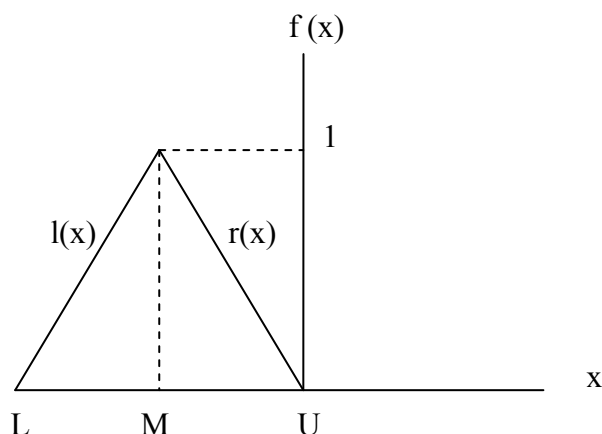
When L=0.5, M= 0.75, U= 1, then the centroid value of trapezoidal fuzzy numbers is equal to

$$\frac{\frac{1}{0.75-0.5}\left[(\frac{0.75^3}{3} - \frac{0.75^3 \times 0.5}{2}) - (\frac{0.5^3}{3} - \frac{0.5^3}{2})\right] + \frac{1}{2}(1^2 - 0.75^2)}{\frac{1}{0.75-0.5}\left[(\frac{0.75^2}{2} - 0.5 \times 0.75) - (\frac{0.5^2}{2} - 0.5^2)\right] + (1-0.75)}$$

$$= \frac{(0.083336) + (0.21875)}{0.125 + 0.25} = \frac{0.302086}{0.375} = 0.80556 \approx 0.81$$

Similarly, when L=0.7, M= 0.91, U= 1, then the centroid value of trapezoidal fuzzy numbers is equal to =0.93237 ≒ 0.93

When L= 0.25, M=0.5, U= 0.75, then the centroid value of triangular fuzzy numbers as the average = (L+M+U)/3 = (0.25+0.5+0.75)/3 = 0.5

(2) The operation of trapezoid area

$$\frac{0.28}{1} = \frac{0.75 - x}{0.25} \rightarrow x = 0.68; \quad \frac{0.28}{1} = \frac{y - 0.25}{0.25} \rightarrow y = 0.32; \quad \frac{zt}{0.25} = \frac{0.28}{1} \rightarrow zt = 0.07$$

Trapezoid abcd area is 0.1204= [(0.18+0.18) + (0.75-0.25)]×0.28×0.5;

Trapezoid wzrs area is 0.2952= [(0.25+0.07)+0.5]× 0.72×0.5 as shown as follows: