Using integrated hierarchical model to assess corporate social responsibility

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Abstract: - To face with the environmental problems, the corporation social responsibility (CSR) is necessary to realize. However, CSR realizing exists many influences form economic, society, and environmental dimensions. This study focus on environmental aspect to draw out the way for company can consider their capability to realize CSR efficiently. This study use the interpretive structure modeling (ISM) to understand the interactive relations of criteria which help companies do environmental CSR efficiently and then set up the hierarchical structure for them to help recognize the steps and the priority criteria for efficient environment CSR realizing. Driving and dependence power also use in this study to analyze deeper about the significant role of each criterion in the hierarchical structure. This study includes seven criteria to consider.

Keywords: - Corporation social responsibility (CSR), driving and dependence power (DDPA), interpretive structure modeling (ISM), efficiency, environment.

1. Introduction

Natural capital is the priceless asset of human society. It provides the materials for manufacturing activities, livings, entertainments. Abusively, human exploited them result in the natural resource depletion. The human abusive exploiting is the activities of three different, closely connected, mutually influencing main spheres: government, the business sector, and the citizens and their organizations (NGOs). Although governmental power is at the centre of media attention, it is moreover the business sector which could potential play the most important role in making a move toward greater sustainability [1][2][3][4]. The dimensions of sustainability comprise being responsible for future generations by sustaining a certain state of natural resources and providing essential functions to human society [5]. It aim to the greater sustainability for the level of natural resources in the future, the corporation must have the responsible for green manufacturing which limit the damage for environment. The business sector is supposed to go beyond its profit-oriented commercial activities and increase the well-being of the community, thereby making the world a better place [6], i.e. the corporations should play a deeper (non-economic) role in society than only producing goods and making profits or the corporations need have the responsibility for society.

Corporate social responsibility (CSR) performs via three aspects: economic, social, and environmental. These factors have the mutually influencing. Economic activity influences the natural environment directly by taking inputs form and generating output into the environment and indirectly through society in 2 ways: (1) by influencing the ability to improve eco-efficiency, and (2) by determining attitudes toward consumption and natural capital so that natural preservation becomes a priority in the future [5]. Moreover, the technological innovation which is optimized to contribute to resource and energy conservation generate the rebound effect on both micro and macro levels [7].

On the micro, the total materials for the company's production is increase and the number of

land and water area a human population requires producing the resources it consumes absorb its waste are bigger and bigger under environmental optimization [5]. In this context, the environment aspect is affected from the rest of dimensions, and need preserving to reach the sustainable development. Thus, three dimensions should be balanced by focusing the activities in CSR. The objective of this study aims to compose a hierarchical structure for CSR in environmental and uses DDPA mapping the analytical result into quadrants for their strategic plan for the company consider whether their CSR process can be realized efficiently.

1.1 Contributions

Few studies have adopted such a hybrid method to model and evaluate the CSR in environmental in academic and practical field. This study presents multi- criteria that are sufficiently general and it can be applied in various study settings. The unique points of this study involved linguistic perceptions to compose a hierarchical structure and further decompose the group of criteria into a visual map for analysis in interactive relations.

Moreover, though the sustainable development concepts exist some limitations as well as have a lot of methodologies to measure the strong ecological sustainability such as some researchers can determine a few of criteria to follow for ecological sustainability, in the contrary, some authors state that it is difficult to bring out the exact conditions because of the localism of the company and the scientific uncertainty concerning natural resources [5], this study makes the effort to demonstrate the important and critical environmental protection and gives some corporate social responsibilities for the environmental protection; to recommend a hierarchical framework on which the corporation can depend on realizing CSR in environment efficiently and analyze the interactive relations among those criteria.

The study begins with a brief introduction of the CSR definition, environment issue, and study objectives. Section 2 follows a literature discussion of the CSR and the related literature. Section 3 presents the proposed hybrid method, specifically, the modeling technique uses ISM. Section 4 presents the result of the interactive relations among criteria and the modeling of this inter-relationship. Section 5 concludes with a summary of the findings of the

method as well as recommendations for its further development and practical application.

2. Literature review

Literature review comprises four parts. Beginning with the mentions about corporation social responsibility (CSR). Part two is the environmental issues. The next part is the proposed method. Seven criteria are proposed in the last part of this chapter.

2.1 Corporation social responsibilities:

According to the concept in Europe, corporation social responsibilities (CSR) are the expectations from citizens, consumers, public authorities and investors in the context of globalization and large scale industrial change, investment decisions considering social interest, the increased concern about the damage caused by economic activity to environment, and transparency of business activities brought about by the media and modern information and communication technologies [8]. Kytle and Ruggie [9] demonstrated CSR in the ethical side of behavior that CSR comprises on what company does with their profitability.

It is also the way firms integrate social environmental and economic concerns into their values, culture, decision making, strategy and operations in a transparent and accountable manner and thereby establish better practices within the firm, create wealth and improve society in the Canadian business's definition [10]. The most common term used in addition to CSR is corporate sustainability which focuses on long-run shareholder value by incorporating principles in nine areas: ethics, governance, transparency, business relationships, financial return, community involvement, product value, employment practices, and environmental protection [11]. The other definition of CSR is as a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis [12].

2.2 Environmental issue

Porter and Johnson [13] found that covering review articles discuss the effects to ecosystems in Europe [14] [15] and for both the eastern US [16] [17] [18]

and the western US [19] through a variety of ecosystem types. Human life now is supporting the climatic change, exhaustion of natural capital and the environmental retrogression as well. Although there are many opportunities for mitigating resource depletion and environmental degradation through the substitution of manufactured capital, economic production is still a work process that uses energy to transform materials into goods and services [5].

For the continuously growing, the intensity of human's activity is now facing the material limits of human's living space [20]. To response to this contemporary context, human need to preserve and maintain all planetary exists for aiming to the sustainable development. The environmental aspect is very important because it's basic for human surviving and activities. Comprehensive reviewing, the business and production activities are the factors which affect strongly on environment directly and indirectly.

The fledgling environmental movement was demanding a reckoning for the pollution and waste of resources that had characterized industry since the beginning of the Industrial Revolution. Therefore, following Tseng [21] beside the social and the economic aspects of firm's activities, the environment aspect is emphasized within the current understanding of sustainable development. Intending to the sustainable development, the business sector need do CSR efficiently because according to Málovics and his colleague [5] the core idea of CSR concept emphasis the role of business sector in non-economic than only producing merchandise and profit making. The CSR activities are considered effectively contribute to the conservation of natural resource and their vital service [5]. Up to now, many studies have used different methods to measure the efficiency in CSR realizing of company.

2.3 Propose method
Interpretive structure modeling (ISM) is the method which gives some criteria related to the efficiency in CSR realizing and then investigates the inter-relationship between them. ISM is an interactive learning process in which a set of different and directly related elements is structured into a comprehensive systemic model [22] [23]. However, [24] [25] [26] used absolute and relative measures to survey corporate contribution to sustainability.

Absolute measure focuses on effectiveness or on the absolute resource using [5].

Following the absolute measure, the efficiency of CSR realizing can determined by the value added by the company, defined as benefits minus internal and external costs. Differently, relative measure researches efficiency which compares the value created by the company with the resources used or environmental damage, or measure amount of reducing of environmental input consumption while produce the same amount of product [5].

However, efficient doing environmental CSR exists some influences around it because according to [5], beside the business sector's attempt, government and citizens are two more main pheres contribute the natural resource depletion. Hence, it is necessary to propose some criteria and understand the interactive relationship among them to help corporations appraise their capability toward the efficient environmental CSR running. But both of above measures don't give the criteria affect to the efficiency of CSR realizing. Furthermore, in the present studies, non-studies use ISM method to analyze the in the relationship between the criteria affect on the CSR in general and on the CSR's environmental aspect in particular. Therefore, this study wants to use the ISM method to interpret the mutual relationship of the proposed criteria for the CSR's efficient realizing modeling.

3. Propose criteria
Sustainable development can be defined in strong sustainability, which assume that natural capital cannot (or only to a limited extent) be substituted by man-made capital and may suffer irreversible harm, thus it is necessary to maintain not only the aggregate but also the amount of available natural capital [27] [28]. One the business sector can maintain the man-made capital, it also maintain the competitiveness in privately and the economic development in generally. Málovics et al. [5] presented the corporations can reach the sustainable development by the efficient protection of environment and company competitive capability.

The competitive increasing derived from the technological innovation and guide to the economic development. This consumption expanding makes the input increase to satisfy consumer demands. Human beings basically use improved technological

efficiency to increase comfort and improve quality of life, not to reduce resource consumption.

The natural capital exploited more and the social life quality will be lessened dramatically. Furthermore, in order to innovate the technology and protect environment by the emission treatment, the corporation need pay a large of money for the research to apply them. Cost raise will increase the product price [29].

Moreover, companies have to meet two conflict requirements: (1) selling at low price and (2) being environmentally and socially conscious and if a socially responsible company does not lower its prices, it will most likely be outrun by its competitor as well as result in the competitive advantage decreasing of this enterprises. Galbreath [30] stated that examining CSR in the context of firm strategy is both possible and increasingly necessary to developing competitive advantage in the current environment.

According to the concept of Bertrand Collomb, the president of World business council of sustainable development (WBCSD), only the business sector can find solutions for sustainable development because government do not produce good, and the environment and social investment are the necessary tools for the successful business[31]. Following to Kytle [9], the director of the Hungarian Business Council for Sustainable Development defined the main motivating factor of the business sector is profit, and the management of a sustainable company regards environment and social investment as a business opportunity. Researchers seem to agree that both business and non-business (Ethical) aspects appear due to the implementation of CSR measures, but that environment and social investment are mainly business driven [32][33][34][35][36][37][38]. So, how can the company realize CSR in environment efficiently or do CSR to protect environment and company's profit?

This study tries to draw out some criteria which can affect on the environment protection and the company' profit in the conceptual identification. The corporations can depend on these variables to appraise whether their CSR realizing in environment can be efficient or not. These criteria will be integrated in the relationship by using the interpretive structural modeling (ISM) method. In this study, it exist seven criteria for the efficient CSR estimation environment: (1) Relevant population rate, (2) Economic development maintenance, (3) Consistent

consumption, (4) Maintaining environmental functions, (5) Clean production, (6) Technological innovation, (7) Company reputation saving. All of variables are depicted in following chart:
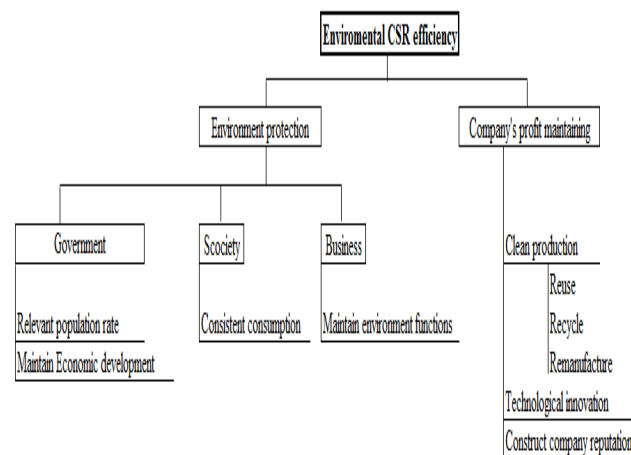

Fig. 1. The criteria of CSR in environment (model 1)

1. Relevant population rate

The high rate of consumption is partly stemmed from the high population rate. One person has many consumer demands for his or her own living. More demands people have, more consumption people do, and more emissions people eliminate and discharge. High population rate also influence on the economic development because of the lack of satisfaction of human consumption and living needs.

Consumption driven population dynamics (CDPD) begins by assuming that the physiological act of reproduction is predictably dependent upon the consumption of resources to support growth [39]. To deepen the consumption base line of inquiry through an investigation base on the ecological footprint, if the population variable is used to weight the data, the result become all the more clear-cut, so as to consider also the total pressure that each country impose on global [40].

The study on population and the resource-environment by the consumption may contribute to the further cognition about their correlations and provide the policy references for natural resources use and environmental protection [41]. Increase in population would result in more energy consumption and degrade the environment and public health [42].

2.   Economic development maintenance

The environment must be valued as an integral part of the economic process and not treated as a free good [43]. The present continuous worldwide economic growth does not help to solve environment and social problems, and instead seems to deepen them [44] [45]. But the economic development also very important with companies. Companies have to be economically sustainable, they do business in order to earn profit and create wealth, so their perceptions of how to achieve sustainable development will always be influenced by their overall business strategy. The impacts of economic growth on energy consumption and on environment and public health are unsymmetrical [42].

3.   Relevant consumption:

The reduction of consumption is necessary to achieve sustainability [46] [47]. The main reasons for environmental damages are the wasteful consumption patterns of developed countries' consumers and the increasing push towards new developing markets [48]. Sustainable consumption is subsumed within sustainable production or resource efficiency [2]. The growing of the Ecological Footprint (EF) ratio which measure how much land and water area a human population requires show us that a society consumes an increasing amount of natural resources and depletes these resources to an ever-greater extent [5]. Thus it needs develop the consumer's consciousness about the correspondence in the consumption activities.

4.   Maintaining environmental functions:

Environmental function has been defined as the provision of environmental goods or services by the natural environment for human use [32] [49]. Ekins[50] stated that the environment function is divided to two kinds of functions which are call the functions for (which provide direct benefits for humans) and the functions of (which maintain the basic integrity of natural system in general and ecosystem in particular). The continued operation of the "functions of" the environment is a prerequisite for the continued performance of many of the "functions for" humans [50]. This author also assumes that the maintenance of environmental functions related to human health is one of the basic criteria for environmental sustainability.

5.   Clean production:

Clean production includes reuse, recycle, and remanufacture. The primary goal to improve our environment is the ability to use process like efficient recycling and remanufacturing, increase spending on Research and Development on finding sustainable business and clean manufacturing technologies [51]. It's important to distinguish remanufacturing from recycling and recovery as remanufacturing begins with the recovery of worn out products, disassembling them, cleaning, inspecting, and testing them to decide if can be reused while others become waste [52].

Eco-manufacturing processes or remanufacturing can give significant competitive advantages to an organization [53]. Ecodesign methods focused on Remanufacturing [42]. The CSR activities include practicing clean production, such as conserving energy, reducing emissions, using recycled materials, reducing packaging materials, and sourcing materials from vendors located geographically close to manufacturing facilities [54].

6.   Technological innovation:

Evolutionary economics has long described innovation as a driving force behind economic growth and competitive success [55][56][57]. It exists the change in resource and emission intensity of production due to technological modernization [58][59][60][61[62][63][64][65].

Researchers dealing with corporate sustainability emphasize the role of more effective and less natural resource - intensive (both concerning energy and materials) production methods and systems[5]. Improved technology and more abundant resources available for investment generally lead to a de-linking between economic growth and environmental degradation [40].

7.   Company reputation construction:

The role of CSR is anticipation and minimization the conflicts between corporations and society and its representatives [66]. CSR is positively related to the market value of firms [67]. Companies manage risk and reputation through CSR rather than tackling the more difficult issues [5].

Concerning the reputation, most companies only meet their must- and should- responsibilities due to government regulations or consumer expectations, thus CSR and EMS (environmental managements systems) are mostly only applied as long as they

contribute to economic success such as: profit, long-term competitiveness, image, etc [5]. CSR can help companies improve their profits and guard against reputational risks [68].

4. Method

The method chapter starts with the introduction of the interpretive structural modeling (ISM). The next part mentions about the driving and dependence power principle (DDPA).

4.1 Interpretive structural modeling

The theory of ISM is based on discrete mathematics, graph theory, social sciences, group decision-making, and computer assistance. The procedures of ISM are begun through individual or group mental models to calculate binary matrices, also called relation matrix, to present the relations of the criteria [22]. The steps of ISM are depicted in the following figure:
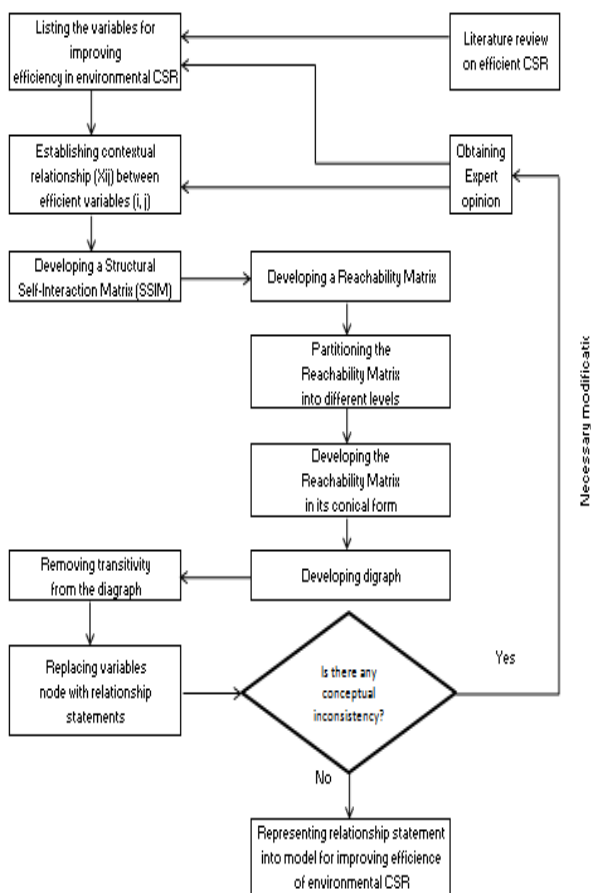

Fig. 2. Flow diagram for preparing ISM

After develop the model of the criteria, the DDPA is apply to calculate the driving power and the dependent power of the criteria. Then, the graph of cluster of criteria is build, the criteria of a system are represented by the "points" of this graph and the existence of a particular relationship between criteria is indicated by the presence of a directed line segment. It is this concept of relatedness in the context of a particular relation which distinguishes a system from a mere aggregation of criteria. A relation matrix or reachability can be formed by asking the question like "Does the feature e_i inflect the feature e_j?" The general form of the reachability matrix can be presented as follows:

- If the (i, j) described is A, the (i, j) described in the reachability matrix becomes 1 and the (j, i) entry becomes 0.
- If the (i, j) described is B, the (i, j) described in the matrix becomes 0 and the (j, i) entry becomes 1.
- If the (i, j) described is C, the (i, j) described in the matrix becomes 1 and the (j, i) entry also becomes 1.
- If the (i, j) described is D, the (i, j) described in the matrix becomes 0 and the (j, i) entry also becomes 0. Following these rules, initial reachability matrix for the criteria is established.

$$D = \begin{array}{c} \\ e_1 \\ e_2 \\ . \\ . \\ e_n \end{array} \begin{pmatrix} \overset{e_1}{0} & \overset{e_2}{d_{12}} & \overset{\cdots}{\cdots} & \overset{\cdots}{\cdots} & \overset{e_n}{d_{1n}} \\ d_{12} & 0 & \cdots & \cdots & d_{2n} \\ \cdots & \cdots & \cdots & \cdots & . \\ \cdots & \cdots & \cdots & \cdots & . \\ d_{m1} & d_{m2} & \cdots & \cdots & 0 \end{pmatrix}$$

Where e_i is the i th criterion in the system, d_{ij} denotes the relation between i th and j th criterion, D is the relation matrix. After constructing the relation matrix, we can calculate the reachability matrix using Eqs. (1) and (2) as follows

$$M = D + I \qquad\qquad (1)$$

$$M^* = M^k = M^{k+1} \quad k > 1 \qquad (2)$$

Calculates the reachability and the priority set bases on Eqs. (3) and (4), respectively, as the following equations

$$A(t_i) = \{ t_j \mid m'_{ij} = 1 \}$$
(3)

$$R(t_i) = \{ t_j \mid m'_{ij} = 1 \}$$
(4)

Where m_{ij} denotes the value of the ith row and the jth column.

According to Equation (5), the levels and relations between the criteria can be determined and the structure of the criterion's relations can also be expressed using the graph. R represents the intersection of antecedent set and reachability set.

$$R(t_i) \cap A(t_i) = R(t_i) \qquad (5)$$

4.2 Dependence - driving power analysis

This study followed the flow chart to result the hierarchical model. The interpretation of structure needs to apply dependence - driving power analysis (DDPA). It is to draw implications for managing the criteria. It identifies the relative the dependence and driving power of the criteria associated with environmental CSR while at the same time indicating the degree of dependence and driving power ranking [69]. The results are plotted graphically on a four-dimensional grid, in which the driving power of the criteria is displayed on the vertical axis while the dependence power level is displayed on the horizontal axis into four quadrants. The quadrants are labeled as: Autonomous criteria, Dependent criteria, Linkage criteria and Independent criteria.

First quadrant includes criteria (autonomous criteria) that have weak driver power and weak dependence. These criteria are relatively disconnected from the system, with which they have only few links, which may be strong. Second quadrant (named: dependent criteria) consists of criteria that have weak driving power but strong dependence. Criteria in third quadrant have strong driving power and strong dependence.

These criteria fall into the category of independent or linkage criteria. These criteria are unstable which presented any action on these criteria have an effect on others and also a feedback effect on

themselves. Fourth quadrant includes independent criteria having strong driving power but weak dependence. Using simple visual analysis, the quadrant evaluation grid reveals strengths and weaknesses of the criteria under consideration and so draws managerial implications for resource allocation. The competitive positions are identified, and further improvement strategies are discussed.

5. Results

To understand the interactive relations among eleven criteria, at first, this study do an interview to investigate the relationship of each two sub-variables (i and j). Four symbols are used for the type of the relation that exists between the two sub-variables under consideration:

V – Criteria i will help to achieve criteria j.
A – Criteria J will be achieved by criteria i.
X – Criteria I and j will help achieve each other.
O – Criteria j and i are unrelated.

Table 1: Structural self-interaction matrix (SSIM)

Criteria	C7	C6	C5	C4	C3	C2
C1	O	O	O	V	V	V
C2	X	X	X	A	X	
C3	O	A	O	X		
C4	V	A	A			
C5	V	X				
C6	V					

Follow the rule of the reachability matrix mentioned above , this study encodes the SSIM to initial reachability matrix using the numbers 1 and 0

Table 2: Initial reachability matrix

Criteria	C1	C2	C3	C4	C5	C6	C7
C1	1	1	1	1	0	0	0
C2	0	1	1	0	1	1	1
C3	0	1	1	1	0	0	0
C4	0	1	1	1	0	0	1
C5	0	1	0	1	1	1	1
C6	0	1	1	1	1	1	1
C7	0	1	0	0	0	0	1

Depending on the reachability matrix, this study instructs the integration tables to rank the level of the criteria. The intersection between the reachability set

and antecedent set is used to compare with the initial reachability to extract stage by stage. In the interaction table I, criteria 1, 3, and 7 have the intersection to be the same with their reachability sets. Hence, this criterion is assigned as the first level in the hierarchical structure.

Table 3: Interaction I

Criteria (Pi)	Reachability set: R (Pi)	Antecedent set: A (Pi)	Intersection R (Pi) ∩ A (Pi)	Level
C1	C1, C2, C3, C4	C1	C1	
C2	C2, C3, C5, C6, C7	C1, C2, C3, C4, C5, C6, C7	C2, C3, C5, C6, C7	I
C3	C2, C3, C4	C1, C2, C3, C4, C6	C2, C3, C4	I
C4	C2, C3, C4, C7	C1, C3, C4, C5, C6	C3, C4	
C5	C2, C4, C5, C6, C7	C2, C5, C6	C2, C5, C6	
C6	C2, C3, C4, C5, C6, C7	C2, C5, C6	C2, C5, C6	
C7	C2, C7	C2, C4, C5, C6, C7	C2, C7	I

After removing the first level criteria, the intersections of remain criteria continue to compare with their reachability sets to extract the second level criteria in the interaction table II. This process is interacted one more time for assigning the third level criteria in the interaction table III.

Table 4: Interaction II

Criteria (Pi)	Reachability set: R (Pi)	Antecedent set: A (Pi)	Intersection R (Pi) ∩ A (Pi)	Level
C1	C1, C4	C1	C1	
C4	C4	C1, C4, C5, C6	C4	II
C5	C4, C5, C6	C5, C6	C5, C6	
C6	C4, C5, C6	C5, C6	C5, C6	

Table 5: Interaction III

Criteria (Pi)	Reachability set: R (Pi)	Antecedent set: A (Pi)	Intersection R (Pi) ∩ A (Pi)	Level
C1	C1	C1	C1	III
C5	C5, C6	C5, C6	C5, C6	III
C6	C5, C6	C5, C6	C5, C6	III

Table 8 is the entire level statement of three criteria stages in the hierarchical structure.

Table 8: Level of efficient environmental CSR criteria

Criteria (Pi)	Reachability set: R (Pi)	Antecedent set: A (Pi)	Intersection R (Pi) ∩ A (Pi)	Level
C1	C1, C2, C3, C4	C1	C1	III
C2	C2, C3, C5, C6, C7	C1, C2, C3, C4, C5, C6, C7	C2, C3, C5, C6, C7	I
C3	C2, C3, C4	C1, C2, C3, C4, C6	C2, C3, C4	I
C4	C2, C3, C4, C7	C1, C3, C4, C5, C6	C3, C4	II
C5	C2, C4, C5, C6, C7	C2, C5, C6	C2, C5, C6	III
C6	C2, C3, C4, C5, C6, C7	C2, C5, C6	C2, C5, C6	III
C7	C2, C7	C2, C4, C5, C6, C7	C2, C7	I

From the table of level efficient environment CSR criteria, this study builds the conical form of the reachability matrix which arranges the criteria form level 1 to level 3 follow horizontal and vertical

Table 9: Conical form of reachability matrix

Criteria	C2	C3	C7	C4	C1	C5	C6
C2	1	1	1	0	0	1	1
C3	1	1	0	1	0	0	0
C7	1	0	1	0	0	0	0
C4	1	1	1	1	0	0	0
C1	1	1	0	1	1	0	0
C5	1	0	1	1	0	1	1
C6	1	1	1	1	0	1	1

The hierarchical structure in figure 3 is created basing on the conical form of reachability matrix. The relevant population rate (C1), technological innovation (C2) and clean production (C3) in level 1 will help to maintain environmental functions (C4) which is the criteria to maintain economic development (C2), reach to the consistent consumption (C3) and contract company reputation (C7). Depending this hierarchical structure, this study can discuss the environmental functions can be maintained if the country has the consistence in population growth which partly moderate the consumption.

The innovation of technology and clean production process effect each other due to the quality of clean production process result is based on the quality of technology. However, one the manufacturer run a clean production process well, it also mean they have a good technology and have emotion to innovate their technology more and more to maintain as well as develop their machinery. Through the good growth of these criteria will help reduce the waste and energy for environmental functional maintaining.

The stable environmental functions ensure the essential resources to develop the economy and for stability in consumption. The consumers just have their consistent consumption when they have enough sources to balance their consumption due to the existing any lack of sources, the number of substitutes are used more and more result in their exhausted capability (i.e. this consumption is not consistent). Furthermore, when the company can maintain the environmental function, the company's

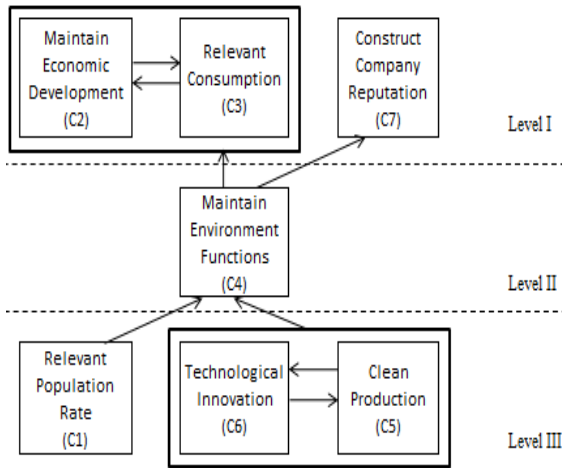reputation will be growing rapidly due to the positive effect from their social responsibility.

Fig. 3. ISM- based model of the criteria for improving efficient environment CSR realizing (Model 2)

Applying the driving and dependence power analysis, table 10 is created to calculate the driving power and dependence power of every criterion and then rank their driving and dependence power levels. Following the result of table 10, the technological innovation (C6) has the strongest driving power while the company reputation construction (C7) is the weakest driving power criteria and the dependence power of economic development maintaining (C2) is strongest and of the relevant population rate (C1) is weakest.

Table 10: Driving and dependence power in reachability matrix

Criteria	C2	C3	C7	C4	C1	C5	C6	Driving Power	Ranking
C2	1	1	1	0	0	1	1	**5**	II
C3	1	1	0	1	0	0	0	**3**	IV
C7	1	0	1	0	0	0	0	**2**	V
C4	1	1	1	1	0	0	0	**4**	III
C1	1	1	0	1	1	0	0	**4**	III
C5	1	0	1	1	0	1	1	**5**	II
C6	1	1	1	1	0	1	1	**6**	I
Dep.	**7**	**5**	**5**	**5**	**1**	**3**	**3**		
Ranks	I	II	II	II	IV	III	III		

This study sets up the cluster matrix of criteria for improving the efficiency in environmental CSR realizing in which the criteria are classify

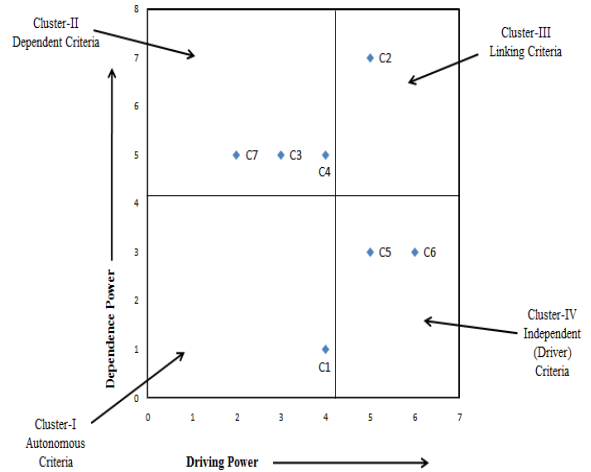following four domains to assign more exact about the driving and dependence power of each criteria.

Fig. 4. Cluster of criteria for improving the efficiency in environmental CSR realizing

Figure 4 show the relevant population rate (C1) is belonged to the domain of cluster-I (Autonomous criteria) in which has the weak driving and weak dependence power. Cluster-II domain contains the dependent criteria which have the weak driving power and strong dependence power includes relevant consumption (C3) and company reputation construction (C7) and maintaining of environment function (C4). The linkages criteria in this result are the maintaining of economic development (C2) reflect to be strong in both driving power and dependence power is in the domain of cluster-III. Cluster-IV comprises the strong driving and weak dependence power criteria. Clean production process (C5) and technological innovation (C6) are in cluster-IV.

6. Concluding remarks

At the beginning of this study mentions the critical problem about the environment and CSR doing. In this context, the activities of government, society, business sections damage environment performance, especially business sector. This matter result in the damage for society due not to enough natural capital for alive consumption. Thus the business section should be responsible for society by doing CSR simultaneously industrial activities and make profits. However, in three aspects of CSR, the environmental

aspect influents significantly in economic and social dimensions. Therefore, this study focuses on the environmental problem in company's CSR activities toward the efficiency.

Literature review reveals seven criteria for the efficient CSR realizing that have the relationship among three dimensions of CSR comprises (1) Relevant population rate, (2) Economic development maintenance, (3) Relevant consumption, (4) Maintaining environmental functions, (5) Clean production, (6) Technological innovation, (7) Company reputation saving. From this principle, this study set up a proposed hierarchical model which has all of seven criteria in level three. So, if all of criteria in level three have done, it will lead to completion of level two (environmental and company profitable maintaining) and level one (realizing CSR efficiently).

From the proposed model, this study recognizes that the criteria in the third level is the most significantly important because they influent to the result of the rest of two levels. Hence, this study aimed to analyze to understand the interactive relations among these third level criteria and determine clearer about the way to reach all of them by establish privately another hierarchical structure for these criteria. In order to do that, this study use ISM method which helps to impose order and direction on complexity of relationships among element of the system [5].

After setting up the hierarchical structure for the third level criteria, this study find that the relevant population rate, the innovation of technology, and the applying of clean production process is very important because they affect on the rest of criteria. The relevant population will partially reduce the consumption, technology innovation helps save the materials and energy, applying clean production also save the material by toward reuse, recycle, remanufacturing characteristics in products. These result in maintaining the environmental functions. Once the environmental functions are maintained, the natural capital can carry out their functions. This will make the facility and sustainable for the economic growth or another way the economic development is preserved. Basing on the DDPA matrix, economic development maintaining has the strong driving and dependence power, so this is the key criterion among seven the third level criteria of the proposed model. The citizens in the countries where they have developed economy will have the greater cognition

and for the saving consumption and environmental conserving.

Thus, the economic development will lead to the relevance in consumption. The result shows maintaining environmental functions also help the citizens have the conditions to consume appropriately because environmental functions provide the abundant material which is necessary for all activities. If some of material source are lacked, the citizens need find another substitute materials which also have the threat for depletion. So the supply and the demand about the natural capital are not balanced, consequently the consumption is difficult toward the relevance. Furthermore, when the company can maintain environmental functional, its reputation will be improved because its products to be safe for the consumer life.

6.1 Comparative proposed model and result model

In the proposed model, all of seven criteria are belong to the third level and not reflect the relationship among them. The criteria (1) Relevant population rate, (2) Economic development maintenance, (3) Consistent consumption, (4) Maintaining environmental functions related together via government, society, business sector which will help to reach the criterion in level two (Environment protection). Similarly, if three criteria comprise clean production (5), technological innovation (6), company reputation saving (7) in the third level can be achieved, that mean the company profit maintaining (which in level two) will be achieved as well. After two criteria in level two are obtained, the result is the efficiency of CSR in environment.

The advantage of this model is the clear determination about the main criteria (the third level criteria) need to be cared to gain. Once they are gained, the first level will be reached immediately. But it exist many the third level criteria, this model cannot determine which criteria are stronger or weaker to have achieve the second criteria. In order to identify the stronger and weaker criteria, it is essential to understand the inter-relations among them. These mean three sectors in level 3 also have the relationship.

In the model from this study's result, seven criteria are classified to three levels and the relationship between them is depicted. This makes easier to recognize the way which helps to obtain all

of these criteria for the result in efficiently environmental CSR realizing. Depending on model one and two, this study view the relations of government, society, and business sections as well as the relations between two criteria of level 2 in model one.

The result of model two show that the business section that suffers the influences from two criteria of company's profit maintaining, have the driving power on government and society sections which have the mutual affections, through business's trying to maintain economic development by maiming the company's profit and through partially help establish the relevant consumption by encouraging the consumers not to consume so much or wastefully. But the government also affects on the business sector by managing the population rate. These two models provide a perception about the process to realize the CSR in environment efficiently. Relevant consumption also is reached when the environment functions are maintained

6.2 Managerial implications:

The companies can earn the profits by improving their reputation via their efforts to maintain the environmental functions. Hence, the company need invest in the clean production process to save the material and energy for reducing the emission and pollution.

To applying the clean production process, it is necessary for the companies update their technological mechanism to correspondent with their clean production process. Moreover, the company need be toward the long- term profits than the short-term profits. That means the company should care about the environmental functions and the sustainability of the national capital during their manufacturing process to ensure they won't face with the material depletion and environmental population problems. Therefore, the companies need have the programs to announce the environmental preservation and encourage consumers to do the saved and relevant consumption.

6.3 Future research

Although this study sheds light the way to help company consider about their capability for efficient CSR realizing, but it exists some limitations. Even though the company efforts to maintain environment,

but it will not be efficient as without the government and citizens efforts.

This study only focus on the business section, not focus on the way to help the government and society sections carry out the specifically necessary activities toward the environmental maintaining to help the business section do CSR efficiently. Future research should investigate the criteria of these two sections toward the environmental issues.

CSR includes tree aspects, but this study just pays attention to the environment aspects. Future research should focus on the economic and social dimensions. Technological innovation toward the clean production process waste a lot of money of the companies. Hence, the company with small capital can not apply the clean production process. Therefore, this study just mentions about the method to improve the companies' profits and reputation for the large enterprises. Future research should pay attention to the small companies to help them find the criteria and the way to contribute to environmental preservation and realizing the social responsibility.

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