Build up Successful R&D Strategic Alliances for Biotechnology Industry

Sun Chia-Chi

***Abstract*—With increasingly fierce global competition, companies must do their best in research and development (R&D) to strengthen their competitiveness. This paper proposes a R&D strategic alliance model for Taiwan's biotechnology industry. This research applies a fuzzy Decision Making Trial and Evaluation Laboratory (DEMATEL) linguistic information method for group decision-making to gather group ideas and analyze the cause-effect relationship of complex social science problems in fuzzy environments. These ideas are divided into causal and effect groups, enabling readers to gain a better understanding of the interactive relationship among them, as well as making suggestions for improvement to enhance their overall performance. The results show that Strategic Behavior is a major causal dimension and the proposed model is capable of producing effective R&D strategic alliance evaluation with adequate criteria that fit the respondent's perception patterns, especially when the evaluation criteria are numerous and intertwined. We provide suggestions for government officials to devise Taiwan biotechnology industry policy and for companies to make business strategies for future development in this industry.**

***Index Terms*—R&D strategic alliance, biotechnology industry dematel, mu1tiple criteria decision-making (MCDM).**

I. Introduction

In the last decades, remarkable changes have been occurring in R&D strategic alliances [1], [2]. With increasingly fierce global competition, companies must do their best in research and development (R&D) to strengthen their competitiveness [3], [4]. This research develops a decision process model to maximize the success R&D strategic alliance model for Taiwan's biotechnology industry. Taiwan's biotechnology industry and entrepreneurial companies operating has faced such new strategic challenges [5], [6]. A strategic alliance is defined as a long-term cooperative arrangement between two or more independent firms that engage in business activities for mutual economic gain. [7], [8] Research and development strategic alliances are an important element of technology strategy. R&D strategic alliances have been increasingly used by firms over the past three decades as a key source of competitive advantage [6]. Although there is an extensive amount of literature dealing with strategic alliances, a comprehensive theory of R&D inter firm co-operation has not yet emerged [9]-[11].

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Sun Chia-Chi is with Institute of International Business at Tamkang University, Taiwan (e-mail: ccsun@mail.tku.edu.tw).

II. Assessment Criteria For R&D Strategic Alliance Of Biotechnology Industry

A. Strategic Perspective on R&D Strategic Alliances

The emergence of new technological sectors (such as biotechnology) and the growing technological convergence between sectors (have also played an important role [12]-[13]. Strategic alliances improve a firm's ability to obtain necessary resources. Strategic behavior is evident in efforts to gain market power in industry by blocking potential competition and by discouraging entry by other firms [14]-[16].

B. Synergy Perspective on R&D Strategic Alliances

In addition though, new firms and the older established firms develop a symbiotic relationship as suppliers and buyers when it is mutually beneficial. A R&D strategic alliance as a strategy is viewed from the perspective of reduction of a firm's risk exposure in terms of environmental uncertainty [15], [18].

C. Cost Perspective on R&D Strategic Alliances

Another dimension behind establishing R&D strategic alliances is to reduce costs [15], [16]. The cost perspective, on the other hand, suggests that strategic alliances may allow firms to achieve optimal decision making with lower costs. To share the cost for developing a technology and avoid duplicating investment, to reduce the producing cost, to reduce the marketing cost, and to lessen management cost in this R&D strategic alliances [14], [17], [19].

D. Organizational Learning Perspective on R&D Strategic Alliances

Organizational learning refers to "the environmental adjustment process for achieving the specific goals of an organization [20]. Learning the newest knowledge and technology is the fourth dimension for establishing an R&D strategic alliance. R&D personnel can learn from the partner by conducting joint technological development. It is the common learning method or procedure of the organization". Gain the latest technology refers to skills learned and technology acquired by the focal firm from a partner during an alliance [21]. The final category includes motives related to speeding up the innovation process by getting access to other companies' resources and gaining the production process skills [22]-[23].

In a real situation for a R&D strategic alliances problem, the specific list of criteria used to evaluate R&D strategic alliances during formation does vary based on the nature and context of the R&D strategic alliances problem. However, as a proof of concept, this study considers 15 important

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subjective criteria, also known as: Market access (C_1), Market defense (C_2), Gain market share (C_3), R&D time-span reduction (C_4), Risk reduction/sharing (C_5), Gain financial resources (C_6), Technical compatibility (C_7), Human resources integration (C_8), Minimize R&D cost (C_9), Minimize the producing cost (C_{10}), Minimize the marketing cost (C_{11}), Minimize management cost (C_{12}), Gain the latest technology (C_{13}), Gain product patents (C_{14}) and Gain the production process skills (C_{15}). These criteria are then grouped into four dimensions: Strategic Behavior dimension (D_1), Synergy dimension (D_2), Transaction cost dimension (D_3) and Organization learning dimension (D_4)

III. Fuzzy DEMATEL Technique For Building The Evaluation Model

The DEMATEL method was developed to study the structural relations in a complex system [24]. According to Liou et al. [24] and Wu [25], we describe the DEMATEL model construction process in the following.

Step 1: Selecting a committee of experts who have experienced this research issue

The study should set the decision goal and set up a committee.

Step 2: Generating the assessments of decision –makers.

To measure the relationships between the factors which are demonstrated by the $F = \{F_i | i = 1, 2, \ldots, n\}$, the experts were asked to make sets of pair wise comparison. The $\tilde{Z}_{(1)}, \tilde{Z}_{(2)}, \ldots, \tilde{Z}_{(n)}$ can be obtained [12, 24]. Fuzzy matrix $\tilde{Z}_{(k)}$ is the initial direction relation fuzzy matrix of expert k as following Equation (1).

$$\tilde{Z}^k = \begin{bmatrix} 0 & \tilde{Z}_{12}^{(k)} & \cdots & \tilde{Z}_{1n}^{(k)} \\ \tilde{Z}_{21}^{(k)} & 0 & \cdots & \tilde{Z}_{2n}^{(k)} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{Z}_{n1}^{(k)} & \tilde{Z}_{n2}^{(k)} & \cdots & 0 \end{bmatrix}; \quad k = 1, 2, \ldots, P \tag{1}$$

$$\tilde{Z}_{ij}^{(k)} = (l_{ij}^{(k)}, m_{ij}^{(k)}, u_{ij}^{(k)})$$

Step 3: Normalizing the direct-relation fuzzy matrix

The values of $\tilde{\alpha}_i^{(k)}$ and $r^{(k)}$ are the triangular fuzzy numbers in Equations (2) and (3).

$$\tilde{\alpha}_i^{(k)} = \sum \tilde{z}_{ij}^{(k)} = (\sum_{j=1}^{n} l_{ij}^{(k)}, \sum_{j=1}^{n} m_{ij}^{(k)}, \sum_{j=1}^{n} u_{ij}^{(k)}) \tag{2}$$

$$r^{(k)} = \max(\sum_{j=1}^{n} u_{ij}^{(k)}) \quad 1 \le i \le n \tag{3}$$

The linear scale transformation is used to transform the criteria scale into comparable scales. The normalized direct-relation fuzzy matrix can be gotten as $\tilde{X}^{(k)}$.

$$\tilde{X}^k = \begin{bmatrix} \tilde{X}_{11}^{(k)} & \tilde{X}_{12}^{(k)} & \cdots & \tilde{X}_{1n}^{(k)} \\ \tilde{X}_{21}^{(k)} & \tilde{X}_{22}^{(k)} & \cdots & \tilde{X}_{2n}^{(k)} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{X}_{n1}^{(k)} & \tilde{X}_{n2}^{(k)} & \cdots & \tilde{X}_{nn}^{(k)} \end{bmatrix}; \quad k = 1, 2, \ldots, P \tag{4}$$

$$\tilde{Z}_{ij}^{(k)} = (l_{ij}^{(k)}, m_{ij}^{(k)}, u_{ij}^{(k)})$$

where $x_{ij}^{(k)} = \dfrac{\tilde{z}_{ij}^{(j)}}{r^{(k)}} = (\dfrac{l_{ij}^{(k)}}{r^{(k)}}, \dfrac{m_{ij}^{(k)}}{r^{(k)}}, \dfrac{u_{ij}^{(k)}}{r^{(k)}})$

This research assumes that at least one i such that $\sum_{j=1}^{n} u_{ij}^{k} < r^{(k)}$. Equations (5) and (6) are used to calculate the average matrix of $\tilde{X}$ [25].

$$\tilde{X} = \frac{(\tilde{x}^{(1)} \oplus \tilde{x}^{(2)} \oplus \cdots \oplus \tilde{x}^{(p)})}{P} \tag{5}$$

$$\tilde{X}^k = \begin{bmatrix} \tilde{X}_{11} & \tilde{X}_{12} & \cdots & \tilde{X}_{1n} \\ \tilde{X}_{21} & \tilde{X}_{22} & \cdots & \tilde{X}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{X}_{n1} & \tilde{X}_{n2} & \cdots & \tilde{X}_{nn} \end{bmatrix} \tag{6}$$

$$where\ \tilde{x}_{ij} = \frac{\sum_{k=1}^{p} \tilde{x}_{ij}^{(k)}}{P}$$

Step 4: Establish and analyze the structural model

Once the normalized direct-relation X is obtained, the total-relation matrix T can be calculated, it should be ensured that the convergence of $\lim_{w \to \infty} \tilde{X}^w = 0$. The total-relation fuzzy matrix is shown as Equations (7), (8) and (9).

$$\tilde{T} = \lim_{w \to \infty} (\tilde{X} + \tilde{X}^2 + \cdots + \tilde{X}^w) \tag{7}$$

$$\tilde{T} = \begin{bmatrix} \tilde{t}_{11} & \tilde{t}_{12} & & \tilde{t}_{1n} \\ \tilde{t}_{21} & \tilde{t}_{22} & & \tilde{t}_{2n} \\ & & & \\ \tilde{t}_{n1} & \tilde{t}_{n1} & & \tilde{t}_{nn} \end{bmatrix} \tag{8}$$

where $\tilde{t}_{ij} = (l_{ij}^{"}, m_{ij}^{"}, u_{ij}^{"})$

$$\begin{aligned} Matrix\left[l_{ij}^{"}\right] &= X_l \times (I - X_l)^{-1} \\ Matrix\left[m_{ij}^{"}\right] &= X_m \times (I - X_m)^{-1} \\ Matrix\left[u_{ij}^{"}\right] &= X_u \times (I - X_u)^{-1} \end{aligned} \tag{9}$$

Step 5: Producing a casual diagram

The sum of rows and the sum of columns are denoted as vector $\tilde{D}_i$ and vector $\tilde{R}_i$. The horizontal axis vector $(\tilde{D}_i + \tilde{R}_i)$ named "Prominence" is made by adding $\tilde{D}_i$ to $\tilde{R}_i$, which represents how much importance the criterion has. We should convert the fuzzy number for vectors $\tilde{D}_i$ and $\tilde{R}_i$ into crisp values by applying Equation (9).

Equally, the vertical axis $(\tilde{D}_i - \tilde{R}_i)$ named "Relation" is made by subtracting $\tilde{D}_i$ from $\tilde{R}_i$, which may divide the criteria into a cause group and an effect group. Based on the above statements, when $(\tilde{D}_i - \tilde{R}_i)$ is positive, the criterion belongs to the cause group. Otherwise, $(\tilde{D}_i - \tilde{R}_i)$ is negative, the criterion belongs to the effect group. Therefore, the casual diagram can be acquired by mapping the dataset of the $(\tilde{D}_i+\tilde{R}_i, \tilde{D}_i-\tilde{R}_i)$ [24, 25].

$L=\min(l_k),\ R=\max(u_k),\ \Delta=R-L$

$$\tilde{N}_k^{def}=L+\Delta\times\frac{(m-L)(\Delta+u-m)^2(R-l)+(u-L)^2(\Delta+m-l)^2}{(\Delta+m-l)(\Delta+u-m)^2(R-l)+(u-L)(\Delta+m-l)^2(\Delta+u-m)} \quad (10)$$

IV. Empirical Study And Discussion

Step 1: Constructing a framework for build up a successful R&D strategic alliances for Taiwan's biotechnology industry

The first step involves identifying how many attributes or criteria are involved in R&D Strategic Alliance. We construct the evaluation model in Section 2 using a literature review and interviews with experts in Taiwan Biotechnology industry.

Step 2: Selection of committee of experts with experience about this research issue

Twelve experts were invited to evaluate the criteria. We anticipated the interview would last two hours. The first part consisted of a presentation of the previous results (i.e., first MCDM model).

Step 3: Designing the fuzzy linguistic scale

The committee adopted 15 criteria through the literature investigation and expert opinions. This research includes 4 dimensions and 15 evaluation criteria.

Step 4: Generating the assessments of decision –makers

To measure the relationships between the factors demonstrated by the $C=\{C_i \mid i=1,2,\ldots,9\}$, the experts were asked to make pair wise comparison sets. $\tilde{Z}_{(1)},\tilde{Z}_{(2)},\ldots,\tilde{Z}_{(n)}$ then can be obtained for the first-tier dimension $\tilde{Z}^1$ as in the following example

$$\tilde{Z}^1=\begin{bmatrix}(0,0,0) & (0,0.25,0.5) & (0.5,0.75,1) & (0,0.25,0.5)\\ (0,0.25,0.5) & (0,0,0) & (0.5,0.75,1) & (0,0.25,0.5)\\ (0.25,0.5,0.75) & (0.5,0.75,1) & (0,0,0) & (0.25,0.5,0.75)\\ (0.25,0.5,0.75) & (0,0.25,0.5) & (0,0.25,0.5) & (0,0,0)\end{bmatrix}$$

Step 5: Normalizing the direct-relation fuzzy matrix

Equations (9)-(11) were used to calculate the normalized direct-relation fuzzy matrix for $\tilde{X}^1$ as follows:

$$\tilde{X}^1=\begin{bmatrix}(0,0,0) & (0,0.1,0.2) & (0.2,0.3,0.4) & (0,0.1,0.2)\\ (0,0.1,0.2) & (0,0,0) & (0.2,0.3,0.4) & (0,0.1,0.2)\\ (0.1,0.2,0.3) & (0.2,0.3,0.4) & (0,0,0) & (0.1,0.2,0.3)\\ (0.1,0.2,0.3) & (0,0.1,0.2) & (0,0.1,0.2) & (0,0,0)\end{bmatrix}$$

Step 6: Establish and analyze the structural model

Once the normalized direct-relation $\tilde{X}$ is obtained the total-relation matrix $\tilde{T}$ can be calculated.

$$\tilde{T}=\begin{bmatrix}(0.016,0.134,1.096) & (0.109,0.322,1.370) & (0.055,0.245,1.228) & (0.017,0.174,1.079)\\ (0.106,0.314,1.408) & (0.018,0.154,1.183) & (0.085,0.298,1.325) & (0.042,0.221,1.166)\\ (0.097,0.311,1.384) & (0.089,0.318,1.403) & (0.013,0.130,1.061) & (0.051,0.208,1.130)\\ (0.032,0.212,1.147) & (0.016,0.201,1.149) & (0.031,0.183,1.056) & (0.002,0.068,0.782)\end{bmatrix}$$

Step 7: Producing a casual diagram

After computing the matrix $\tilde{T}$, the numbers of $\tilde{D}_i+\tilde{R}_i$ and $\tilde{D}_i-\tilde{R}_i$ are then calculated. $\tilde{D}_i$ and $\tilde{R}_i$ are the sum of the rows and the sum of the columns for matrix $\tilde{T}$. The sum of rows and the sum of columns are separately denoted as vector $\tilde{D}_i$ and vector $\tilde{R}_i$. The horizontal axis vector $(\tilde{D}_i+\tilde{R}_i)$ named "Prominence" is made by adding $\tilde{D}_i$ to $\tilde{R}_i$, which represents how much importance the criterion has. We should convert the fuzzy number of vector $\tilde{D}_i$ and vector $\tilde{R}_i$ to the crisp value.

TABLE I: The Sum of $\tilde{D}_i$, $\tilde{R}_i$, $\tilde{D}_i+\tilde{R}_i$ and $\tilde{D}_i-\tilde{R}_i$ of Influences Given and Received among Four Dimensions

	$\tilde{D}_i$	$\tilde{R}_i$	$\tilde{D}_i+\tilde{R}_i$	$\tilde{D}_i-\tilde{R}_i$
Strategic Behavior dimension	0.196	0.876	4.773	0.252
Synergy dimension	0.251	0.987	5.082	0.231
Transaction cost dimension	0.250	0.967	4.978	0.183
Organization learning dimension	0.081	0.664	4.133	0.112

Table I depicts the direct and indirect effects of the four first-tier dimensions. Table II depicts that the Strategic Behavior dimension and Transaction cost dimension are the net causes, whereas the Synergy dimension and Organization learning dimension are the net receivers by observing $(\tilde{D}_i-\tilde{R}_i)^{def}$ values. It is clear that the Strategic Behavior dimension might be the most critical dimension. The Synergy dimension and Organization learning dimension are affected by each other as well as affected by the Strategic Behavior dimension and Transaction cost dimension.

TABLE II: The Amount of $(\tilde{D}_i+\tilde{R}_i)^{def}$ and $(\tilde{D}_i-\tilde{R}_i)^{def}$ of Influences Given and Received among Four Dimensions on Research Objective

	$(\tilde{D}_i+\tilde{R}_i)^{def}$	$(\tilde{D}_i-\tilde{R}_i)^{def}$
Strategic Behavior dimension	3.146	5.938
Synergy dimension	3.299	-0.006
Transaction cost dimension	3.104	0.138
Organization learning dimension	2.521	-0.011

The causal relationships among the four second-tier criteria of the Strategic Behavior dimension are depicted in Tables III-IV. The causal relationships among the four second-tier criteria of Synergy dimension are shown in Tables V-VI. Tables VII-VIII summarize the causal relationships among the three second-tier criteria of the Transaction cost dimension. The causal relationships among the three second-tier criteria of Organization learning dimension are figured out Tables IX-X.

Tables IV and V depict that Market access and R&D

time-span reduction are the net causes, whereas Market defense and Gain market share are net receivers by observing (D-R) values. From Fig. 5 it is clear that Market access might be the most critical factor. Market defense and Gain market share are affected by each other as well as by Market access and R&D time-span reduction.

TABLE III: THE SUM OF $\tilde{D}_i$, $\tilde{R}_i$, $\tilde{D}_i+\tilde{R}_i$ AND $\tilde{D}_i-\tilde{R}_i$ OF INFLUENCES GIVEN AND RECEIVED AMONG THE SECOND-TIER CRITERIA OF THE STRATEGIC BEHAVIOR DIMENSION

	$\tilde{D}_i$	$\tilde{R}_i$	$\tilde{D}_i+\tilde{R}_i$	$\tilde{D}_i-\tilde{R}_i$
Market access	0.459	1.334	6.061	0.395
Market defense	0.285	1.079	5.395	0.309
Gain market share	0.369	1.207	5.704	0.387
R&D time-span reduction	0.175	0.794	4.262	0.196

TABLE IV: THE AMOUNT OF $(\tilde{D}_i+\tilde{R}_i)^{def}$ AND $(\tilde{D}_i-\tilde{R}_i)^{def}$ OF INFLUENCES GIVEN AND RECEIVED AMONG THE FOUR CRITERIA OF THE STRATEGIC BEHAVIOR DIMENSION

	$(\tilde{D}_i+\tilde{R}_i)^{def}$	$(\tilde{D}_i-\tilde{R}_i)^{def}$
Market access	4.056	0.122
Market defense	3.631	-0.002
Gain market share	3.939	-0.003
R&D time-span reduction	2.770	0.023

TABLE V: THE SUM OF $\tilde{D}_i$, $\tilde{R}_i$, $\tilde{D}_i+\tilde{R}_i$ AND $\tilde{D}_i-\tilde{R}_i$ OF INFLUENCES GIVEN AND RECEIVED AMONG SECOND-TIER CRITERIA OF SYNERGY DIMENSION

	$\tilde{D}_i$	$\tilde{R}_i$	$\tilde{D}_i+\tilde{R}_i$	$\tilde{D}_i-\tilde{R}_i$
Risk reduction/sharing	0.108	0.836	5.041	0.180
Gain financial resources	0.179	0.877	4.973	0.127
Technical compatibility	0.119	0.715	4.341	0.091
Human resources Integration	0.057	0.587	3.919	0.066

TABLE VI: THE AMOUNT OF $(\tilde{D}_i+\tilde{R}_i)^{def}$ AND $(\tilde{D}_i-\tilde{R}_i)^{def}$ OF INFLUENCES GIVEN AND RECEIVED AMONG FOUR CRITERIA OF THE SYNERGY DIMENSION

	$(\tilde{D}_i+\tilde{R}_i)^{def}$	$(\tilde{D}_i-\tilde{R}_i)^{def}$
Risk reduction/sharing	2.93	0.11
Gain financial resources	2.94	0.14
Technical compatibility	2.76	21.23
Human resources Integration	2.44	-4.48

Tables V and VI depict that Risk reduction/sharing, Gain financial resources and Technical compatibility are the net causes, whereas Human resources Integration is a net receiver by observing (D-R) values. It is clear that Technical compatibility might be the most critical factor.

Tables VII and VIII depict that Minimize R&D cost and Minimize the marketing cost are the net causes, whereas Minimize the producing cost and Minimize management cost are net receivers by observing (D-R) values. It is clear that Minimize R&D cost might be the most critical factor.

TABLE VII: THE SUM OF $\tilde{D}_i$, $\tilde{R}_i$, $\tilde{D}_i+\tilde{R}_i$ AND $\tilde{D}_i-\tilde{R}_i$ OF INFLUENCES GIVEN AND RECEIVED AMONG SECOND-TIER CRITERIA OF TRANSACTION COST DIMENSION

	$\tilde{D}_i$	$\tilde{R}_i$	$\tilde{D}_i+\tilde{R}_i$	$\tilde{D}_i-\tilde{R}_i$
Minimize R&D cost	0.119	0.458	3.482	0.109
Minimize the producing cost	0.156	0.623	3.789	0.176
Minimize the marketing cost	0.130	0.637	3.930	0.056
Minimize management cost	0.088	0.614	3.866	0.152

TABLE VIII: THE AMOUNT OF $(\tilde{D}_i+\tilde{R}_i)^{def}$ AND $(\tilde{D}_i-\tilde{R}_i)^{def}$ OF INFLUENCES GIVEN AND RECEIVED AMONG FOUR CRITERIA ON TRANSACTION COST DIMENSION

	$(\tilde{D}_i+\tilde{R}_i)^{def}$	$(\tilde{D}_i-\tilde{R}_i)^{def}$
Minimize R&D cost	2.09	1.16
Minimize the producing cost	2.36	-0.03
Minimize the marketing cost	2.12	0.24
Minimize management cost	2.32	-0.03

TABLE IX: THE SUM OF $\tilde{D}_i$, $\tilde{R}_i$, $\tilde{D}_i+\tilde{R}_i$ AND $\tilde{D}_i-\tilde{R}_i$ OF INFLUENCES GIVEN AND RECEIVED AMONG SECOND-TIER CRITERIA OF ORGANIZATION LEARNING DIMENSION

	$\tilde{D}_i$	$\tilde{R}_i$	$\tilde{D}_i+\tilde{R}_i$	$\tilde{D}_i-\tilde{R}_i$
Gain the latest technology	0.536	1.702	11.521	0.475
Gain product patents	0.507	1.655	11.327	0.557
Gain the production process skills	0.401	1.387	10.214	0.412

TABLE X: THE AMOUNT OF $(\tilde{D}_i+\tilde{R}_i)^{def}$ AND $(\tilde{D}_i-\tilde{R}_i)^{def}$ OF INFLUENCES GIVEN AND RECEIVED AMONG THREE CRITERIA ON ORGANIZATION LEARNING DIMENSION

	$(\tilde{D}_i+\tilde{R}_i)^{def}$	$(\tilde{D}_i-\tilde{R}_i)^{def}$
Gain the latest technology	6.487	0.199
Gain product patents	6.558	-0.014
Gain the production process skills	5.960	-2.726

Tables IX and X depict that Gain the latest technology is the net cause, whereas Gain product patents and Gain the production process skills are net receivers by observing (D-R) values. It is clear that Gain the latest technology cost might be the most critical factor.

The committee observes that “Market access” is the main causal factor for the R&D Strategic Alliance of

Biotechnology industry in the Strategic Behavior dimension (D_1). In the Synergy dimension (D_2), we find that the Technical compatibility is the most critical factor for the R&D Strategic Alliance of Biotechnology industry. The experts also indicated that Minimize R&D cost is a crucial and determinative element for the R&D strategic alliance of biotechnology industry.

V. Conclusions And Remarks

This research reveals that when policy makers are considering how to drive or improve the R&D strategic alliance as a whole, they must take into account the key influential factors and their affects upon the other indirect dimensions. Generally speaking, activating influential factors can more easily result in expected improvement results, but indirect factors can only have limited contributions to stimulating the continual growth of these industrial clusters. It appears that "Strategic Behavior dimension" is the main causal dimension which strongly directs influencers in all other dimensions.

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Chia-Chi Sun is Assistant Professor at the Institute of International Business at Tamkang University, Taiwan. He earned his PhD from the Institute of Management of Technology at National Chiao Tung University and his work has been published in the Applied Soft Computing, Expert Systems with Applications, Technology Analysis & Strategic Management, Online Information Review, Journal of Scientific and Industrial Research, Journal of Global Business and Technology, and others. His research interests include innovation and technology management, strategic management and marketing studies. Sun, Chia-Chi is the corresponding author and can be contacted at: ccsun@mail.tku.edu.tw.