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Competitive Advantage of Japan and Taiwan Transformer Industry

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Abstract

Transformers are one type of magnetic component used in relevant structures like power switch supplies. Transformers are the necessary parts in all products involving electricity, for the alteration of current voltage during the processes of power generation, transformation, transmission and distribution. This paper is an empirical study, describes and explores the case of competitive advantages of the Japanese and the Taiwanese transformer industries as catalogued by the consumer electronics division and makes a comparison in order to discover the collaboration possibilities for the industries, and the purpose of collaboration between Japan and Taiwan is to enhance the competitive advantages for the industries. A major applicant of transformers is to increase or decrease voltage before transmitting electrical energy through wires. Most consumer and commercial electronic devices such as personal computers, home theaters, air conditions, TVs, cell phones, and notebooks, etc., for daily using need transformers to do electrical transfer. The main materials for transformers are cores and wires, and the prices rose since 2004 and fluctuated until 2010. For manufacturers, it is a big challenge between suppliers and customers. Asia-Pacific represents the largest and the fastest growing transformers market in the world, with sales projected to exceed US$ 21.4 billion by 2015. Many developed countries, like America, Japan, and Germany, energy conservation has been a serious issue. Meanwhile, transformer is not only a simple device that transfers electrical energy from one circuit to another through inductively coupled conductors but also plays a role in energy efficiency and environmental conservation. People realized and started on the issue of how to protect the earth and make energy efficiently. From the view of geography, Taiwan is proximity to Japan than most other countries and also historical and cultural factors are two of the points to contact Japan and Taiwan. Since the 1960s, Taiwan government had been attracting foreign investments through incentive policies, among which, 50% was invested in processing zones, with Japan taking the largest proportion, followed by the US. Some of engineers who worked for Japanese firms in Taiwan were sent to Japan to study knowledge, technologies and managements. This study not only discusses vertical integration and horizontal division but also issues external and internal factors which affect the competitive advantages for the industries. As firms go global, they must face more and more competitors and figure out how to break down barriers between international and domestic organizations and begin building the competitiveness and competitive advantages that acknowledges their respect for the success of innovation and dependence on the home country's expertise.

Keywords: Competitiveness; Taiwan; Japan, Transformer Industry, Competitiveness, Competitive Advantage

1. Introduction

According to [8], strategies for business operation include three factors: categories, resources and networks. Categories include markets, business activities (value chains), landforms and scales of businesses. Resources mean to create and accumulate core value of business, include tangible assets, intangible assets, abilities of employees and power of organizations.

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Networks mean the series of business activities from getting materials to do marketing, include suppliers, the other manufacturers in the same industry, the other firms in different industry and strategic constituency.

The Japanese industries are facing twofold stresses from both internal and external business environments. Not only the governments' attitudes and policies affect the growth and development of industries, but also industries' structures and unbalanced supply and demand systems push industries relocations overseas or pull industries back to mother countries. In an industry, while most of its suppliers and customers go overseas, in order to save cost (including export and import trading costs, exchange rates, taxes, surcharges, etc.) to compete, firms have to try to adjust their strategies to adapt the complex environment. Moreover, monetary policies, flexible exchange rates (especially RMB funds affect Japan obviously), and (foreign) trade policies are seriously effect advantages or disadvantages for firms. Nevertheless, products are nearly customizations: small quantities and various specifications. In order to satisfying customers, standard products are made overseas and customizations tend to become made in home town [19].

According to Porter, in his book of "Competitive Advantage (1985) [12,13]", five forces model is a framework for an industry to estimate competitiveness and to plan the strategies. And his value chain can be used to for identify a firm's core competencies and distinguish those value chain activities that drive competitive advantage. Industry is a kind of process to delimit to classify firms with different internal structures. From the view of strategy, while the differences between firms are huge, it could be classified to be another industry. As an example, while an industry in one country is noticed by the government; however, it might not be a notable for other country or even not exist. It is because every country has its special culture, history and nature resources, etc. Regarding industry, many scholars identify that firms (manufacturers) with substituted products/services or similar products/services which could be sold to customers could become an industry. William G. Shepherd (2004) [18] points out that an industry is a market; it provides supplier and customers a stage to offer.

Manufacturing includes all steps necessary to convert raw materials, components, or parts into finished goods that meet a customer's expectations or specifications. Manufacturing commonly employs a man-machine setup with division of labor in a large-scale production. Information, communication and consumer electronic devices are changing with each passing day and toward to the tendency from 3C (computer, communication, consumer electronics) integration to IA (information appliance). 3C products are the most rapid developing industries in both Japan and Taiwan. And every 3C products need transformers for the alteration of current voltage during the processes of power generation, transformation, transmission and distribution. Transformer industry has the specific characteristics of every 3C products need transformers.

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2. Literature Review

M.E. Porter's Five Force

The first fundamental determinant of a firm's profitability is industry attractiveness. In any industry, whether it is domestic or international or produces a product or a service or not, the rules of competition are embodies in five competitive forces: the entry of new competitors, the threat of substitutes, the bargaining power of buyers, the bargaining power of suppliers, and the rivalry among the existing competitors[11].

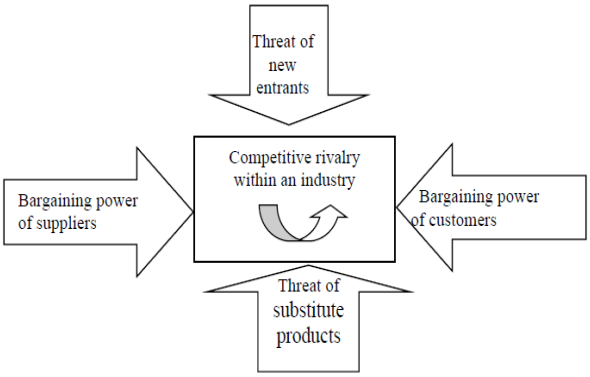

Figure 1. **Michael E. Porter's Five Forces Analysis [11]**

These five competitive forces determines the ability of firms in an industry to earn, on average, rates of return on investment in excess of the cost of capital.

1) The threat of substitute products: buyer propensity to substitute, relative price performance of substitutes, buyer switching costs, and perceived level of product differentiation.
2) The threat of the entry of new competitors: the existence of barriers to entry, economies of product differences, brand equity, switching costs, capital requirements, and access to distribution, absolute cost advantages, expected retaliation by incumbents and government policies.
3) The intensity of competitive rivalry: number of competitors, rate of industry growth, intermittent industry overcapacity, exit barriers, diversity of competitors, informational complexity and asymmetry, fixed cost allocation per value added, level of advertising expense, and sustainable competitive advantage through improvisation.
4) The bargaining power of customers: buyer concentration to firm concentration ratio, degree of dependency upon existing channels of distribution, bargaining leverage, buyer volume, buyer switching costs relative to firm switching costs, buyers information availability, ability to backward integrate, and buyer price sensitivity.
5) The bargaining power of suppliers: supplier switching costs relative to firm switching cost, degree of differentiation of inputs, presence of substitute inputs, supplier concentration to firm concentration ratio, employee solidarity, threat of forward integration by suppliers relative to the threat of backward integration by firms, and cost of inputs relative to selling price of the product.

Competitiveness grows fundamentally out of a value a firm is able to create for its buyer to exceed the firm's cost of crating. Value is what buyers are willing to pay, and superior value stems from offering lower prices than competitors for equivalent benefits or providing unique benefits that more than offset a higher price. According to Porter (1998), there are two types of competitive advantage: cost leadership and differentiation. Firms can gain a cost advantage or by differentiate themselves to compete in global. Firms have to broad scope and serve many industry segments, and may even operate in related industries, later, firms' breadth are often important to their cost advantages. The sources of cost advantage are varied and depend on the structure of the industry. They include the pursuit of economies of scale, proprietary technology, preferential access to raw materials, government's rules, and production technology (include defection ratio, tolerances, etc.) In a differentiation strategy, firms seek to be unique in their industry along some dimensions that are widely valued by buyers. The select one or more attributes that many buyers in an industry perceive as important, and uniquely positions themselves to meet those needs. They are rewarded for their uniqueness with premium prices. Differentiation can be based on the product itself, the delivery system by which it is sold, the marketing approach, and a broad range of other factors.

Competitiveness in one individual industry can be strongly enhanced by inter-relationships with business units competing in related industries, if these inter-relationships can actually be achieved. Inter-relationships among business units are the principal that means by which a diversified from creates value, that provide the underpinnings for corporate strategy. Competitive strategy is on industry structure and competitor analysis in a variety of industry environments, through it contains many implications for competitive advantage.

According to Colin Leys (2001) [2], the International development of financial markets, of technology and of some manufacturing and services bring firms a new set of limitations on the freedom of action of nations. To survive, nations and firms must increasingly "manage" national politics in such a way as to adapt them to the pressures of trans-national market forces.

Diamond Model

Michael E. Porter's diamond model is a classical theory of national advantage. He introduces the diamond model in his book, The Competitive Advantage of Nations in 1990 [14]. He uses a diamond shaped diagram as the basis of a framework to illustrate the determinants of national advantage. The effect of one point depends on the others. Factor disadvantages will not lead firms to innovate unless there is sufficient rivalry. Porter's diamond model is as follows.

1) Factor Conditions: A country creates its own important factors such as skilled resource and technological base. Moreover, the amount and cost of capital resources that are available in the banking and finance sectors, and the type, quality, and user cost of nation; infrastructures, must also be considered. After interview the

factor conditions skills which mean that how to getting new skills from European and how-to using R&D to make the structures to be easy to bulk producing are respected.

2) Firms' Strategy, Structure, and Rivalry: Local conditions affect firm strategy; and local rivalry forces firms to move beyond basic advantages that the home country may enjoy, such as low factor costs.

3) Demand Conditions: The nature of demand for products or services at home and the degree of sophistication of buyers, such as the compositions of demand in the home market.

4) Related and Supporting Industries: When local supporting industries are competitive, firms enjoy more cost effective and innovative inputs.

5) Government's Role: Encourage companies to raise their performances and stimulate early demand for advance products. This force and "the rule of change (chance of events)" are identified as two outside forces.

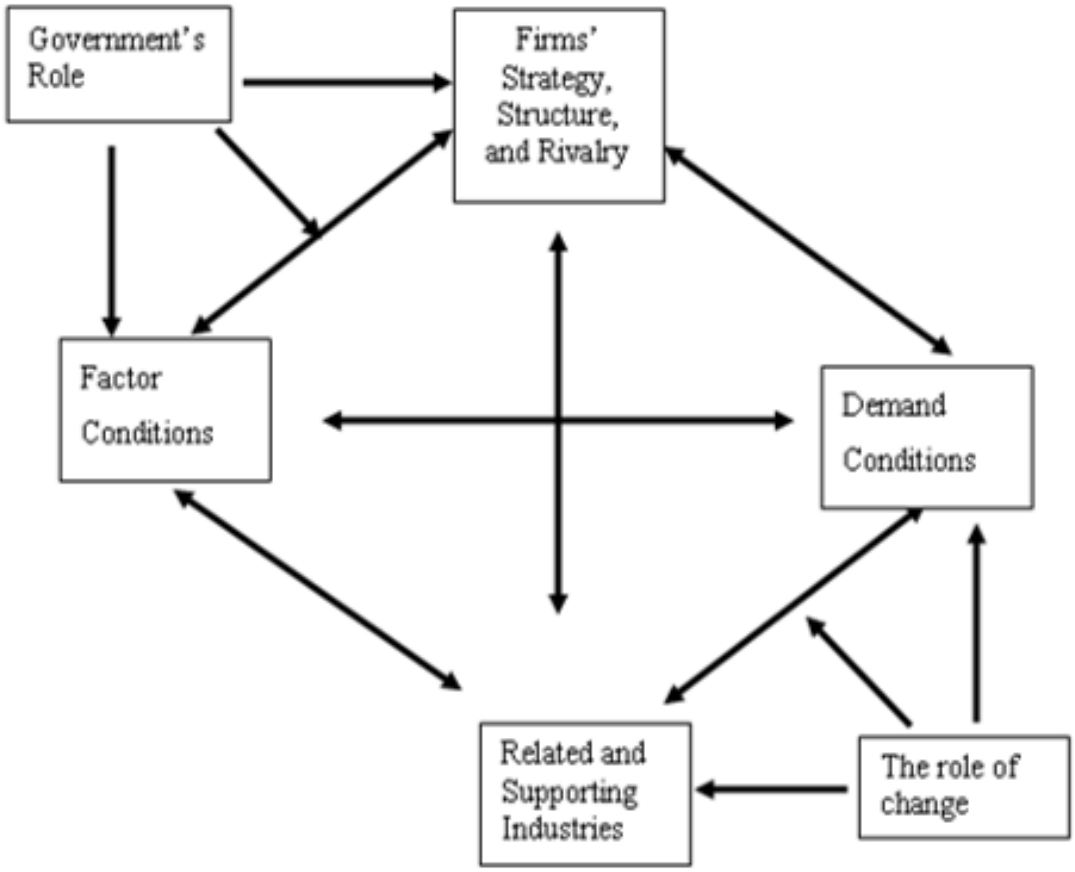

Figure 2**. Michael E. Porter's Diamond Model [14]**

Dunning (1993) points out that in the 1990s, an increasing proportion of the assets of firms in a particular country are either acquired from or are located in, another country. For firms having a large proportion of their operations outside their home base it is ludicrous to suggest that their competitive position rests largely upon the strength of the diamond in the home base, although their initial move abroad might have been based on those advantages. The echoes the comments of many reviewers and suggests that he diamond model should at least be reappraised the amended.

Tender relay for most of the products and services to customers are the main generators of value added in any country. Innovations made by employees that give an organization the sustained growth its needs and enhance competition (Popescu Delia Mioara, 2010) [10].

3. Methodology

Base on in-depth interview with CEOs and "five force and diamond model" the model of this research is designed as below (figure 3).

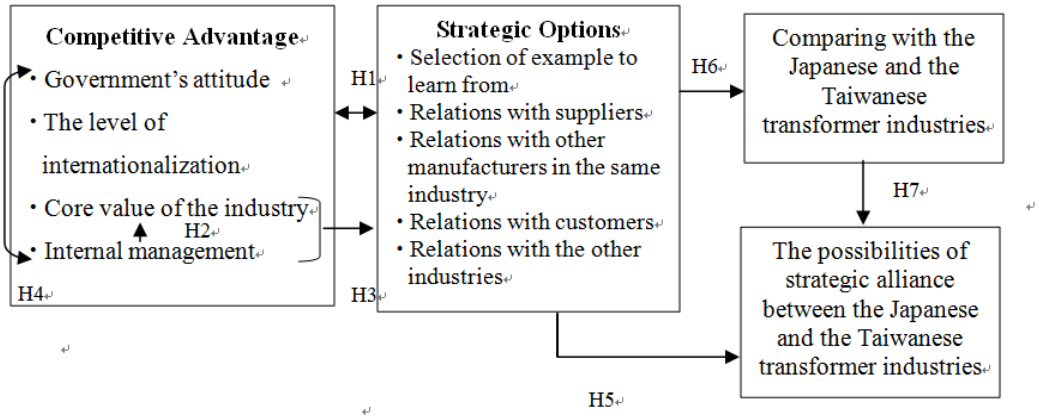

Figure 3. **the Model of this Research**

Both external and internal factors are considered in this model. The factors are distinguished as follows.

External factors:

- Government's attitude: extend from diamond model
- Internationalization: extend from diamond model

Internal factors:

- Core value of the industry: extend from value chain
- Internal management: extend from value chain

H1: The relations between industrial competitive advantages and strategic options are significant.

H2: The internal management affects the core value of the industry.

H3: The correlation between the two internal factors (core value and internal management) and the five strategic options are significant.

H4: Government's attitude, core value of the industry, internal management and strategic options affect market position (market position is a section in the level of internationalization).

H5: Strategic alliances between the Japanese and the Taiwanese transformer industries bring competitive advantages for the industries.

H6: The common points and different points between the Japanese and the Taiwanese transformer industries are identified.

H7: Different characteristics firms between the Japanese and the Taiwanese transformer industries have different strategic alliance slants for customers, suppliers or the other manufacturers in the same industry.

And "strategies" includes selection of example to learn from, relations with suppliers, relations with other manufacturers in the same industry, relations with customers and relations with the other industries are involved in both external and internal factors. By questionnaires, this research attempts to find while the firms do "what kind of strategies" with "which parties" will bring "what kind of performance on competitive advantages" for the firms. This research not only aims to find competitiveness of the Japanese transformer industries but also attempts to discover their partner strategies.

Estimation results

On Jan. 2015, the survey is sent to the manufacturers and 56 effective returns are returned.

Table 1. **Descriptive Statistics of the Japanese Transformer Manufacturers**

Background Information of Objects		Case Number	Percentages
The level of internationalization (plural elections)	Export area		
	North America	22	20.55%
	The Middle and South America	30	28.04%
	China	13	12.15%
	Taiwan	9	8.41%
	Northeastern Asia	5	4.67%
	Europe	26	24.30%
	Oceania	1	0.94%
	Africa	0	0.00%

		The Middle East Area	0	0.00%
		India	1	0.94%
		Export ratio		
		Less than 10%	43	76.78%
		10%~less than 30%	8	14.29%
		30%~less than 50%	3	5.36%
		50%~ less than 80%	2	3.57%
		Your company have had plans for international expansion	24/56	42.86%
		Your company have no plan for international expansion in the future	32/56	57.14%
		Ratio of local procurement of raw materials:		
		Less than 10%	36	64.29%
		10%~less than 30%	6	10.71%
		30%~less than 50%	2	3.57%
		50%~ less than 80%	7	12.50%
		Over 80%	5	8.93%
Positions: Product marketing (plural elections)		High quality, high price	12	21.43%
		High quality, medium price	21	37.50%
		High quality, low price	5	8.93%
		Medium quality, medium price	18	32.14%
		Low quality, low price	0	0.00%
Company established year		Before 1979	47	83.93%
		1980~1999	4	7.14%
		After 2000	5	8.93%
Personal information	Ages	Over 61 years old	12	21.43%
		51~60 years old	21	37.50%
		41~50 years old	18	32.14%
		31~40 years old	4	7.14%
		21~30 years old	1	1.79%
	Gender	Male	56	100.00%
		Female	0	0.00%
	Personal income in 2008 (the prices commodities between Japan and Taiwan are different)	Over JPY 10 million	19	33.93%
		JPY 5 million~ 10 million	23	41.07%
		JPY 4 million~5 million	6	10.71%
		JPY 3 million~4 million	5	8.93%
		JPY 2 million~3 million	2	3.57%
		Below JPY 2 million	1	1.79%
	Level of education	Graduate school and above	5	8.93%
		University	26	46.43%
		College	9	16.07%
		Senior high school and below	16	28.57%
	College department	Engineering and science	31	55.36%
		Business	17	30.36%
		Humanistic and social science	8	14.28%
	Seniority of the current company	Over 30 years	17	30.36%
		20~30 years	20	35.71%
		10~20 years	8	14.28%
		5~10 years	7	12.50%
		Below 5 years	4	7.15%
	Position	CEO/President/General manager/Vice general manager	45	80.36%
		Manager/Assistant manager/middle-high level manager	6	10.71%
		The others (assistant)	5	8.93%

The objects of this research are SMEs, and the capital of SEMs in Japan is JPY 300 million. Because the questionnaire surveys are sent to CEOs/presidents/general managers directly, most of the CEOs of the Japanese companies are males; the result shows that gender is 100% male. About the Cronbach's α Coefficient of the variables, they are showed in Table 2.

Table 2 Cronbach's α Coefficient of the Variables

Items	Cronbach's α Coefficient
• Government's attitude	0.939
• Core value of the industry	0.707
• Selection of example to learn from	0.706
• Relations with suppliers (except question 2)	0.551
• Relations with other manufacturers in the same industry	0.526
• Relations with customers	0.536
• Relations with the other industries	0.704
• Internal management	0.809

The average list is too long to show here, but this research shows the special ones. The "relations with customers" is high in pre-investigation; however, from formal survey, the highest average in "strategic options" is "relations with other manufacturers in the same industry." With regard to in-depth interviews, collaboration is one of the competitive advantages of the industry, and to do strategic with the other manufacturers in the same industry can help firms to get economy scales and learn technologies from each other to help firms get new ideas on innovation.

Relations between Competitiveness and Strategic Option by CCAAuthors and Affiliations

In order to examine H1, Canonical Correlation Analysis (CCA) is used in this chapter. There are no cause-result relations in CCA [1,3,15,16,17], only the correlations in the relations are noted.

The correlation between competitive advantages and strategic options is estimated in Table 5.33. Wilks Λ (5.07), Pillai-Bartlett trace V (4.23), and Hotelling-Lawley trace T (5.67) are all significant (0.000*) [3,4,5,18,20].

Table 3 Analyzed Result of Canonical Correlation Analysis to the Japanese Transformer Industry

Model	Eigenvalue	Canonical Correlation	Canonical R-Square	F-Value	p-Value
Model 1	1.689	0.793	0.628	156.83	0.000*
Model 2	0.546	0.594	0.353	127.29	0.001*
Model 3	0.247	0.445	0.198	98.00	0.074
Model 4	0.009	0.094	0.009	50.00	0.801

Eigenvalue is calculated from the equation $\rho_j^2/(1-\rho_j^2)$. [6,7,9] Table 3 shows Model 1 is significant and the eigenvalue is larger than Model 2-Model 1 is selected. The canonical correlation is 0.793; it means the cumulative percentage for Model 1 is 79.30%; meanwhile, canonical factor structure coefficient in this study is 79.30%. Canonical Factor Structure Coefficients and model is in Figure 4.

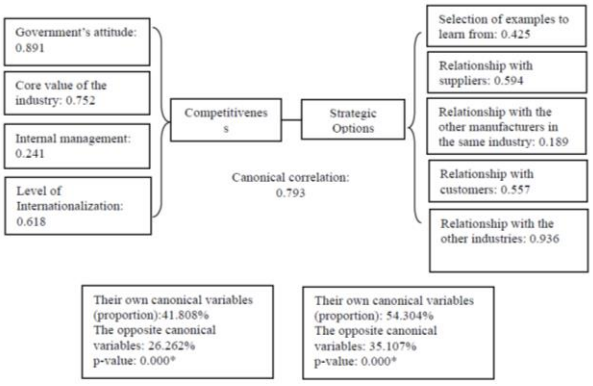

Figure 4. **Canonical Correlation Analyses to the Japanese Transformer Industry**

Three factors: "government's attitude", "core value of the industry", "the level of internationalization" and "internal management", and "level of internationalization" can explain the dependent various-competitiveness 41.808%; the adequacy explains the competitiveness in this industry is 26.262%. And four strategic options could explain the dependent various-competitiveness 54.304%, the adequacy explained the competitiveness in this industry was 35.107%.

Moreover, the coefficient of "government's attitude" is highest 0.819; and "relations with the other industries" is highest 0.936. From Figure 4, the government's attitude is and the relations with the other industries are the two of the crucial factors to affect the competitive advantages of the industry.

The equation of estimative factors (competitive advantages) is 0.819+0.752+0.241+0.618.

And the equation of strategic options is 0.594+0.189+0.557+0.936. And all of them are positive and significant.

4. Conclusions

From the analyzing result of CCA, we can see that Canonical correlation between competitive advantages and strategic options to the Japanese transformer industry is 0.793 and two p-values are significant. The notably result is that the relation between competitiveness and strategic options is verified. For the Japanese transformer industry, "government's attitude" and "relations with the other industries" are important factors to affect their competitive advantages. And about the ranking of the importance to affect the competitive advantages and strategic options, the Japanese transformer industry is as follows: Competitive advantages: 1) government's attitude, 2) core value of the industry, and 3) the level of internationalization. Strategic options: 1) relations with the other industries, 2) relations with suppliers and 3) relations with customers. This research suggests that the government should respect on this industry and the firms should focus on their core value: high technology and R&D in order to enhance their competitiveness.

References

[1] Borgen, F., & Seling, M., Uses of discriminate analysis following MANOVA: Multivariate statistics for multivariate purposes. Journal of Applied Psychology, vol. 63, 1978, pp. 689-697.

[2] Colin Ley, Market-Driven Politics, Neo-liberal democracy and the public interest, London, Verso Books 280, 2001.

[3] Catwright, W.R., Multiple linked "diamonds" and the international competitiveness of export-dependent industries: the New Zealand experience, Management International Review, Vol. 33 No. 2, 1993, pp. 55-70.

[4] C.S. Chen, B.L. Chen, S.F. Chen and T.K. Liu, Multivariate Analysis 4th Ed., WUNAN Publication, Taiwan, 2007.

[5] Hair, J. F. Jr., Anderson, R.E., Tatham, R.L., & Black, W.C., Multivariate data analysis with reading, 4th ed., Englewood Cliffs, NJ: Prentice Hall, 1995.

[6] Krislal, J.B., Multidimensional scaling and other methods for discovering structure, in Enslein, Ralston, and Wilf (Eds). Statistical Methods for Digital Computers, John Wiley, N.Y., 1964.

[7] Lawrence S. Meyers, Glenn Gamst and A.J. Guarino, Applied Multivariate Research, Sage Publications, Inc., UK., 2006.

[8] Nonaka, I. Takeuchi, H., the Knowledge-Creating Company, N.Y: Oxford University Press, 1995.

[9] Pedhazur, E.J., Multiple regression in behavioral research: explanation and prediction, 3rd ed., Orlando, FL: Harcourt Brace College Publishers, 1997.

[10] Popescu Delia Mioara, Robescu Valentina Ofelia, Velter Victor, Ion Stegaroiu, Popa Gabriela, Goldbach Dumitru, Innovation Management and Romanian SME's, Proceedings of the 4th WSEAS International Conference on Business Administration, 2010.

[11] Porter, M.E., How Competitive Forces Shape Strategy, Harvard Business Review, March/Apr. 1979.

[12] Porter, M.E., Competitive Advantage: Creating and Sustaining Superior Performance, the Free Press, New York, 1985, pp. 33-63.

[13] Porter, M.E., Technology and Competitive Advantage, the Journal of Business Strategy, winter, 1985.

[14] Porter, M. E., the Competitive Advantage of Nations, The Free Press, New York, 1990.

[15] Tabachnick, B.G., & Fidell, L.S., Using multivariate statistics, 5th ed., Needham Heights, MA: Allyn and Bacon, 2007.

[16] Tenko Raykov, and George A. Marcoulides, an Introduction to Applied Multivariate Analysis, 2008, Taylor & Francis Group, LLC, USA.

[17] Thompson, B., Variable Important in Multiple Regression and Canonical Correlation, Advances in Social Science Methodology, vol. 4, 1996, pp. 107-135.

[18] William G. Shepherd and Joanna M. Shepherd, the Economics of Industrial Organization, Waveland Press Inc., 2004.

[19] Yoshino and Rangan, Michael Y. and U. Sriniovasa, Strategic Alliance-An Entrepreneurial Approach to Globalization, 1st ed., Boston, 1995.
[20] Yasunori Fujikoshi, Vladimir V. Ulyanov, Ryoichi Shimizu, Multivariate Statistics, John Wiley & Sons, Inc., USA. 2009.