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Taiwanese and Chinese Automotive Industry Trends

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ABSTRACT
With the rapid growth of economy in China, automotive industry is promptly expanding. Following the trend, there is a boom that Taiwanese automotive manufacturers start to set up plants in China. Therefore, some of Taiwanese automotive industry clusters which consist of vehicle component suppliers moving to China as well. Under the background of supply chain's migration of automotive industry, this paper analyzes the significant differences in supplier selection of automotive manufacturers between China and Taiwan; and explore whether there is a consistency between automotive manufacturers and vehicle component suppliers on key factors. Analytic Network Process approach is applied to identify the key factors on supplier selection of automotive manufacturers. The results demonstrated that Taiwanese automotive manufacturers focus on Product Cost, followed by Quality Consistency and Payment Terms; and automotive manufacturers from China do as well; Taiwanese automotive suppliers also prioritize to Product Cost, followed by Payment Terms and Correct Delivery; suppliers from China pay much attention to Product Cost, in particular Quality Consistency and Deployment Capability of Mixed Product followed by. Based on the theory of business ecosystem, a novel view of "two places (Taiwan and China) - two parties (manufacturers and suppliers)" is presented. With the perspective of supply chains' transferring and duplication from Taiwan to China, automotive manufacturers and parts suppliers should make some significant adjustments to differences caused by the change of key factors, which is to better meet the demand on both parties in new ecosystems.
Keywords: *automotive industry, supplier selection, supply chains, transferring and duplication, ANP*

1. INTRODUCTION

As is well-known to all, supply chain has become an important source of competitive advantage in manufacturing enterprises [39]. The division within the automotive industry is exacerbating; and automotive manufacturers outsourcing auto parts business in supply chain has reached a consensus. Choosing a good supplier is an extremely important guarantee for business success [6]. Nowadays, researches' arguements about how to find out right parts suppliers for automotive manufacturers are increasing rapidly. In these studies, the key factors on supplier selection of automotive manufacturers are identified [12, 33, 35]. These researches provide some reliable theoretical references for the automotive manufacturers to select right suppliers.

Because the components of automobiles are related to mechanical industry, electronic industry, chemical industry and information industry, etc. Therefore, automotive industry, as one of Taiwanese top industries, could promote the development of other industries [19]. However, due to the global economic recession, international crude oil and raw material price rising, as well as the lower consumer confidence in Taiwan, all those adverse factors cause a sharp decline of the overall performance in Taiwanese automotive industry for decades [28, 30]. To confront this phenomenon and weakness that the market demand in Taiwan is small and very hard to be amplified, the automotive operators to join the international division of labour systems actively, or invest in China and overseas to build up factories, in order to break through the bottleneck of survival and development. In order to reduce delivery time and cost, meanwhile, to enhance competitiveness, suppliers choose mostly to plant constructions near central manufacturers. So the upstream and downstream enterprises of a supply chain form a special industrial cluster [29]. Due to advantages of cost, innovation and expansion capability, industrial clusters could boost competitiveness rapidly by integrating superiority resource within the clusters [26, 28, 30, 31]. When automotive manufacturers intend to build factories in China, as part of their supply chain, normally suppliers will follow by, industrial clusters duplicated directly in China.

When a company decides to enter a new market or expand abroad from home country, in addition to changing the internal product processes and organizational structures [32], it is also necessary to fully understand business and social environment and target a right role in business ecosystem [21]. With the rapid growth of demand for automobiles in China, the supply chain of Taiwanese

automotive manufacturers which built factories in China has dramatically changed. It is interesting that suppliers' forces are expanding gradually, so that the business ecosystem in which automotive manufacturers locate changes a lot.

1.1. Literature Review

1.1.1. Business ecosystem.

Business ecosystem was first presented by Choi [7] presented, its research indicates that the majority of companies are in a joint operation of the network model based on imitation of ecosystems. In this system, the company's competitive advantages come from innovation [38, 40]. Therefore, the members of the enterprise system should be fully recognized that they can step into different areas, develop new products, and create a brand new system collaboratively [11]. This is just like what Iansiti and Levien [21] said, if we cannot understand the impacts and effects of entire business ecosystem, it represents that competitive environment has already been ignored.

Battistella [3], Chang [5] proposed the concept of the life cycle of the business ecosystem, in which companies face different competitive situations at every stage of the life cycle in business ecosystem, so companies require different management activities to deal with competitions. Since every member in the business ecosystem plays a dual role of competition and cooperation, so the members of the business ecosystem regard each other as community of destiny [15, 16]. Battistella, Colucci, De Toni and Nonino [3], took Italian future telecommunications center as an example , to analyze the network of the business ecosystem. The analysis pointed out that the positions of "Key Person", "Dominator", "Free Rider", and "Niches" of the business ecosystem varied constantly with changes in the environment. Because of changes in the environment, some "Key Persons" lost gradually their dominant positions; as well, some "Key Persons" become "Free riders" or "Dominators", enter business areas, which are originally operated by "Niches", making "niches" substantially reduce living space, or even expulsion from the market, so that the "Niches" cannot survive [17, 37]. Kuo, Seetoo, and Yu [25] focus on business ecosystem in software industry, their paper indicates that no matter the company holds the position of "Dominator" or not, it is necessary to seize the changes of the overall business ecosystem, in order to be a long-term survivor in the rapidly changing environment.

For the members' transferred relationships of Industrial Clusters in business ecosystem, Yen refers a native (Original) clustering and replicative (Cloned) clustering concept in the study of Taiwanese businessmen's growth strategies, which amended the simplified model of "Grasping the Meat" in the previous study [19, 20]. In this concept, original clustering, which means the industry and business cluster model in Taiwan, is developing fast in specific environmental conditions, then this original clustering face gradually a bottleneck to growth. The cloned clustering means that the original clustering is consisted of "secondary Core Members" and "main border Members" and the replication occurs not in the home country. In the original clustering, "secondary core Members" and "main border Members" would do the "strategical Copy", "main core Members" tend to stay in the home country because of the core abilities, and "minor border Member" tend to stay in the local place to hold down costs, increase efficiency or promote differentiation [1, 2, 4].

On the basis of the above business ecosystem literature, the perspective of business ecosystem emphasize the use of interdisciplinary systems to replace the enterprises of single field and with systems against systems to replace the companies' competitions. In other words, when the company decided to enter a new market or expand abroad from the home country, competitive policies should be changed, which includes, not only to change internal business and products processes and organizational structures, but also to understand the new business environment and select business system for companies' roles and strategies. Thus, this study suggests when Taiwanese companies invest in China and set up the factories, automotive suppliers should vary the composition of parts suppliers and industrial supply chain will also change because of the differences in ecosystem.

1.2. Research Methods

1.2.1. Establishment of aspects and criteria.

In this section, the Delphi method was performed to establish the aspects and criteria for supplier selection of automotive manufacturers. Delphi method was developed by Rand Corporation in U.S.A. for long-term prediction in 1960s [10, 14, 18]. It consisted of a series of repeated interrogations through questionnaires of a group of experts and managers whose judgments were of interest in order to arrive at a group position regarding an issue. After the initial interrogation of each individual, each subsequent interrogation was accompanied by providing information of previous round of replies. Individuals were encouraged to reconsider and change their previous reply with the consideration of the replies of other members of the group [10].

According to the related research [7, 8, 14, 18, 20, 36] there are numerous criteria from eight aspects were initially identified for expert assessment. In order to ensure selected criteria has a higher degree of consensus, senior managers and experts from automotive manufacturers and suppliers both in Taiwan and China are interviewed first to decide the aspects and the subsequent criteria for supplier selection. To obtain a consensus among people who were involved in, maximum average score method [36, 37] which can adjust the value of consensus deviation index

(CDI) is used. Specifically, they should give a score from 0 to 100 points by evaluating the degree of importance of criteria listed in the questionnaire, and critical value of CDI is set to 0.1 (i.e., $\varepsilon=0.1$). The group position that all experts have reached a consensus on the evaluation criteria is finally determined after three rounds. And 17 criteria which CDI value have been <0.1 is ranked based on the average score given by experts. All six experts agreed to set 80 points as the threshold value for filtering criteria. It means that the criteria of less than 80 points will be deleted due to lack of importance.

The hierarchical network structure, which composes of five aspects and thirteen criteria, is established as shown in Table 1. Aspects are assumed to interrelate to each other; in consequence, criteria are all interrelated even if they have different upper level criteria.

Table 1 Sensor network experimental results

Goals	Aspects	Criteria
Supplier Selection of Automotive Manufacturers	Quality (A)	Delivery Quality (A1)
		Quality Consistency (A2)
		Service Quality (A3)
	Delivery Date (B)	Delivery on time (B1)
		Delivery Correctly (B2)
		Delivery Flexibly (B3)
	Cost (C)	Product Cost (C1)
		Payment Terms (C2)
	Technology (D)	Innovation Ability (D1)
		Process Technology (D2)
	Unique Abilities (E)	Power Advantages (E1)
		Risk Assessment and Mitigation Capacity (E2)
		Deployment Capability of Mixed Product (E3)

The 13 criteria from five aspects mentioned-above for supplier selection are defined as follows:

(1) Quality

Delivery Quality refers to the reliability and integrity when raw materials and components arrive.

Quality Consistency shows a certain level of product quality maintained.

Service Quality emphasizes that whenever customers put forward demands about products, the service should be provided promptly and appropriately.

(2) Delivery Date

Delivery on time represents that components should be delivered to automobile factories due to customer's schedule.

Delivery correctly refers to consistency of items and quantity etc.

Delivery flexibly emphasizes the production planning and delivery schedule can be easily revised.

(3) Cost

Product cost accounts the total cost including raw materials, manufacturing, processing, assembly, maintenance, even recycling.

Payment Terms shows that suppliers allow deferred payment so that automobile factories can improve the turnover rate of current capital.

(4) Technology

Innovation Ability represents the support for concept, structure and engineering design in new product development.

Process Technology emphasizes the close relationship between suppliers and manufacturer about production process.

(5) Unique Abilities

Power Advantages measure the degree of power that manufacturer is greater than the suppliers' in trading relationship, which is also called the influence of manufacturer to suppliers.

Risk Assessment and Mitigation Capacity refers to the abilities that suppliers can evaluate the uncertainty of performing the contract and profit, and the abilities that suppliers can design and implement security mechanisms to reduce uncertainty.

Deployment Capability of Mixed Product emphasizes that suppliers should build a flexible product platform to standardize the production and delivery of hybrid products which can meet the service needs of individual customers.

1.2.2. ANP Process.

The process of ANP comprises four major steps [34].

Step 1: Model construction and problem structuring: The problem should be stated clearly and decomposed into a rational system like a network. The structure can be obtained by the opinion of decision makers through brainstorming or other appropriate methods [9, 10].

Step 2: Pairwise comparisons matrices and priority vectors: In ANP, like AHP, decision elements at each

component are compared pairwise with respect to their importance towards their control criterion, and the components themselves are compared pairwise with respect to their contribution to the goal. Decision makers are asked to respond to a series of pairwise comparisons where two elements or two components at a time will be compared in terms of how they contribute to their particular upper level criterion.

Step 3: Supermatrix formation: The supermatrix concept is similar to the Markov chain process. To obtain global priorities in a system with interdependent influences, the local priority vectors are entered in the appropriate columns of a matrix, known as a supermatrix. As a result, a supermatrix is actually a partitioned matrix, where each matrix segment represents a relationship between two nodes (components or clusters) in a system [9, 10]

Step 4: Selection of best alternatives: If the supermatrix formed in Step 3 covers the whole network, the priority weights of alternatives can be found in the column of alternatives in the normalized supermatrix. On the other hand, if a supermatrix only comprises of components that are interrelated, additional calculation must be made to obtain the overall priorities of the alternatives [9, 10].

2. EMPIRICAL STUDY

In this section, ANP is used as the decision making method which can be applied in non-independent hierarchical structure. It allows for more complex interrelationships among decision levels and attributes. The ANP feedback approach replaces hierarchies with networks, in which the relationships between levels are not easily represented as higher or lower, dominate or being dominated, directly or indirectly [22, 34]. For example, important criteria can determine the importance of the alternatives as in the hierarchy, and vice versa (Saaty, 1996). Therefore, a hierarchical structure with a linear top-to-bottom form is not applicable for a complex system [9, 23]. Recently, the ANP method has been successfully applied to many practical problems, such as program evaluation and outsourcing decision making et al [22, 24, 27, 34].

Here we take the interrelationship among aspects into consideration with respect to the goal and also the interrelationship among criteria with respect to an upper level criterion (i.e., Quality, Delivery Date, Cost, Technology, Abilities).

Experts are invited to give a score from 0 to 100 points (i.e., 0 represents no impact and 100 represents absolute impact) by comparing the interdependence between any two criteria listed in the questionnaire. Arithmetic average method is used to deal with the expert's scores. It shows that average score is 55.7 which means the middle degree of correlation. All experts contribute their professional experience to set 60 as the critical value that means the criteria scored 60 and above are of interconnectedness. Therefore, the schematic representation of the relationship among criteria is presented in Fig. 1.

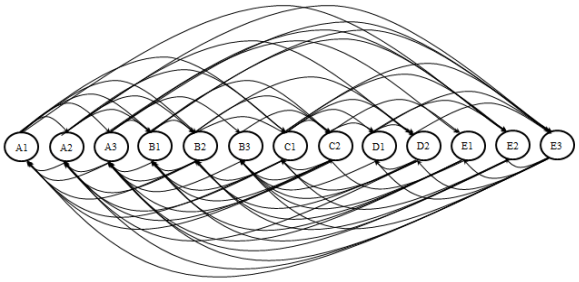

Figure 1 Inner dependence among criteria

The next step is to construct the comparison matrices at each component for pairwise comparison of the factors inside the component. There are a total of 24 pairwise comparisons. The details are explained as follows. First, a group of 20 respondents that consists of senior managers of several automotive manufacturers and suppliers from Taiwan and China is invited to complete the pairwise questionnaires with a nine-point scale.

Super Decision is used to analysis the data of pairwise comparisons, and to calculate the supermatrix of criteria or aspects. More importantly, consistency index (CI) of each matrix is tested for compliance (i.e. CI < 0.1). For example, Table 2 shows the weights of five aspects on the view of Taiwanese automotive manufacturers.

After all limit supermatrices contain every respondent have been established, the arithmetic average method is used to integrating the weights in each supermatrix later. Table 3 shows the comparison results of the integrated weights of five aspects among automotive manufacturers and suppliers in Taiwan and China, that is, "two places - two parties".

According to Table3, we conclude that the rank of Taiwanese automotive manufacturers is Quality, Cost, Unique Abilities, Technology and Delivery Date. The manufacturers from China focus on Quality firstly as well, and Cost, Technology, Unique Abilities and Delivery Date follow by. In suppliers' opinions, what are Taiwanese mostly concerned about is also Quality and Cost, but the rank of the rest is Delivery Date, Technology and Unique Abilities. It is interesting that suppliers in China also regard Quality as their competitiveness, however, the sequence of rest aspects is totally different with Taiwanese, and followed by Technology, Unique Abilities, Cost and Delivery Date.

As shown in Table 4, Taiwanese automotive manufacturers focus on Product Cost, followed by Quality Consistency, Payment Terms, Delivery Quality and Service Quality; and what are the automotive manufacturers from China concerned about are Product Cost, Quality Consistency, Payment Terms, Delivery Quality and Process Technology; Taiwanese automotive suppliers also attach firstly importance to Product Cost, followed by Payment Terms and Delivery Correctly, Quality Consistency and Delivery Quality; suppliers from China pay much attention to Product Cost, in particular Quality Consistency and Deployment Capability of Mixed Product, and Delivery Quality and Process Technology followed by.

Table 2 The Rank of weights in supermatrix of aspects (Taiwanese automotive manufacturers)

Aspect	Automotive manufacturers in Taiwan					Avg.	Rank
	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5		
Quality (A)	0.3110	0.1930	0.2485	0.4772	0.3236	**0.3107**	**1**
Delivery Date (B)	0.1449	0.1394	0.1301	0.1051	0.1974	**0.1434**	**5**
Cost (C)	0.2903	0.1268	0.1826	0.1340	0.2794	**0.2026**	**2**
Technology (D)	0.1567	0.1180	0.2408	0.2196	0.1042	**0.1679**	**4**
Unique Abilities (E)	0.0971	0.4229	0.1980	0.0641	0.0953	**0.1755**	**3**

Table 3 The Rank of integrated weights of aspects

	Taiwan		China	
	Automotive manufacturers	**Suppliers**	**Automotive manufacturers**	**Suppliers**
Quality (A)	0.3017	0.2841	0.3124	0.3069
	(1)	(1)	(1)	(1)
Delivery Date (B)	0.1434	0.1768	0.1024	0.1092
	(5)	(3)	(5)	(5)
Cost (C)	0.2026	0.2836	0.2139	0.1685
	(2)	(2)	(2)	(4)
Technology (D)	0.1679	0.1373	0.1995	0.2153
	(4)	(4)	(3)	(2)
Unique Abilities (E)	0.1755	0.1182	0.1538	0.2002
	(3)	(5)	(4)	(3)

Note: The ranking of the structure aspects in brackets.

Corporations are developing their businesses all over the world driven by the trend of globalization and international specialized division of labor, it would result in the increased complexity of the management of production supply chain. In terms of the automobile industry, the selection of supplier would directly influence the quality of product and control of cost.

According to Table 3, both automotive manufacturers and suppliers from Taiwan regard quality and cost as the top two concerns, that is to say, the capability of effectively controlling the quality while simultaneously lowering the cost is the aspect of top priority for both automotive manufacturers and suppliers. Unique Abilities is the third consideration for automotive manufacturers, while Delivery date is more emphasized by suppliers. This research believes that automotive manufacturers pay more attention to the aspect of Unique Abilities than Technology and Delivery date due to the influence of 2011 Japan earthquake and widespread flooding in Thailand that forces automotive manufacturers to consider the abilities to cope with risks and transformation in the future. Suppliers, on the other hand, have not yet experienced the importance of Unique Abilities, thus giving lower priority to this aspect. Suppliers give Delivery date the third priority of consideration. In order to meet the need of JIT mode which shortage of materials is not allowed, suppliers have to product on schedule strictly.

In terms of the automotive manufacturers and suppliers in China, the rank of Quality and Delivery date coincides. Both would suffer significant losses once quality problems arise, therefore, they both regard quality as the top-priority aspect. Cost is the second consideration for automotive manufacturers. Since the cost of components accounts for a relative high proportion of the total cost, automotive manufacturers tend to select suppliers with the cost advantages to reduce the total cost of automobile manufacture and to increase the volume of sales.

Table 4 The Rank of integrated weights of criteria

	Taiwan		China	
	Automotive manufacturers	**Suppliers**	**Automotive manufacturers**	**Suppliers**
Delivery Quality (A1)	0.0981	0.0838	0.1023	0.101
	(4*)	(5*)	(4*)	(4*)
Quality Consistency (A2)	0.1170	0.1050	0.1410	0.1228
	(2*)	(4*)	(2*)	(2*)
Service Quality (A3)	0.0918	0.0812	0.0565	0.0918
	(5*)	(6)	(9)	(7)
Delivery on time (B1)	0.0706	0.0688	0.0496	0.0449
	(9)	(8)	(10)	(10)
Delivery Correctly (B2)	0.0909	0.122	0.082	0.0674
	(6)	(3*)	(6)	(9)
Delivery Flexibly (B3)	0.0041	0.005	0.0037	0.0071
	(13)	(13)	(13)	(13)
Product Cost (C1)	0.1556	0.1988	0.1664	0.1322
	(1*)	(1*)	(1*)	(1*)
Payment Terms (C2)	0.1060	0.1419	0.1099	0.0952
	(3*)	(2*)	(3*)	(6)
Innovation Ability (D1)	0.0431	0.0334	0.0612	0.0741
	(10)	(10)	(8)	(8)
Process Technology (D2)	0.0745	0.0655	0.0982	0.1
	(8)	(7)	(5*)	(5*)
Power Advantages (E1)	0.0284	0.0206	0.025	0.022
	(12)	(12)	(12)	(12)
Risk Assessment and Mitigation Capacity (E2)	0.0344	0.0269	0.0277	0.0273
	(11)	(11)	(11)	(11)
Deployment Capability of Mixed Product (E3)	0.0855	0.0472	0.0764	0.1142
	(7)	(9)	(7)	(3*)

This is also the major consideration for the investment of Taiwanese in China. Suppliers rank the technology as the second emphasis, since component suppliers invested in China also supply other automotive manufacturers in China, which is very different from what in Taiwan, in consequence, process technology and other innovative technologies, serve as important influence factors. Technology is the third consideration for automotive manufacturers. The technology is transferred from Taiwan to China, fully supported by head office, hence ranked No.3 with lower priority than the aspect of cost. Suppliers, however, provide components to multiple manufacturers in China, facing massive competition, as well as new transforming in the future, hence highly value the aspect of unique abilities.

Automotive manufacturers in Taiwan and China have the consensus opinion on the sorting of Quality, Cost, and Delivery date. Transferring from Taiwan to the China, supply chains are required to reduce cost as much as possible while maintaining the quality. Only in the aspect of Technology and Unique abilities do Taiwanese automotive manufacturers and China automotive

manufacturers have slight difference ranking result. In terms of suppliers, only the ranking of Quality is consistent in Taiwan and China, while other factors all present big uniformity. The reason for this diversity is not all of the suppliers are transferred to China in supply chain transferring, only suppliers of key components are transferred, supplying other automotive manufacturers in China as well. For the suppliers of non-key components, it is preferable to be localized. Moreover, the power structure and cooperative relationship of a supply chain would change in the process of transferring and duplication (Yan, 2006, 2007), all these result in the significant differences in the weights of different key aspects.

Taiwanese automotive manufacturers and suppliers both rank quality and cost as the top two concerns. therefore, the capability of effectively controlling the quality while simultaneously lowering the cost is the top-priority aspect for both automotive manufacturers and suppliers. Manufacturers give unique abilities the third priority, suppliers, on the contrary, value more on delivery date. Therefore, component suppliers should make timely adjustment against manufacturers' early response to risks, demand to future transforming and stress on unique abilities to satisfy the manufacturers' requirements. China automotive manufacturers and suppliers have the same ranking result (most important) in terms of the quality and delivery date aspects. For other aspects, manufacturers value cost in the second place, which is also the major consideration for the investment of Taiwanese in China. Suppliers, on the other hand, give technology and unique abilities the second and the third priorities respectively, which is clearly different from the consideration of manufacturers. This suggests that to the suppliers transferred to China, apart from effective cost controlling, technological development which can meet the demands of other local automotive manufacturers, unique abilities for future are in significance. Automotive manufactures and component suppliers have different attitudes to the criteria of supplier evaluation, and both need adjustment.

It can be seen from Table 4 that only the product cost is considered as the most important criterion by both automotive manufacturers and suppliers in Taiwan, while other key criteria all have significant differences in ranking. This study considers that automotive manufacturers emphasize the quality consistency since they are facing the actual consumers while suppliers emphasizing delivery correctly due to their responsibility to automotive manufacturers.

In China, automotive manufacturers and suppliers have the same attitude to significance of most key criteria, while differing in the criterion of the third-priority of importance. Automotive manufacturers value "payment terms" because they are facing various dealers and customers. Suppliers in China, however, are facing the fierce competition market, so they focus on the deployment capability of mixed product to keep a certain growth rate.

In terms of the prioritization of key criteria, the Taiwan and China automotive manufacturers reach a basic agreement. In the process of the supply chain transferring, the whole manufacturing processes are transferred to the new location, so the new plant and the initial manufacturer would have the consistent consideration to the weight of key criteria. Both Taiwan suppliers and China suppliers regard product cost as important key criterion, while distinctly differing in weighing other criteria. The reason for such distinction is only key component suppliers are transferred in the supply chain transferring from Taiwan to China, and these suppliers also serve for other local manufacturers, and consequently enter the local automotive supply chain. The market these suppliers face would be entirely different from the initial, and this will result in the bigger differences in the recognition of key criteria.

When the commercial system is transferred from Taiwan to China, the supply chain aims to lower the cost as much as possible while maintaining the quality, therefore, the automotive manufacturers in Taiwan and China have the same ranking results on the aspects of quality, cost and delivery date. However, in terms of the attitudes of the component suppliers in two areas, only in the aspect of quality reach a consensus, while others vary significantly in the priority ranking. This is because only suppliers of key components are transferred along with the supply chain, consequently, the changes of commercial system structure and market environment would generates the changes of criteria priorities. Moreover, the customer of these "component suppliers" transferred to China does not limited to the initial automotive manufacturer, and the power-dependence relation changes accordingly. As a result, existing supplier selection criteria would not meet the requirements of the new established business ecosystem, therefore, supplier selection criteria need to be revised against the discrepancy to adjust to the requirements of the new commercial eco-system. Supplier selection criteria would be influenced by the transferring of the supply chain, thus it needs to be revised against area discrepancy.

3. CONCLUSION

3.1. Research contributions

According to the results acquired from the empirical analysis, this research suggests the following contributions:

1. Various important factors are included in the evaluation of automotive suppliers, however, no systematic evaluation procedure has been established as a reference to corporates involved. This study, on the basis of supply selection criteria, determines the supplier evaluation criteria through the assistance of experts, and takes the dependent status among aspects and criteria into consideration. Accordingly, it establishes the structure that specific to the evaluation of component suppliers.

Therefore, results not only conform to actual status but also have a practical reference value.
2. This research is not limited to a single point, in the contrary, it provides the difference discrimination of the aspects and criteria suggested by "automotive manufacturers" and "suppliers" as a reference to both parts. Meanwhile, the research proposes the new supplier selection criteria in the new commercial system against the discrepancy between system in Taiwan and China. In other words, this research expands traditional "one region one end" to "two regions two ends", thus comprehensively analyzes the variety and diversity of supply chain evaluation.
3. In the practical decision making, most of the aspects and criteria would influence each other, therefore, our study analyzes such influences based on Analytic Network Process (ANP) to enhance the rigorousness and completeness of the research results.

3.2. Future studies

1. Due to the limits of research purposes and scales, this study determines several key aspects and criteria only from evaluation structure. In the follow-up scheme evaluation research, it is suggested to collect the performance value of each solution under each criterion through interviewing, and to determine the overall performance values or aggregate scores through weighted average method, the highest score of which is the best solution.
2. The current study is designed on the basis of a single case study and expert interviewing, so it is suggested in the follow-up research to extend the research and discussion scale through classifying the critical and the less critical component suppliers and to organize interviews with experts seeking from large automotive manufacturers, increasing the sample size to enhance the science rigorousness of the key factors of supplier evaluation.
3. The scale of current research is limited to the automotive manufacturers and suppliers of Taiwan and that invested by Taiwan corporates in China. Therefore, in the future study, this specific structure can be applied in the research on the supplier selection in China or overseas in multiple industries, and further discussing the similarities and differences of the key factors in automotive industries and others.

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