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Analyzing The Migration Factors Of Industrial Service Flexibility

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Abstract

In recent years, the global industry has been moving toward a service-oriented trend, and a critical service revolution has occurred in the manufacturing industry. Its flexibility provides a type of service that serves upstream and downstream manufacturers and customers in the entire supply chain, and the concept of industrial service flexibility is thus born. This study aims to explore the influential factors of industrial service flexibility. It examines industrial service flexibility from internal and external perspectives with manufacturing flexibility and collaboration network. In this study, a questionnaire was designed according to the content of each dimension, and the questionnaire was conducted in two stages. The sample of the first stage questionnaire was companies' senior management, and the analysis results of this questionnaire were compiled into the second stage questionnaire, which was redistributed to the management of the companies to verify the first stage questionnaire and extract more rigorous conclusions. Through the Analytic Hierarchy Process (AHP), fuzzy logic, and SPSS, the results show that the external collaboration network contributes more to the industrial service flexibility than the internal manufacturing flexibility of the companies. In terms of manufacturing flexibility, the strategic decisions made by senior management affect the effectiveness of industrial service flexibility. Moreover, it is also advisable for companies to use existing equipment and workforce for processing re-engineering and education training, and the expansion of resources will not be effective for industrial service flexibility. In terms of collaboration networks, the government's involvement has not made the industrial service flexibility any smoother. What companies need is a unique core competency and human network and the adoption of an integrated vertical and horizontal division of labor to maximize the effectiveness of the industrial service flexibility.

Keywords: *Industrial service flexibility; Manufacturing flexibility; Collaboration network.*

1. Introduction

Due to the increasing complexity of the competitive environment, the organization's business model has changed significantly. The traditional way of life, which emphasizes autonomy and independent operation, may no longer be effective in today's industry. Instead, the trend is to emphasize inter-organizational collaboration and integration so that each organization can play its core competency and form a mutually beneficial symbiosis to achieve a close interacti[1]ve relationship for operational synergy. In the area of supply

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chain management, manufacturers and other members should focus on long-term collaboration and form partnerships and alliances to achieve benefits such as reducing uncertainty, saving costs, developing new products, improving communication and sharing rewards, and diversifying risks to improve overall system performance (Maloni and Benton, 1997). In other words, the manufacturer's ability to provide flexible service responses is critical in shaping impressive performance and provides the impetus for other supply chain members to maintain collaborative relationships.

2. Literature Review

2.1 Industrial services

After the industrial revolution in Europe, the change in production tools and production methods allowed an economy based on manual labor to be quickly replaced by an economy based on industrial production machines. After experiencing technology-oriented, market-oriented, and other management thinking, human thinking is gradually shifting toward service strategy and innovation. It can be said that after the continuous evolution of the process from manual to machine to technology, our management thinking has returned to serving human nature. The production and operation model cannot be molded directly; only those behind it can shape it. Organizations in various industries use the concept of flexibility to shape their own desired operating model and even coordinate with different organizations in the entire industry to make adjustments. Higher flexibility in product development, especially in production, is necessary for the industrial revolution (Lasi et al, 2014). Flexibility provides a service that serves upstream and downstream manufacturers and customers in the overall supply chain. Industrial services play a crucial role in supporting the operations of businesses in various industries, ensuring the efficient and safe functioning of industrial facilities and equipment.

2.2 Industrial service flexibility

Industrial service flexibility usually refers to the ability of industrial service providers to adapt their services to meet the changing needs from the internal and external demand sides in a rapidly evolving business environment. From the above service literature, it is clear that to meet the changing market environment and customer needs, various industries have introduced the concept of service to meet customers' needs at different levels. The customers represent internal and external customers included in a company's entire production and marketing operations. Not only does the company flexibly take orders, produce and sell or provide customized products to satisfy external customers, but it also uses a flexible combination to integrate upstream and downstream collaborators in the overall supply chain.

2.2.1 Manufacturing Flexibility

Manufacturing flexibility improves a firm’s ability to react promptly to customer demands and increase production system productivity without incurring excessive costs and expending excessive amounts of resources, especially from the emerging technologies in the industry 4.0 era, such as cloud operations or industrial Artificial Intelligence, allow for new flexible production systems (Fragapane et al., 2020). Slack (1987) proposed the vertical (or hierarchical) concept of flexibility. Similarly, Gerwin (1987) analyzed and measured flexibility in four hierarchical dimensions, from low to high: machinery and planning, production functions and work departments, products (or product lines), and senior management of the company. Sethi and Sethi (1990) divided the flexibility in

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organizational structure into three hierarchies: base, system, and totality, and the flexibility factors in each hierarchy would affect each other. Gupta (1993) categorized the impact of uncertainty on organizational hierarchy and divided the hierarchy into four categories: mechanical, grassroots organization, planning, and corporate. Upton (1994) divided flexibility into three levels: operational, tactical, and strategic, and the three factors that influence flexibility are scope, uncertainty, and liquidity. Finally, Volberda and Rutges (1999) classified flexibility into three types: operational flexibility, structural flexibility, and strategic flexibility. These three types of flexibility can be based on the company's strategy to strengthen the organization's internal management capabilities to respond to the environment or to absorb external information and combine it with external forces to influence the external environment. The former refers to the management ability of an organization to adapt quickly to the demands of the environment, while the latter refers to the management ability of an organization to influence the environment so that it is less likely to be harmed when faced with environmental changes. To benefit from external integration and increase their flexibility performance, manufacturing firms need to implement different mechanisms of supply chain risk management to prevent and deal with supply chain risks including those associated with supply chain integration. Furthermore, internal integration and supply chain risk management have a direct effect on manufacturing flexibility (Chaudhuri et al., 2018). In addition, Koste and Malhotra (1999) proposed a new hierarchy of flexibility, suggesting that flexibility exists at five levels: individual resources, practical control, planning, functionality, and strategic business units, which coincides with Mair's (1994) view that flexibility exists in individuals, factories, and corporate networks. In view of the scholars' viewpoints and analysis on flexibility mentioned above, this study divides the flexibility into three sub-dimensions of flexibility, namely, operational flexibility, structural flexibility, and strategic flexibility.

2.2.2 Collaboration network

The concept of "network" comes from sociology and describes the interactions between people. Furthermore, the core of economic behavior is rooted in social exchange relationships, a process in which organizations exchange information, construct activities, share resources, and enhance each other's capabilities for mutual benefit. The purpose is to bring different forms of organizations together to create or discover solutions to problems within a limited combination of resources to achieve various goals, sharing not only power and responsibility but also common interests and values (Himmelman, 1996). At the network level, effectiveness is measured by considering the degree to which the network can achieve collective benefits. The interest is not in individual organizational benefits but in the extent to which the network, as a whole body, achieves outcomes that benefit everyone (Jang et al., 2023), and network capability positively affects strategic performance (Majid et al., 2019). Nevertheless, the level of collaboration with different partners can enhance firms' innovation capabilities only if the firms have developed the capacity to scan and acquire external knowledge. In the presence of absorptive capacity, only collaboration with research organizations and competitors has a positive effect on product innovation capability. In the case of process innovation capability, collaboration with research organizations and suppliers is the most important factor (Najafi-Tavani et al., 2018). The causes and forms of network organization among enterprises and the impact of the construction of collaboration networks on the network members and the network's external environment are issues which scholars have paid attention to in recent years.

Hamilton and Kao (1987) compared the organizational patterns of three recovering post-war economies, Japan, South Korea, and Taiwan. He believes that Taiwan is a network of SMEs, and the industry model in Taiwan is based on small family companies and individual relationships that allow companies to source raw materials backward and solicit customers forward. With SMEs as the main force, Taiwan has developed unique techniques to link the entire production and marketing relationship, such as the contract system, the satellite factory system, and the marketing network based on personal relationships. To summarize

the analysis of the scholars mentioned above on the configuration of various collaboration networks, it can be divided into three types of collaborative relationships: horizontal, vertical, and diagonal. "Horizontal" refers to collaboration between the same or similar industries. "Vertical" refers to the collaboration between upstream and downstream in the same product area, from raw materials, parts, semi-finished products, and finished products. "Diagonal" or "cross-industry collaboration" refers to the horizontal or vertical collaboration between manufacturers in different product areas.

This study summarizes the viewpoints of the scholars mentioned above and divides the external forms of collaboration networks into three types: "vertical division of labor collaboration system," "horizontal division of labor collaboration system," and "symbiotic-collaboration collaboration system". The intrinsic factors of collaboration operation deeply affect the quality of collaborative operation and become an indispensable element of collaborative activities. Based on the historical experience of Taiwan's past efforts to promote a system of Corporate Synergy Development Center (CSD) that takes advantage of everyone's strengths and state-owned enterprises working with private firms to expand their production capacity, this study classifies the intrinsic dynamics of collaboration networks into interpersonal relationships, government policies, and skills and abilities (Lambe and Spekman, 1997).

3. Research Methodology

This study adopts the methodology of fuzzy AHP. Fuzzy AHP is a decision-making methodology that extends the traditional AHP approach by incorporating fuzzy logic. The benefit of using Fuzzy AHP methodology is that it allows for more flexibility and accuracy in decision-making processes where there is a high degree of uncertainty and imprecision. Fuzzy AHP methodology not only enables decision-makers to consider both qualitative and quantitative criteria simultaneously, but also accommodates different levels of uncertainty and imprecision in the decision-making process. On the other hand, fuzzy AHP methodology allows decision-makers to express their judgments in linguistic terms rather than just numerical values and provides a systematic approach for structuring complex decision problems, identifying criteria, and evaluating alternatives.

3.1 Research Process

Based on the current situation of Taiwanese enterprises, this study finds that Taiwanese enterprises have the characteristics of rigidity and flexibility. Therefore, by means of literature research, this study explores the relevant academic articles and found two main dimensions, namely, manufacturing flexibility and collaboration network. These two dimensions were further divided into five sub-dimensions and fifteen sub-variables. Furthermore, because most matters in the real world have multiple attributes and cannot be judged by absolute binary logic, this study adopted the hierarchical analysis method, which is widely used in academic and practical circles, of the multiple criteria decision analysis (MCDA), and the fuzzy logic analysis, which is adapted to different variant environments, as the research method. Through weight analysis among variables, these weights were converted into fuzzy logic rules, and then the second stage of fuzzy analysis was performed to output the fuzzy surface model among variables. The growth and decline of each variable's surface graph were carefully observed to build the third SPSS questionnaire's content, and the third questionnaire was distributed to verify the conclusions of the second stage of fuzzy analysis.

3.2 Research Framework

This study classifies the factors influencing the industrial service flexibility into "manufacturing flexibility" and "collaboration network". Figure 1 demonstrates the research framework of this study.

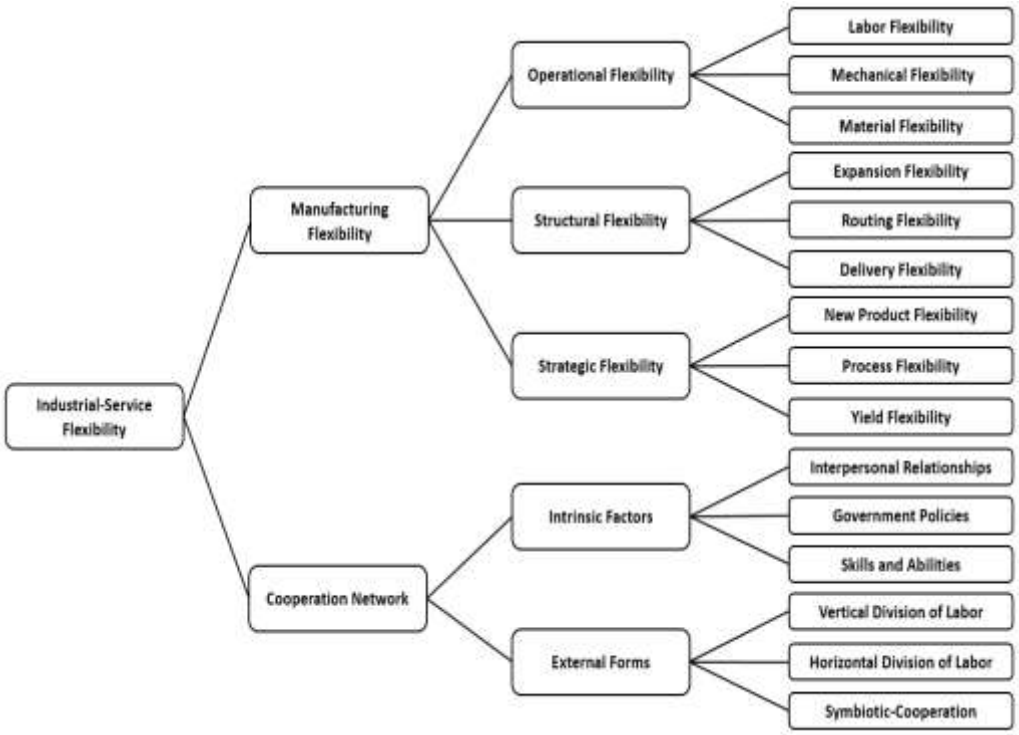


Figure 1 Research Framework

4. Analysis of Research Results

This study was divided into three stages of AHP analysis, fuzzy analysis, and SPSS analysis. The first stage of AHP analysis is used to structure and prioritize complex decision-making criteria and identify the weights of influential factors and sub-factors. The second stage of fuzzy analysis is used to handle uncertainty and vagueness in data. This approach is especially useful when dealing with complex or ambiguous data sets, where traditional statistical techniques may not be sufficient. The third stage of SPSS is used to verify the validity of the outcomes obtaining from the fuzzy analysis.

4.1 First Stage of AHP Analysis

The first stage questionnaire is designed an AHP questionnaire structure through an expert opinion survey. The variables for each item in the questionnaire were summarized from the literatures and divided into two main dimensions, five sub-dimensions, and fifteen sub-variables for the questionnaire design. A total of 30 questionnaires were distributed to a sample of small and medium-sized manufacturing executives in Taiwan, 27 were returned, and 22 were valid. According to the basic information from 22 valid questionnaires, the majority of the interviewees were from graduate schools or above, accounting for 46%, followed by 36% with a college degree and 18% with a university degree. In terms of years of service, those with 5 to 10 years accounted for 50%, those with more than 10 years accounted for 27%, and those with 3 to 5 years accounted for 23%. In terms of duty distribution, senior executives accounted for 45%, middle-level executives 50%, and junior executives 5%. It can be seen that the samples of this questionnaire comprise mainly middle and high-level executives, which meet the standards to be deemed as expert opinions. Table 1 shows the comprehensive ranking of weights of influential factors for industrial service flexibility.

Table 1 The comprehensive ranking of weights of influential factors for industrial service flexibility

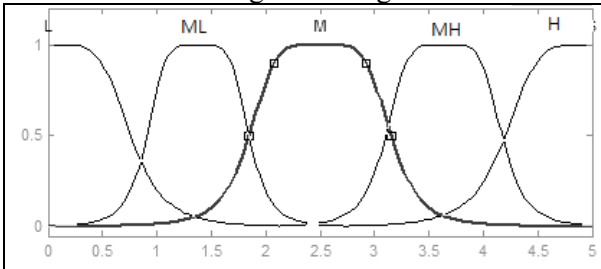
Main Dimension	Sub-dimension	Evaluation Index	Priority Vector	Rank	C.I.

Manufacturing Flexibility 0.428	Operational Flexibility 0.223	Labor Flexibility	0.027010652	2	0.02
		Mechanical Flexibility	0.043140688	1	
		Material Flexibility	0.02529266	3	
	Structural Flexibility 0.184	Expansion Flexibility	0.008032704	3	0.03
		Routing Flexibility	0.036777184	1	
		Delivery Flexibility	0.033942112	2	
	Strategic Flexibility 0.593	New Product Flexibility	0.084262928	2	0.00
		Process Flexibility	0.141622632	1	
		Yield Flexibility	0.02791844	3	
Collaboration network 0.572	External Forms 0.343	Vertical Division of Labor	0.042378336	2	0.02
		Horizontal Division of Labor	0.027075048	3	
		Symbiotic-Collaboration	0.126742616	1	
	Intrinsic Factors 0.657	Interpersonal Relationships	0.160468308	2	0.03
		Government Policies	0.053739972	3	
		Skills and Abilities	0.16159572	1	

4.2 The Second Stage of Fuzzy Analysis

The second stage questionnaire is designed for a fuzzy analysis. In this study, the fuzzy semantic variable table of Chen and Hwang (1992) was used to set the input criteria as Low, Middle, and High fuzzy sets. In order to get clearer and smoother surfaces, this study sets the input criteria of linguistic terms as Low, Moderate Low, Middle, Moderate High, and High. Table 2 shows Outcome ranges and linguistic terms. Table 3 shows the fuzzy rule-based calculations for the sub-dimension of "Manufacturing Flexibility".

Table 2 Outcome ranges and linguistic terms



Outcome (Y) ranges and linguistic terms	
2.6 < Y≦3	High
2.2 < Y≦2.6	Moderate High
1.8 < Y≦2.2	Middle
1.4 < Y≦1.8	Moderate Low
1≦Y≦1.4	Low

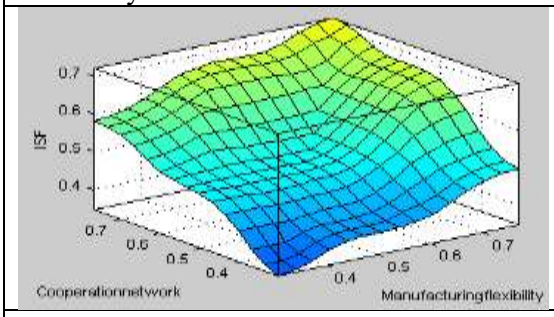
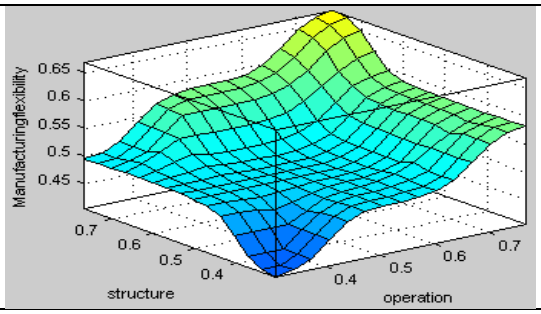
Table 3 The fuzzy rule-based calculations for the sub-dimension of "manufacturing flexibility"

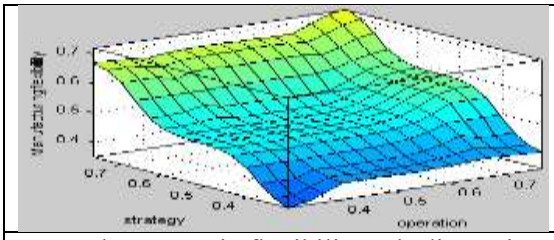
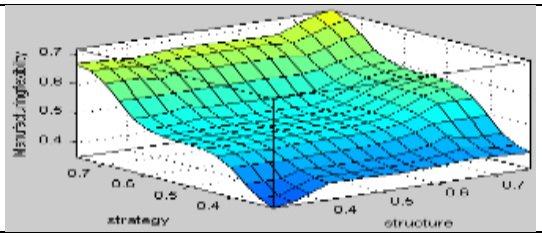
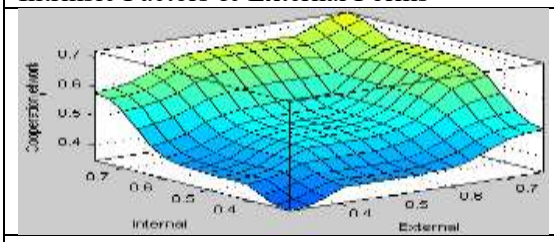
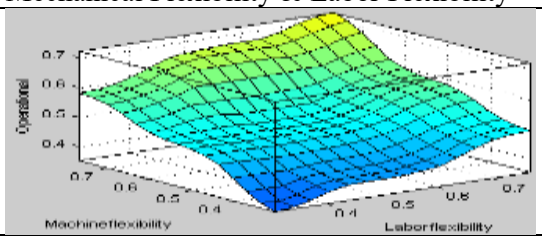
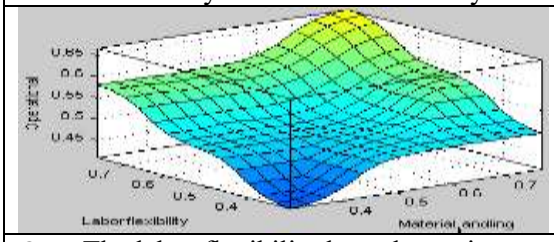
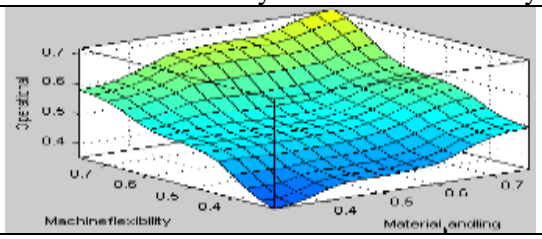
IF Scenarios		Operational Flexibility (0.223)	Structural Flexibility (0.184)	Strategic Flexibility (0.593)	Outcome value	Linguistic terms
1	if	H	H	H	3	H
2	if	H	H	MH	2.8	H
3	if	H	H	MM	2.6	H
4	if	H	H	ML	2.46	MH
5	if	H	H	L	2.28	MH

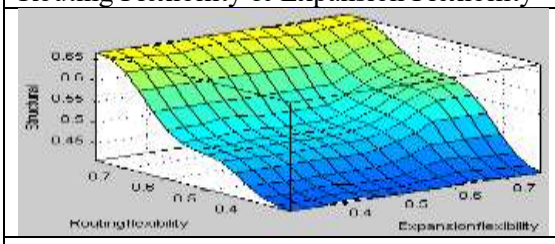
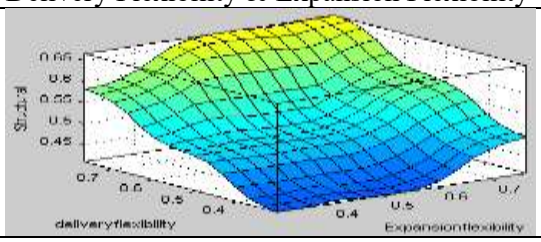
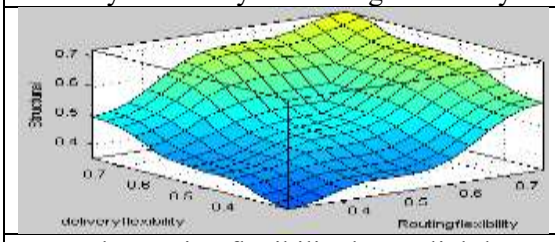
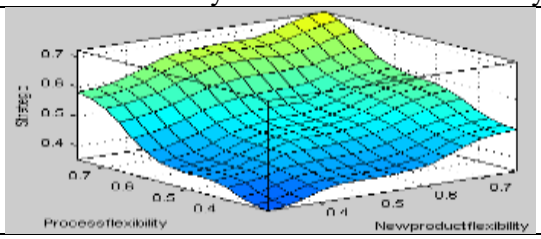
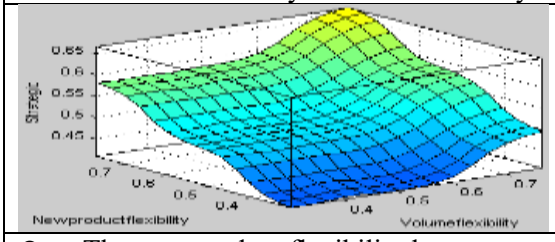
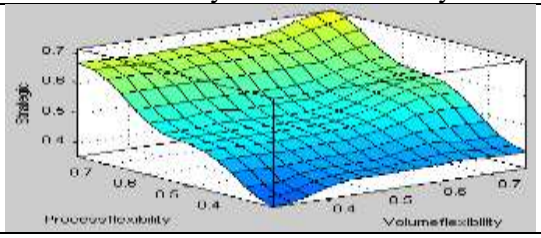
6	if	H	MH	H	2.83	H
7	if	H	MH	MH	2.65	H
8	if	H	MH	MM	2.47	MH
9	if	H	MH	ML	2.2905	MH
10	if	H	MH	L	2.11	MM
……						
116	if	L	ML	H	1.89	MM
117	if	L	ML	MH	1.71	ML
118	if	L	ML	MM	1.53	ML
119	if	L	ML	ML	1.35	L
120	if	L	ML	L	1.17	L
121	if	L	Low	H	1.72	ML
122	if	L	Low	MH	1.54	ML
123	if	L	Low	MM	1.36	L
124	if	L	Low	ML	1.18	L
125	if	L	Low	L	1	L

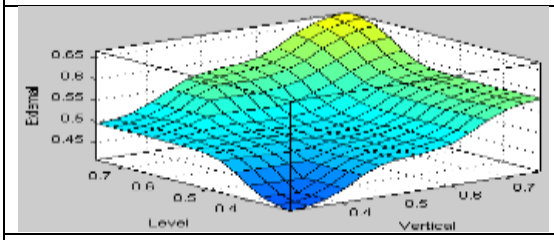
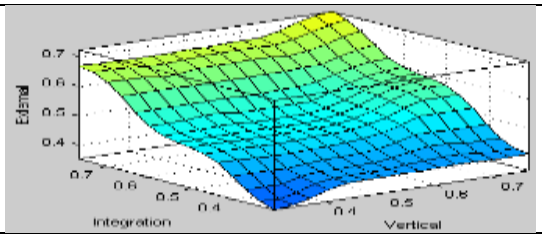
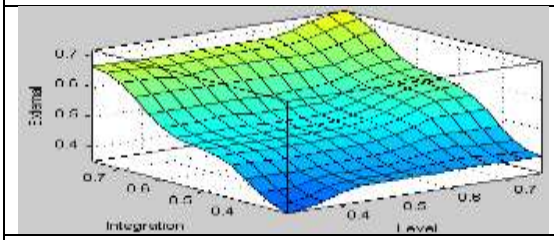
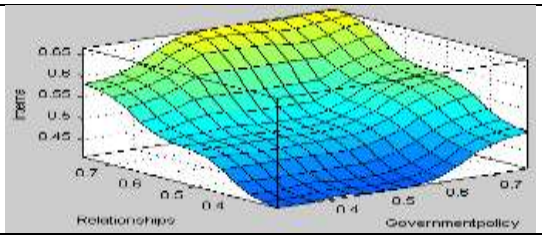
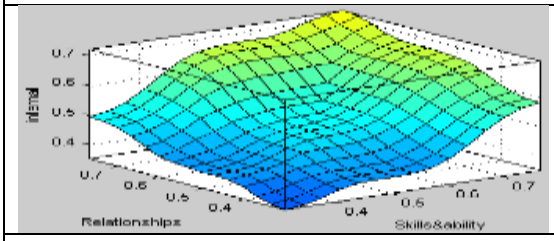
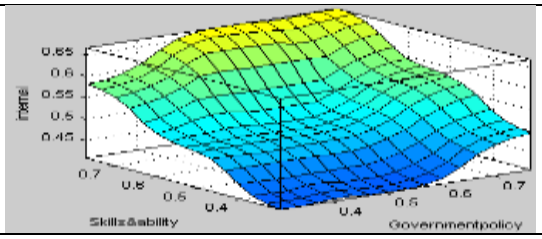
This study used the aforementioned fuzzy input/output criteria to input IF-THEN rules in Matlab to obtain the output of Fuzzy Surface. This study further observed the graphic trend of Fuzzy Surfaces, summarized its possible phenomena, and then found relevant conclusions. The detailed Fuzzy Surfaces and phenomena analyses are shown in Table 4.

Table 4 Fuzzy Surface

Collaboration network & Manufacturing Flexibility	Structural flexibility & Operational flexibility
	
● The collaboration network has a slightly better impact on the industrial service flexibility than the manufacturing flexibility. ● When the two cooperate, they can produce the best industrial service flexibility. ● When the two reach the intensity of ML, the impact on the industrial service flexibility shows stagnation, and there is no rising trend until it exceeds MH.	● The basic operation sub-dimension has a better impact on the manufacturing flexibility than the Structural flexibility sub-dimension. ● When the two cooperate, they can produce the best manufacturing flexibility. ● At the ML stage, both have approximately the same impact on the manufacturing flexibility. ● In the ML stage, the impact of the Structural flexibility sub-dimension on the manufacturing flexibility no longer increases; while the basic operation sub-dimension stagnates at this stage, but it starts to rise after exceeding the MH.
Strategic flexibility & Operational flexibility	Strategic flexibility & Structural flexibility

	
● The Strategic flexibility sub-dimension has a much better impact on the manufacturing flexibility than the basic operation sub-dimension. ● The basic operation sub-dimension no longer has a positive effect on the manufacturing flexibility after exceeding the ML stage. ● The combination of the basic operation sub-dimension and the Strategic flexibility sub-dimension after exceeding the MH stage still has a high impact on the manufacturing flexibility.	● The Strategic flexibility sub-dimension has a much better impact on the manufacturing flexibility than the Structural flexibility sub-dimension. ● The Structural flexibility sub-dimension no longer has a positive effect on the manufacturing flexibility after exceeding the ML stage. ● The combination of the Structural flexibility sub-dimension and the Strategic flexibility sub-dimension after exceeding the MH stage still has a high impact on the manufacturing flexibility.
Intrinsic Factors & External Forms	Mechanical Flexibility & Labor Flexibility
	
● The intrinsic factors and external forms of the collaboration network have approximately the same degree of impact on the collaboration network. ● After reaching the FH stage, the impact of both on the collaboration network has increased significantly, and the intrinsic factors are the most prominent.	● The mechanical flexibility has a better impact on the basic operation sub-dimension than the labor flexibility. ● When the two cooperate, they produce the best effect for the basic operation sub-dimension. ● When the labor flexibility exceeds MH stage, the impact on the basic operation sub-dimension slightly increases.
Labor Flexibility & Material Flexibility	Mechanical Flexibility & Material Flexibility
	
● The labor flexibility has a better impact on the basic operation sub-dimension than the material flexibility. ● The impact of the material flexibility on the basic operation sub-dimension does not increase after reaching the M stage. ● The labor flexibility has inflection points in both M and FH stages.	● The mechanical flexibility has a better impact on the basic operation sub-dimension than on the Structural flexibility sub-dimension. ● The Structural flexibility sub-dimension no longer has a positive effect on the manufacturing flexibility after exceeding the ML stage. ● The combination of the Structural flexibility sub-dimension and the Strategic flexibility sub-dimension after exceeding the MH stage still has a high impact on the manufacturing

	flexibility.
Routing Flexibility & Expansion Flexibility	Delivery Flexibility & Expansion Flexibility
	
● The routing flexibility has a much better impact on the Structural flexibility sub-dimension than the expansion flexibility. ● The expansion flexibility has almost no impact on the Structural flexibility sub-dimension. ● Although the impact of the expansion flexibility on the Structural flexibility sub-dimension is almost zero, a high degree of the expansion flexibility in conjunction with the routing flexibility still has a significant impact on the Structural flexibility sub-dimension.	● The delivery flexibility has a better impact on the Structural flexibility sub-dimension than the expansion flexibility. ● The expansion flexibility needs to reach MH or higher before affecting the Structural flexibility sub-dimension. ● The combination of delivery flexibility and the expansion flexibility at the M stage will have the best impact on the Structural flexibility sub-dimension.
Delivery Flexibility & Routing Flexibility	Process Flexibility & New Product Flexibility
	
● The routing flexibility has a slightly better impact on the Structural flexibility sub-dimension than the delivery flexibility. ● When the two cooperate, they produce the best impact for the Structural flexibility sub-dimension. ● Before reaching MH, the impacts of both flexibilities on the Structural flexibility sub-dimension are almost the same, but after reaching MH, the impact of routing flexibility increases significantly.	● The process flexibility has a slightly better impact on the Strategic flexibility sub-dimension than the new product flexibility. ● The process flexibility has an upward trend of impact after reaching MH.
New Product Flexibility & Yeild Flexibility	Process Flexibility & Yeild Flexibility
	
● The new product flexibility has a slightly better impact on the Strategic flexibility sub-dimension than the yield flexibility.	● The process flexibility has a much better impact on the Strategic flexibility sub-dimension than the yield flexibility. ● The yield flexibility no longer has a positive

● The yield flexibility has an upward trend of impact after reaching MH. ● The new product flexibility, together with the yield flexibility beyond the MH stage, will have a high impact on the Strategic flexibility sub-dimension.	effect on the Strategic flexibility sub-dimension after exceeding the ML stage. ● The combination of the yield flexibility and the Strategic flexibility sub-dimension after exceeding the MH stage still has a high impact on the manufacturing flexibility.
Horizontal Division of Labor & Vertical Division of Labor	Symbiotic-Collaboration & Vertical Division of Labor
	
● The horizontal division of labor has an impact on the external forms of the collaboration network in the beginning, but its influence will not grow after reaching the ML stage. ● The vertical division of labor has a better impact on the external forms of the collaboration network than the horizontal division of labor.	● The symbiotic-collaboration has a much better impact on the external forms of the collaboration network than the vertical division of labor. ● The optimal c external forms of the collaboration network still require the collaboration of the vertical division of labor beyond FH.
Symbiotic-Collaboration & Horizontal Division of Labor	Interpersonal Relationships & Government Policies
	
● The symbiotic-collaboration has a much better impact on the external forms of the collaboration network than the horizontal division of labor. ● The optimal external forms of the collaboration network still require the collaboration of the horizontal division of labor beyond FH.	● The interpersonal relationships have a much better impact on the intrinsic factors of collaboration operation than the government policies. ● The government policies have little or no impact in the early stages. ● The combination of the government policies beyond the M stage and the interpersonal relationships will have the best impact on the intrinsic factors of collaboration operation.
Interpersonal Relationships & Skills and Abilities	Skills and Abilities & Government Policies
	
● The skills and abilities have a better impact on the intrinsic factors of collaboration operation. network than	● The skills and abilities have a much better impact on the intrinsic factors of collaboration operation than the government policies.

the interpersonal relationships. ● When the two cooperate, they produce the best impact for the intrinsic factors of collaboration operation.	● The government policies have little or no impact in the early stages. ● The combination of the government policies beyond the M stage and the skills and abilities will have the best impact on the intrinsic factors of collaboration operation.

Conclusions

The collaboration of external partners is more important than the internal adaptation of manufacturing flexibility to achieve good industrial service flexibility. Compared with middle management, the adjustment of workforce and materials and machinery operation by the grassroots management has a more substantial influence on the internal manufacturing flexibility of the enterprise. The flexibility of senior management to adapt to external environmental changes in products, processes, and yield has a more substantial impact on the internal manufacturing flexibility of the company than the adjustment of the workforce, machinery, and materials by grassroots management. The flexibility of senior management to adapt to external environmental changes in products, processes, and yield has a more substantial impact on the internal manufacturing flexibility of the company than the adjustment of the production lines and delivery time by middle-level executives. The effective scheduling and utilization of machinery by enterprises will produce more flexible effects than using personnel (working overtime, temporary workers, etc.) to accomplish the tasks. The effective deployment and utilization of personnel in the company have a more substantial impact on the internal manufacturing flexibility of the company than the effective deployment and utilization of materials. The expansion of production lines, the recruitment of new personnel, and the introduction of new technologies do not significantly impact manufacturing flexibility. The production system can use different production lines to produce specific products, which has a more substantial impact on the internal manufacturing flexibility of the company compared to changing the delivery time to meet customer demand. Senior management's willingness to adjust the process for improvement is stronger than the company's willingness to develop new products in line with the market. The intrinsic influential factors in the implementation of the collaboration network, such as the degree of collaboration of personnel, technical capabilities of partners, etc., are more important than the type of integration (vertical, horizontal, etc.) to be used. When collaborating, integrating vertical and horizontal collaboration patterns to achieve a symbiotic situation will be more effective than selecting only one to operate. The promulgation of government decrees and policies is not enough to help inter-company collaboration, but the main incentive is the willingness of companies to cooperate with each other. An enterprise with an excellent technical background substantially impacts the collaboration network more than the government's policy, persuasion, and interpersonal relationships between manufacturers.

Table 6 The results of T-test

Conclusions on factors of industrial service flexibility - T-test							
Item No.	**Average Value**	**T Value**	**P Value**	**Item No.**	**Average Value**	**T Value**	**P Value**
No.1	3.80	3.105	0.002***	**No.8**	3.95	5.153	0.000***
No.2	3.69	0.970	0.334	**No.9**	3.66	0.775	0.440
No.3	3.90	4.121	0.000***	**No.10**	4.06	7.440	0.000***
No.4	3.78	2.426	0.017**	**No.11**	4.38	12.469	0.000***
No.5	3.86	3.486	0.001***	**No.12**	4.10	7.456	0.000***
No.6	3.85	3.037	0.003***	**No.13**	4.14	7.957	0.000***
No.7	3.03	-5.878	0.000***				
****** P<0.01, ** P< 0.05, * P< 0.10***							

5. Conclusions and Recommendations

The factors for the industrial service flexibility will be divided into two parts for discussion based on the systematic analysis results of this study. It is expected that the analysis results of this study will provide a reference for enterprises to implement an industrial service flexibility model for industrial services. In addition to the manufacturing flexibility of the internal operation of the enterprise, the manager conducts strategic collaboration between enterprise organizations with collaborative or competitive manufacturers through external environmental management. Obtaining the support and assistance of external resources has a better effect on industrial service flexibility than manufacturing flexibility. Managers gather information from the outside world, learn from the people they work with, and integrate their own decision-making skills and concepts. They then internalize the external resources into their own core competencies through organizational learning and joint discussions and further develop a mission, vision, and goals more suitable for the company. As for forming a collaboration network with other companies, first and foremost, companies must have their unique core competencies as their conditions and bargaining chips to be in a position to engage in inter-organizational strategic collaboration with partners or competitors. The long-term collaborative relationship and the sincerity between enterprises and their employees have established a formless sense of trust. Such a network of contacts without concerning price and profit enables Taiwanese companies to respond quickly to changes in the market environment with great vitality and surprising speed. Driven by the government's industrial networking policy, the industrial and interpersonal networks have enabled Taiwanese companies to win with flexibility.

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