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Based on Data Envelopment Analysis Evaluation of the Competitive Firms Knowledge Sharing

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ABSTRACT. *The knowledge sharing between competitive firms has become an important form of knowledge management. The similar knowledge can highly enhance the absorption ability to some extent, the same industry can better for knowledge transfer and sharing. However, due to the complexity of knowledge sharing in competitive firms, there are many obstacles. How to maximize the efficiency is the focus of this paper. With the help of DEA model and DEAP software tools this paper evaluates the efficiency of knowledge sharing among competitive firms, and establishes the input and output index system of evaluation.*

KEYWORDS: *Competitive firm, Knowledge sharing, DEA model*

1. Introduction

The world is gradually entering the era of knowledge economy. Large and medium-sized firms at home and abroad have gradually recognized the importance of enterprise knowledge management. How to manage knowledge has formed a management system of its own. With the intensification of competition among firms, the trend of seeking cooperation and sharing knowledge among firms has gradually emerged. Knowledge sharing occurs more in the enterprise. Through communication and communication, the employees gradually accumulate experience and circulate within the enterprise. Such continuous circulation and reciprocation, the internal knowledge sharing of the enterprise is more and more mature. At present, knowledge sharing within firms has been far from meeting the existing needs of firms, and knowledge sharing among firms has begun to receive attention. For the knowledge sharing between different firms in the same industry, new breakthroughs can be made, that is, competitive innovation among firms in competitive strategic alliances. Such as: the patent cross-licensing agreement signed between Huawei and Ericsson. The technology update of the communication industry is fast. In order to occupy more markets, it is required to acquire more knowledge from competitors and apply knowledge to the development of the enterprise. However, the knowledge sharing among competing firms faces more

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obstacles. Since the relationship between firms is competitive, the market share of one party will inevitably cause the market share of the other party to fall. Firms will consider the protection of knowledge when sharing knowledge. The emergence of "learning dilemmas" and "target conflicts" has affected the effect of corporate knowledge sharing.

At present, the evaluation of the efficiency of knowledge sharing between universities and firms has attracted the attention of scholars. Li Xingguo and Gu Yujing used data envelopment analysis to study the evaluation of knowledge sharing in supply chain; Zhou Jie and Tao Xiaofang studied the knowledge sharing among firms in strategic alliances; Sun Rui and Zhao Dali used game theory to analyze the knowledge sharing among dynamic alliance firms; Wang Junxia and Guan Jian used the DEA method to evaluate the performance of enterprise knowledge management.

Due to the complexity of knowledge sharing among competing firms, this paper uses DEA method to evaluate the efficiency of knowledge sharing among competing firms under the premise of analyzing the influencing factors of knowledge sharing among competing strategic alliance firms.

2. The complexity of knowledge sharing in competitive firms

Knowledge sharing among competitive firms is different from general inter-enterprise alliances, and there is no upstream-downstream relationship between supply chain firms. Competitive firms will have conflicts such as cooperation and competition when sharing knowledge. Firms need to grasp the relationship between the two to maximize the results of knowledge sharing.

Competitive learning among competitive firms will lead to competitive learning. In the alliance firms, members will continue to learn the knowledge of other members and extend this knowledge to other fields, directly damaging other core competencies of this member. Leading to the instability of the alliance, incurring more contradictions and distrust, and even destroying the established alliance knowledge sharing relationship.

When competing firms share knowledge, there are many firms in the alliance, and the goals of each enterprise will be different. A certain enterprise may have its own small goals, which may be different from the big goals of the alliance group, and may even deviate. Because it will affect the effect of knowledge sharing among competing alliance companies.

In addition, due to the special nature of the alliance between the alliance firms, the stability of the alliance is weak, there are great fluctuations, and the withdrawal and joining of firms will occur at any time, which will lead to the phenomenon of fault sharing.

Because the similarity of knowledge base between competitors can greatly enhance the absorption capacity of alliance member companies, knowledge transfer and sharing between competitors in the same industry can be better. Because the

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mutual benefit and win-win situation of knowledge sharing among competitive firms will have a strong impetus to the innovation of the entire industry

3 Empirical Research on DEA Model Evaluation of Knowledge Sharing in Communication Industry

3.1 Introduction to DEA Model

Data Envelopment Analysis (DEA), by making the input or output of the decision making unit (DMU, Decision Making Units) unchanged, using mathematical programming and statistical data to determine the relative effectiveness of the production frontier, the decision The unit is projected onto the production front surface of the DEA and their relative effectiveness is evaluated by comparing the extent to which the decision unit deviates from the DEA frontier.

DEA has an absolute advantage in dealing with the effectiveness of multi-input-multi-output evaluation, and does not directly integrate the data. Therefore, the optimal efficiency index of the decision-making unit has nothing to do with the dimension selection of the input index value and the output index value. Before applying the DEA method, the data need not be dimensionless; no weighting assumption is required, and the actual weight of the input and output of the decision unit is used to obtain the optimal weight, which eliminates many subjective factors and has strong objectivity; The method assumes that each input is associated with one or more outputs, and there is indeed some connection between the input and output, but it is not necessary to determine the explicit expression of the relationship.

The DEA model was first proposed by Charnes, Cooper and Rhodes in 1978 and was the first DEA model, the CCR model. The CCR model is used to study the hypothesis that the multi-input, multi-output production department achieves "scale effective" and "technically effective" after Banker, Charnes and Cooper in 1984, the scale returns in the CCR model are unchanged. The assumption for the change in scale returns is the BCC model. In addition, the FG model and the ST model have been developed, in which the FG model is under the assumption that the scale returns are decreasing, and the ST model is under the assumption that the scale returns are increasing. The DEA model has been developed to date, and the most representative ones are four categories: CCR, BCC, FG and ST models.

Analysis using the DEA model is available with a variety of software. DEAP, FRONTIER and Efficiency Measurement System software. This article will use DEAP software for analysis. When using DEAP for analysis, the DEA model uses linear programming to construct a non-parametric segmented surface (leading edge) and then calculates efficiency against this surface. The computer program can consider the diversity of the model, there are many choices. According to the need, this paper selects the standard CRS and VRS packet analysis model constructed by Fare, Grosskopf and Lovell in 1994, including the calculation of technical efficiency and scale efficiency.

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3.2 Determination of DMU

This paper takes the communication industry as the goal, and selects 9 communication companies to analyze the DEA model of knowledge sharing. This determines the decision of the input and output items. Knowledge sharing among competitive firms is based on common goals and mutual trust. Referring to relevant literature and materials, combined with the actual situation of nine communication industries, the input indicators are determined as knowledge flow costs, knowledge absorption costs, and alliance costs. The scale of the platform system for enterprise knowledge sharing; the output indicators are the closeness of the alliance, the degree of knowledge acquisition, and the application of alliance innovation.

3.3 Empirical results

Data envelopment analysis, this paper mainly discusses the CCR model and the BCC model, and measures the overall efficiency of DMU with CRS with constant scale return, and measures pure technical efficiency with VRS with scale return change. Table 1 shows the empirical results of nine communication industries, reflecting the technical efficiency under the CCR model, namely the overall efficiency; the pure technical efficiency under the BCC model, and the three different cases of scale efficiency CRS, DRS and IRS.

Table 1 Three efficiency models and scale returns for all samples

firm	CRS	VRS	SCALE	
1	1.000	1.000	1.000	CRS
2	1.000	1.000	1.000	CRS
3	0.514	0.572	0.898	IRS
4	1.000	1.000	1.000	CRS
5	1.000	1.000	1.000	CRS
6	0.755	0.756	0.998	DRS
7	0.806	0.960	0.839	IRS
8	1.000	1.000	1.000	CRS
9	0.874	1.000	0.874	DRS

Table 2 Results of output

Results for firm: 6				
Technical efficiency = 0.756				
Scale efficiency = 0.998 (drs)				
PROJECTION SUMMARY:				
variable	original value	radical movement	slack movement	projected value
output	50.03	0.000	106.205	156.235
output	60.87	0.000	0.000	60.870
output	76.65	0.000	0.000	76.650
input	285.6	-69.619	0.000	215.981
input	150.96	-36.799	-84.168	29.994
input	51.89	-12.649	0.000	39.241
input	95.61	-23.306	-15.447	56.857

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Specifically analyze two samples. A detailed analysis was performed with the results of the sixth and ninth samples. The results of the first sample are shown in Table 2.

The results show that the pure technical efficiency of sample 6 is 0756, and the scale efficiency is 0.998 (drs): the scale return should be decremented. There is no redundancy in the second and third outputs. The first output is insufficient, which is 106.205. The target value for achieving DEA is 156.235. For the input, the four inputs are redundant. The first, second, third and fourth input elements have input redundancy: 69.619, 120.967, 12.649, and 38.753. Therefore, the input elements of the sixth sample need to be reduced by a certain amount.

Therefore, for the sample, if the input factor can be artificially determined, and the output factor cannot be determined, for the enterprise, it can be considered whether the input can be reduced, whether the output is increased or not; Factors can be determined, and when input factors cannot be determined, companies can consider whether output can be increased without considering input factors.

According to the results of the Deap operation, statistics are shown. As shown in Table 3, the best reference point and relative weight in the production of the enterprise can be seen, and the peer count is the number of times the enterprise is referenced by other companies in the same industry. According to the statistical results, the first and fifth companies were cited the most, followed by the second, fourth and eighth companies, while the rest were relatively insufficient.

Table 3 Reference to the communication industry enterprise ranking and order

firm	Peers(Weights)	peer count
1	1(1.000)	3
2	2(1.000)	1
3	1(0.563) 5(0.437)	0
4	4(1.000)	1
5	5(1.000)	3
6	8(0.053) 4(0.032) 5(0.239) 1(0.677)	0
7	5(0.665) 2(0.305)1(0.031)	0
8	8(1.000)	1
9	9(1.000)	0

4. Conclusion

Knowledge management has become an indispensable aspect of firms. Enterprise knowledge sharing is also more recognized and applied. Knowledge sharing not only exists within the enterprise, but also between the upstream and downstream firms in the supply chain and also in the competitive firms in the same industry. Between. How to maximize the efficiency of knowledge sharing among complex and competitive firms. We use DEA model to solve and solve the problem, which can improve the input efficiency and scale efficiency value of each enterprise,

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so that input and output are more effective without redundancy. Insufficient circumstances, each company can adjust accordingly according to the result value. Enhance mutual trust between firms, and weaken or break the barriers between firms in sharing knowledge.

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