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shirong Liu

School of Economic and Management, WuHan Electric power technical College, China, lsrhellen@163.com

jianing Liu

State Grid Hubei Electric power Company, China; School of Economic and Management, WuHan Electric power technical College, China

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Innovation Design Study on E- Bidding System: Chinese Enterprise

Group experience

Liu shirong¹, Liu jianing²

¹School of Economic and Management, WuHan Electric power technical College, China

²State Grid Hubei Electric power Company, China

Abstract: The e-bidding platform of electric enterprise group purchase business is regard as a complex system of interrelated economic, organizational, social and elements as well as the external and internal information flows of a company. Getting positive synergistic effect is one of the important factors for the enterprise group procurement business innovation. The paper showcase the synergistic effect framework, and then study synergistic effect of the e-bidding platform based on complex adaptive theory .We sharp enterprise group purchase system, research how to get positive synergistic effect contributions to the enhancement of the efficiency of the business overall.

Keywords: complex adaptive system, supply chain, enterprise group capability, e-bidding platform, synergistic effect,

1. INTRODUCTION

The E-bidding platform of electric enterprise group purchase business is regard as a complex system of interrelated economic, organizational, social and elements as well as the external and internal information flows of a company. By setting up the multi-layer purchase system based on internet platform, Chinese energy enterprise group began to adopted internet supply platform and take full advantage of synergistic effect and scale effects.

The integration of E-bidding complex adaptive elements (secure, risk, performance and cost) should be performed according to the chosen target audience. In scope of each element, there is a possibility of integration of it's components in order to raise the productivity of a specific element, i.e., the appearance of positive synergistic effect. Since 2006, by using E-bidding system, the enterprise group's purchase management ability increases and take full advantage of the scale effects brought by mass production and standardization, decrease the production and trade cost of the whole supply chain.

2. THEORY VIEW AND REFLECTION

2.1 The innovation study from complex adaptive system theory on enterprise group management

Private and public sector organizations tend to participate in networks in order to gain access to knowledge, skill and resources of other organizations and to create synergies to achieve highly demanding and complex goals they cannot attain individually. The governance of these organizational has been recognized as being an important variable influencing to the investigation and understanding of the relationships between e-bidding platform and governance of purchase business networks.

Success or failure of enterprise group has become the characterization of a nation's strength, so research on enterprise group management and innovation has the important practical significance. On our opinion, the enterprise group is a complex adaptive system in fact. John Holland (1994) fist point out the concept of complex adaptive system. He regard adaptive systems are a complex macroscopic collection of relatively similar and partially connected micro-structures-formed in order to adapt to the changing environment, and increase it

¹ Liu shirong. Email: lsrhellen@163.com

survivability as a macro-structure. They are complex in that they are dynamic networks of interactions, and their relationships are not aggregations of individual static entities. They are complex in that they are diverse and made up of multiple interconnected elements and adaptive in that they have the capacity to change and learn from experience.

Based on the dynamic change of complex environment and defect of core ability, David j.teece (1994) takes the lead in bringing the concept of “dynamic capabilities”, and offered a enterprise group capability strategy framework based on three key elements: organizational process, position and development path.

From the perspective of complex adaptive system theory, the nature of enterprise group’s growth is a system management process integrated use management methods、 techniques and means, prompting system within each subsystem and group way collaboration between system and external environment constantly consolidated coordination, achieve sharing、 consistency effect, in order to adapt to the dynamic changes of the external environment, produce the overall effect which is greater than the sum of the each elements. The development of complex adaptive ability on enterprise group development is essentially the realization of enterprise group synergy management process. On this opinion, this paper showcase the enterprise capability generation framework based on system coordination of enterprise group complex adaptive capacity growth model. (Figure1).

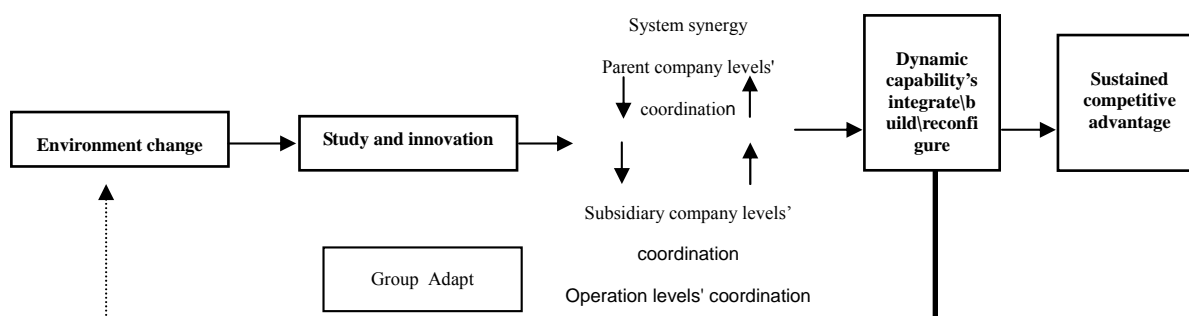


Figure 1. Enterprise group capability innovation framework based on complex adaptive system

□First of all, the change of external environment leads to a series of learning and innovation on enterprise group.

□Secondly, learning and innovation will lead to system synergy on enterprise group at three levels: parent company level, subsidiary company level and operation level. At same time, two-way collaboration exist: the top-down path of collaboration mainly guide by parent company. In this process, the entrepreneur's rational play a leading role. Because innovation is a process full of experiments and the choice of trial and error adaptability, so a single path is not conducive to the formation of enterprise innovation. The second path is the result of the enterprise adapt to the market.

□Form the point of complex adaptive system, although enterprise cannot predict “opportunities” will happen on what time, place and by what way, but enterprise activity of learning and designing activities to innovation is becoming more and more important. The two kinds of collaborative path complement each other and improve the enterprise strain capacity more conducive.

2.2 The innovation study from system synergy theory on enterprise group management

Due to the development of natural history, science and social life the ideas of synergistic are becoming the tools of social thinking and analysis and actively influence the ideas of world view. Since Hermann Haken (1971) fist offered the concept of synergy, the theory of synergy and synergistic management is actively being formed currently. Synergistic management is a principally new approach to management. Synergistic effect is

the effect from combining different systems or from interaction of the components of one system when the total is not equal to the sum of its parts.

Haken (1980) pointed out synergy is the result of target-oriented management. It does not appear by itself as a random effect. However the effect that appears as the result of integration of different elements of enterprise system can be both positive ($2+2>4$) and negative ($2+2<4$).

We enumerate electricity grid enterprise group as research object and divided the enterprise group into three levels: parent company' level, subsidiary company's level and operation level (function level). From the perspective of system function, parent company is the core member on enterprise group. It control, manage, and coordinate the development of the other members on the group and play a role of property rights ties with powerful strength. In a collaborative system, parent company is the center to create the competence of enterprise group. And subsidiary company level's coordination showed as the effectively integrate internal resources. In a collaborative system, subsidiary company located in the relatively weak position. But the synergistic of subsidiary company's level is an inner base of parent company's coordination.

This article offered a hierarchical pattern analysis from the perspective of system synergy (Table1). The relationship between the level of the system in and contribution to the enterprise group ability can be expressed as the curve of a rising trend.

Table 1. synergistic effect and hierarchical pattern analysis

hierarchical classification	Positive or negative synergistic effect	Degree of synergistic effect
operation level	Positive	*
subsidiary company's level	Positive	* *
parent company' level	Positive	* * *

“* ”: poor synergistic effect “* * ”: medium synergistic effect “* * * ”:advanced synergistic effect

□Collaborative effect of enterprise group occurred along three different levels: parent company' level, subsidiary company's level and operation level.

□the relationship between the three levels is that the parent company level's synergy build and foster around corporate strategic assets.

□subsidiary company level's synergy is the intrinsic basis of its parent company's level of synergy.

□function level's synergy is the starting point to coordination management of enterprise group.

□Due to the synergistic effect is essentially a system function enhancements after coordinate. Therefore the more complex of the system, the more significant performance can be achieved for the system coordination. Synergy effect becomes more obvious.

□Specific to the enterprise group, due to the synergy of enterprise resource integration occurred in different management levels, so in the enterprise the role of generation are also different.

□from the aspect of function layer , the subsidiary company level and then the parent company level, collaborative system's contribution to the enterprise group ability will gradually increase.

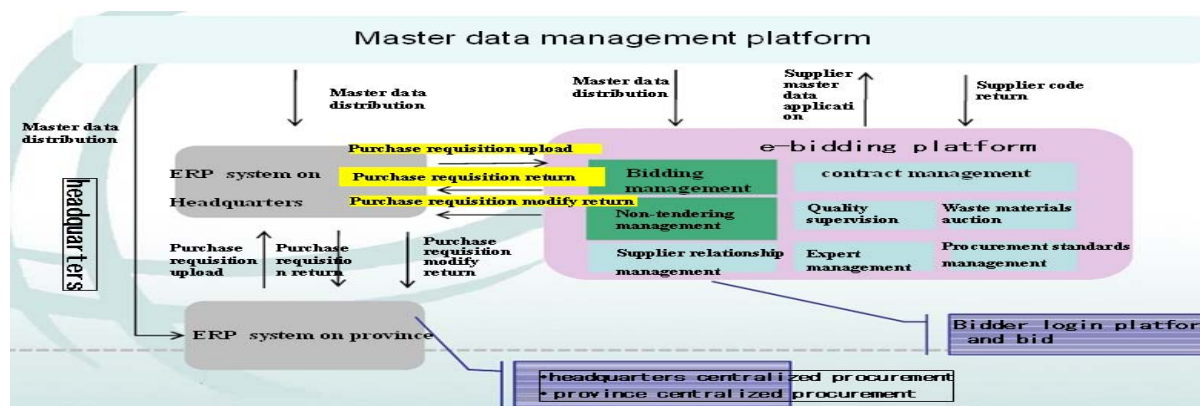
□As a result, the relationship curve between the level of the system and contribution to the enterprise group ability can be expressed as the curve of a rising trend.

3. THE ANALYSIS ON THE COLLABORATIVE E-BUSINESS OF THE ENTERPRISE GROUP'S E-PROCUREMENT PLATFORM

This paper analyzes the course of B2B E-Procurement and offers a synergistic effect system of B2B E-Procurement based on Internet/Intranet. We try to use a synergistic effect framework(model) in this research as a means to discover answers and insights to the research questions we laid out in the introduction of this paper. We study synergistic effect on the e-bidding platform of Chinese electric grid enterprise group on B2B supply business. The enterprise groups have set up multi-layer purchase system based on internet platform since 2006. They adopt internet supply platform and take full advantage of synergistic effect and scale effects, cut down the trade cost of whole supply chain. On the cooperation, the e-bidding business includes two levels: the headquarter procurement and the segment procurement business.

3.1 The design principle of e-procurement platform

Based on the above theory, there is a positive correlation between the synergistic effect and the complex level of synergy. The parent company level's coordination can achieve a more significant synergistic effect. The e-procurement platform of the electric grid enterprise group is established by the headquarter company level. The platform supports electricity bidding work and application on purchasing business. The segment level supports the ERP system. We showcase the framework of the e-procurement platform (Figure 2):



□The framework is designed by the principle that the relationship between the level of the system and the synergistic effect or contribution to the enterprise group capability is positive correlation.

□E-bidding platform focuses on bidding business, purchasing management, contract management, supplier relation management, quality supervision and management, waste materials disposal management, and other functions.

□ERP module implementation mainly involves planning of material requirements, order fulfillment, warehousing and distribution management.

3.2 The analysis of the function on e-procurement platform modules

On the Chinese electric grid enterprise group, the purchasing management information system is established by four main modules and two layers. The four main modules are the e-procurement platform, ERP system, material auxiliary decision system, and data management platform. The two layers are the parent company level and the subsidiary company level. The first layer of the procurement business system is established as the centralized bid procurement platform by the state power corporation (the headquarter). The other layer of the procurement business system is the centralized bid procurement business by the province electric power corporation (the segment).

The electric enterprise group regards the purchase business system as a complex of interrelated economic,

organizational, social, legal and elements as well as external and internal information flows of a company. On our opinion, integration of e-bidding platform functions and the provision of the correspondence to the factors of external and internal environment of the company. the subsystem of e-bidding management functions includes the following functions:

□It include following main modules: purchasing template management, procurement project management, procurement process, procurement policy setting, the use of a variety of procurement methods, suppliers online bidding, online inquiry, online reverse action, bidding terms template management, bidding management, online information template evolution, the winning project management.

□It include following modules on the plan business of purchasing: purchase agreement template management, complex structural quote processing, distribution share purchase by different subjects, protocol approval management.

□It include following modules on purchasing process business: procurement oversight, procurement project control, procurement protocol checks, purchase orders inquiry, purchase the entire process of data analysis, system-wide procurement implementation statistical analysis, multidimensional analysis of procurement data.

□It include following modules on post supervision of purchasing business: supplier online order processing, on the framework agreement to generate orders, quality assessment, procurement services and settlement management.

□In the whole process of the settlement process and purchase order processing, integration with the ERP system. Each of module is tightly integrated with a high degree of supply chain collaboration in various field.

□The segment company level's synergy is controlled by its state headquarter company .

□The platform enables integration with surrounding business system and establish all process control, closed- loop management of information technology applications.

4. SYNERGISTIC EFFECT INDEX FRAMEWORK AND POSITIVE ANALYSIS

This paper studies the sample data in 2006-2014 years of E-bidding business on electricity grid enterprise group. Data is collected from the electricity grid enterprise group's e-business platform (<http://ecp.sgcc.com.cn>). The analysis made by SPSS software. Because the index during the sample calculating methods in 2008 revised by the electricity grid enterprise group, this may influence on analysis result.

4.1 The design and explain of synergistic effect index

Stand on the system synergy theory, the effect that appears as the result of integration of different elements of enterprise system can be both positive ($2+2>4$) and negative ($2+2<4$). Table 2 summarizes the factors impact on synergistic effect from two ways: positive and negative.

Table 2. synergistic effect factors design

Positive synergy effect	Economic of scale
	Coordinated of market
	Management synergy
	Decrease purchasing business cost
Negative synergy effect	Halo effect on enterprise group Risk splice

Multiple synergies forms are different in the different projects. Risks exist always impersonally. Therefore,

it also exist risk clapping and magnifying mechanism on synergy system. Some projects may even appear various negative synergy. Due to the complex adaptive system ,the e-procurement platform is confronted with multiple hazards. Base on the principle of maximum profit, the enterprise group should strengthen the integration and management of e-procurement platform modules, get to the maximum of positive synergy and minimize the risk of negative synergy.

Negative synergy effects of halo effect can be properly monitored by enhancing quality of the evaluators, reinforcing management of evaluative process, improving evaluative skills and feed backing elastically evaluative results.

4.2 Model set

In order to determine the level of influence of the mentioned factors on the appearance of synergistic effect the companies were offered to evaluate the level of influence of these factors. This article establishes the interpretation of the synergistic effect evaluation index model. Table 3 offered the synergistic effect index framework. Six fundamental concept in survival analysis are : the headquarter concentration purchase ratio as the explained variable (Y), select the following indicators as the explanatory variables : average supply cycle, average supply cost (X 1), purchase application completion rate (X 2), order accomplishment ratio (X 3) , the suppliers concentration factor (X4) and average supervision cost (X 5).

Table3. synergistic effect index framework

type	Index system
Cost index	average supply cost, average supervision cost
Performance index	average supply cycle, purchase application completion rate, order accomplishment ratio,
Risk index	the suppliers concentration factor

On this base regression analysis of the influence of the mentioned factors on synergy effect (Y) was made. The multiple regression model is:

$$Y_i = \beta_0 + \beta_1 \ln X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \mu$$

Our sample consists of data on 300 supply-traded business transactions from the second quarter of 2006 to the fourth quarter of 2013 in Chinese electric grid enterprise group e-purchasing platform. Table 4 give a simple analysis of the empirical results.

5. EMPIRICAL ANALYSIS

5.1 R, Adjust R

We use spss 19.0 software to take a basic regression. Table4 offered the synergistic effect index summary.

Tabel4 Model Summary

model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.854	0.730	0.673	0.0207279

This is the summary of the model. The table lists each step of the correlation coefficient(R), the square of correlation coefficient(R square), adjust the square of the correlation (adjusted R square) and standard error of estimation. Table4 shows that the correlation coefficient is 0.854, the R square is 0.73, the adjusted R square is 0.673. it reflect the model is with high degree of fitting.

5.2 ANOVA Table

Tabel5 ANOVA

Model	Sum of Squares	Mean Square	F	Sig.
Regression	0.028	0.006	12.947	0.000 ^a
Residual	0.010	0.000		
Total	0.038			

The significance probability is less than 5%, that is, the regression meaningful.

Table 5 shows that the test to the influences of different indicator this research. When the significance < 0.005, it can be considered that the indicators really has a significant different.

5.3 Simple Regression Analysis

Tabel 6 regression Correlation model results

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Average supply cost	0.127	0.134	0.382	1.457	0.158
Average supply cycle	13.818	2.310	0.923	5.981	0.000
purchase application completion rate	0.052	0.081	0.671	1.568	0.130
Order accomplishment ratio	0.061	0.020	0.698	3.075	0.005
the suppliers concentration factor	-9.77	0.850	-0.481	3.301	0.002
Average supervision cost	-10.034	2.08	-0.759	5.086	0.000

The objective of the research was to reveal the factors that the influence the appearance of synergistic effect on company's activity, and measurement the level of the synergistic effect .

□the headquarter concentration purchase ratio is a measure to synergy degree. It a important index reflect the synergistic effect of the application on e-procurement platform established by headquarter company level. So the more of the headquarter concentration purchase ratio, the degree of synergy will be also increase.

□The level between synergistic effect and average supply cost (x_1) is positive and not significant;

□The level between synergistic effect and average supply cycle (x_2) is significant positive;

□Purchase application completion rate are significant positive relationship with synergistic effect. The headquarter company level's synergy on e-purchasing system is a very useful methods of increase the qualitative and quantitative on purchasing order;

□order accomplishment ratio (X_3) is also significant positive relationship with synergistic effect;

□The level between synergistic effect and the suppliers concentration factor (X_4) is negative but not significant.

□The level between synergistic effect and average supervision cost (X_5) is negative and significant.

Analysis from the cost indexes, the expensive reduction on purchasing business is not obvious with the synergy effect index increase. The cost on supervision of purchasing business even improved obvious. The empirical result shows that when the complex system is used on purchasing business management and innovation, the cost on the supply chain management sometimes also increase too. Analysis from the statistical data of performance index, it shows that the high positive synergy correlation existed between the efficiency of purchasing business and synergy management. On the result of risk index, it shows with the increase of synergistic effect, the e-bidding platform is confronted with more multiple hazards.

From the above analysis, the effect appears as the result of integration of different elements can be both positive and negative. The value of positive synergy effect of interaction of e-procurement system elements exceeds the sum of effects of independent functioning of the same elements. The framework improved the efficiency on centralized bidding work, enhanced support role for standards to the e-bidding on whole process management.

6. CONCLUSIONS

In order to improve synergistic effect of supply chain, e-bidding platform should collaborate with other modules in data interaction, security and other aspects.

6.1 Strengthen the synergy support on ERP system

ERP has distinctly benefits on the part of control and analyses of purchase application, purchase quantity, purchase price and etc, evaluation of the purchase risk control and purchase performance and suppliers' management. Existing information systems to public bidding is not strong efforts to support business operations, application integration and supply chain management of all areas of expertise is not enough. At present, the application on ERP system is still not complete phase. Most of the headquarters of the item has not yet been unified master data coding. ERP system and the main data management platform is not yet connection completely. It cause the units that directly under the procurement information cannot be achieved to headquarters through ERP system.

6.2 Strengthen the risk management on system

Purchase risk control includes purchase cost risk control, supply risk control and raw risk control to the jobbery, mainly to the purchase flow, purchase application, purchase price, purchase contract, purchase quality and payment. New intelligent data extraction technology extracted the data from multiple file types to the database. Analysis the processing of data and form structured information, and achieve automatically compare, analysis ,statistical functions. E- bidding business process node default template to form a structured process.

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