

# Research on the Competitiveness Promotion Based on Triple Play in Telecommunication Industry

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**Abstract:** Due to rapidly changing environment based on triple play, the conovation of competitiveness in telecommunication industry has also changed. The operators should adjust their strategic direction timely according to changes in competitive environment. So how to promote the competitiveness under triple play has become a hot issue in telecommunication industry. Based on ISM (Interpretative Structural Model) method, we established the competitiveness promotion model under triple play environment. In this model, the competitiveness structure is divided into explicit layer, driver factor layer and the basic layer; each layer contains several driver factors affecting the telecommunication competitiveness, including technical scalability, market innovation and so on. Through the empirical study on the status of telecommunication industry and the model validation, we proposed strategies to promote the competitiveness for the development of telecommunication industry.

**Keywords:** Competitiveness promotion, ISM, telecommunication industry, triple play.

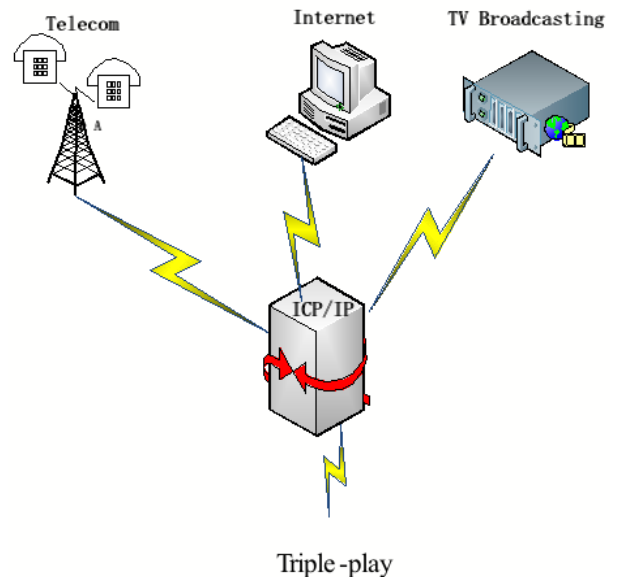
## 1. INTRODUCTION

Globally, telecommunication industry is a dynamically changing and complex one. Due to rapidly changing environment in which enterprises existing competitive advantage may be lost, enterprises cannot maintain strategic dynamic adaptability [1]. Thus, how to stay competitive in the complex and fickle competitive environment becomes an important proposition of enterprises. Teece and Pisano pointed that enterprises in the dynamic and complex industry need to recognize how change in the competitive environment influence the core competitiveness [2].

Triple-play, also well known as three network convergence, refers to the convergence among telecommunication, Internet and television broadcasting [3]. After the release and implement of triple-play, the competitive environment of Chinese telecommunication industry has changed vigorously. It has become more and more evident that the network convergence will develop towards a higher and broader level. Rapidly changing environment may makes a competitive advantage of enterprises in the past no longer be a competitive advantage. The operators must adjust their strategic direction timely according to changes in competitive environment. So how to promote the competitiveness of telecommunication operators in the new competitive environment has become a hot issue in telecommunication industry.

## 2. TRIPLE PLAY IN CHINA

Triple play is a technological and marketing term for the provisioning, over a single broadband connection, of:



**Fig. (1).** Triple play.

telecommunication, Internet access and TV broadcasting, as is shown in Fig. (1).

It is generally believed that the network convergence can be divided into three progressive stages: network convergence, service convergence and application convergence.

(1) Network convergence: The network convergence means that users can flexibly switch networks in different places. Network convergence can not only ensure the perceived the quality of the users, but also protect existing investments and save operating and maintenance costs.

(2) Service Convergence: Service convergence means users can choose different services flexibly according to their

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demands without replacing terminals. Service convergence also includes two aspects, which are to use same services on different networks, and to use same services by different types of terminal.

(3) Application convergence: Application convergence includes of telecommunication operators' different kinds of application platforms which makes innovations to their own applications or integrate applications from other industries, SP or CP to attract more attention of users.

Triple play brought about wide-ranging changes. For telecommunication operators, the changes not only indicate to a simple transition or upgrade technology, but to the role conversion on the basis of technological upgrading. According to the requirements and trends of convergence, this paper has come up with the key success factors for telecommunication operators under the triple play environment: converged network, converged services, and close cooperation with the industry chain, application innovation and professional products division.

### 3. COMPETITIVENESS MODEL BASED ON TRIPLE PLAY

#### 3.1. The Competitiveness in Telecom Industry

As the previous section mentioned, enterprises of relationship layer, realizing external benefits is the driven force to promote the improvement of enterprises' competitive resources and competitive capabilities; external environment has influence on the changes of competitive resources and competitive capabilities of enterprise at industrial convergence layer, which can also promote the improvement of enterprises' competitiveness. The industrial view of competitiveness just holds that point: industrial environment decides the competitiveness of the enterprises (Fig. 2).

Enterprises' competition capability refers to the capability of conducting its business successfully through adapting to, coordinating and managing internal and external environment. It involves many aspects, such as information capability, technology capability, service capability, and marketing capability and so on. We classify the enterprise competitive capabilities into four categories - strategy and organization layer, technology and network layer, market layer and industrial convergence layer. But how is the actual relationship among them, we need to know further from the enterprise executives and industry experts, correctly classify these four types of competitive capabilities and classify which of those belong to the explicit layer factor, the driver layer factors or basic layer factors.

#### 3.2. Interpretative Structural Modeling

ISM, referred as Interpretative Structural Model, is a model which qualitatively shows system elements and the essential interdependence, mutual restrict and sub-factors existed between them. ISM is by relating matrix principle in the graph theory to analyze the overall structure of the complex system, transfer the system structure analysis into topological analysis of isomorphic directed—graph, and then into algebraic analysis, through the operations of incidence matrix to clear the structure characteristics of the system [4].

There are two important matrixes in the ISM method: adjacency matrix and reach ability matrix. The adjacency matrix is used to describe the opposite relationship between each node in the chart. The element  $S_{ij}$  of the adjacency matrix R can be defined as follows:

$$R = \begin{matrix} & S_1 & S_2 & S_3 & S_4 & S_5 & S_6 & S_7 & S_8 & S_9 & S_{10} & S_{11} & S_{12} \\ \begin{matrix} S_1 \\ S_2 \\ S_3 \\ S_4 \\ S_5 \\ S_6 \\ S_7 \\ S_8 \\ S_9 \\ S_{10} \\ S_{11} \\ S_{12} \end{matrix} & \begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 0 & 1 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 1 & 1 & 0 & 1 & 1 \end{bmatrix} \end{matrix} \quad (1)$$

(2) The reachable matrix refers to a matrix form which is to describe the reachable degree between each node in connection diagram, after a certain length pathway.

$$R^* = \begin{matrix} & S_2 & S_4 & S_6 & S_{10} & S_9 & S_3 & S_8 & S_7 & S_{12} & S_5 & S_{11} & S_1 \\ \begin{matrix} S_2 \\ S_4 \\ S_6 \\ S_{10} \\ S_9 \\ S_3 \\ S_8 \\ S_7 \\ S_{12} \\ S_5 \\ S_{11} \\ S_1 \end{matrix} & \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 1 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 1 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \end{bmatrix} \end{matrix} \quad (2)$$

Reachable matrix R has an important feature, namely elapse characteristics. According to the passage characteristics, reachable matrix can be obtained by adjacency matrix A plus unit matrix, and then through Boolean matrix calculations.

Make  $A_1=A+I$ ,  $A_2=(A+I)^2$ , ...,  $A_r=(A+I)^r$ , and then through Boolean algebra operations rules, we can get  $A_1 \neq A_2 \neq A_3$ , so reachable matrix  $R = A_2$ .

Matrix R is called reachable matrix, which showed the degree that each node pass the no longer than (n - 1) access. For the map whose node number is n, the length of the longest access does not exceed (n - 1). In reachable matrix R, if the elements of certain two lines or those of some two columns are same, it indicates that these two lines (two columns) constitute a level [5].

The reason why we chose ISM method mainly is that the adjacency matrix can be used to identify different factors in the relationship between nodes, to reveal the internal structure of competitiveness and rules. By the loop in reachable matrix R, we can analyze enterprise competitive force. Through the calculations, we can find the root of enterprise competitiveness.

#### 3.3. The Model of Competitiveness Promotion in Telecom Industry

Under the ISM principle, the telecommunication competitiveness can be divided into the following layers:

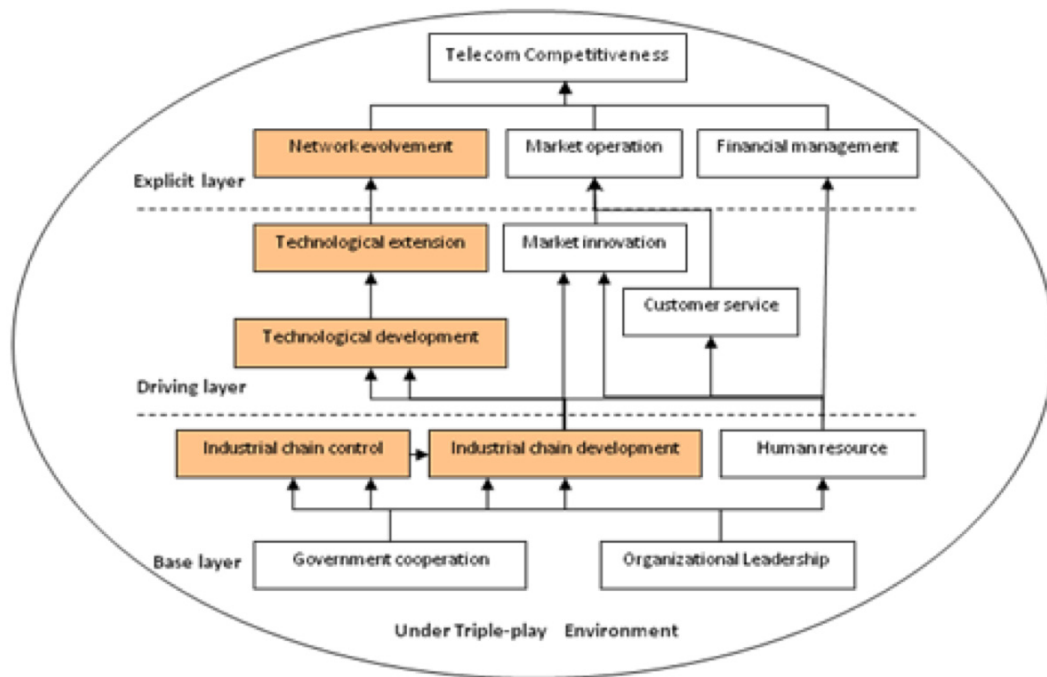


Fig. (2). Competitiveness promotion model under triple-play.

Explicit layer: The improvement of factors of the explicit layer can rapidly promote the enterprises' competitiveness; they are the directly resources and capabilities when the enterprises compete in market.

Driver layer: The factors of the driver layer mainly affect the enterprises' competitiveness through affecting explicit layer factors, support and drive the explicit layer factors. They are the resources and capabilities which maintain competitive advantages in a long-term.

Basic layer: It is the base of the explicit layer and drive layer. Its changes will affect the enterprise's operating direction, competition barriers, and the way of knowledge transformation. It will cause the fundamental impact for the explicit layer and driver layer.

According the questionnaire of experts, explicit layer contains the network edge resources and brand loyalty resources, customer resources and network development capabilities, market operating capacity, financial management capacity. Competitiveness in the driving layer contains technical scalability, technology and development capabilities, marketing and innovation. The base layer contains the control ability in industrial chain, expanding capacity, human capital, government collaboration and the organization leadership [6].

4. MODEL VALIDATION

Reliability refers to the credibility of the questionnaire. It mainly represents coherency, consistency, reproducibility and stability of the test result and specifically reflects variation degree of the survey result along with factors such as time and locations. The most common test methods are Cronbach's alpha coefficient. The Cronbach's alpha coefficient which is used in measuring the internal consistency can be calculated as follows:

⊖ Calculate the related coefficient matrix of each item to be evaluated and obtain the average value;⊖ Calculate Cronbach's alpha coefficient according to the formula below:

$$\alpha = \frac{\kappa}{\kappa - 1} \left( 1 - \frac{\sum_{i=1}^{\kappa} S_i^2}{S_T^2} \right) \tag{3}$$

Where: k stands for total number of the inspecting questions in the questionnaire,  $S_i^2$  stands for variance of the score of I question, and  $S_T^2$  stands for variance of total score. It is widely accepted that 0.65-0.70 is the smallest acceptable value while 0.70-0.80 is fairly good and 0.80-0.90 is extremely good [7].

Validity, also called effectiveness, refers to accuracy degree of the measurement tool in judging the object to be measured. As an important section in empirical study, the validity test can make its result convincing only by satisfying empirical analysis required by validity. The true variance of a set of test scores can be divided into two parts, namely the variance and systematic error variance:

$$S_T^2 = S_V^2 + S_f^2 \tag{4}$$

And obtained score variance can be represented as

$$S_X^2 = S_V^2 + S_f^2 + S_E^2 \tag{5}$$

Validity is defined as the ratio of the true variance and obtained score variance in a set of test scores:

$$r_{XY}^2 = \frac{S_V^2}{S_X^2} \tag{6}$$

It is generally considered that if the correlation coefficient is over 0.2, the construct validity is better. And if a variable to a certain factor loading value exceeds 0.5, we can believe that this variable is associated with this factor significantly. It is generally considered that a factor of variable

Table 1. The validation results of competitiveness promotion model.

Level Classification	Sub Level Classification	Classification Index Description	Factor Loads	Accumulated Contribution Rate Variance
Strategic organizational capacity Cronbach $\alpha$ =0.8204	Organizational Leadership	1. Prospects of the company's future proactive strategy	0.709	45.67%
		2. dynamically adjust business strategy according to changes in the main body relations of external economic,	0.544	
		3. Decision-making capacity of senior leadership	0.607	
		4. Capability to optimize the allocation of corporate resources	0.453	
		5. Enterprises pass the core values, and create a harmonious culture through formal and informal channels,	0.578	
	Organizational Leadership	6. A two-way transformation capacity of individual knowledge and organizational knowledge	0.617	21.46%
		7. Provide staffs with support capability of the platform and implementation capacity of learning system	0.713	
	Financial management Capacity	8. Enterprises maintain sustainable growth basing completion of the profitable objectives	0.821	25.64%
		9. Comprehensive operation profitability to invest producing factors	0.592	
Technology and network capacity Cronbach $\alpha$ =0.7251	Technology Development's Capabilities	1. Adaptation and adjustment capacity of technology development	0.415	25.66%
		2. Ability to absorb new technologies	0.471	
		3. Capacity of information's analysis and processing	0.422	
		4. Development capabilities of new product / business	0.507	
	Technology Scalability's Capabilities	5. The core technology extension areas	0.562	11.31%
		6. Development prospects of core technology	0.812	
	Capacity of the Network Development	7. Networks' capability to match future business development	0.554	60.91%
		8. Business monitoring capability	0.491	
		9. Networks' optimization capabilities	0.798	
		10. The laying capacity of the last mile	0.737	
		11. Capacity of smooth upgrading to higher networks	0.804	
Marketing capabilities Cronbach $\alpha$ =0.8221	Market Innovation	1 Guide customers to need new products and technologies	0.623	34.68%
		2. Marketers' marketing development capabilities	0.587	
		3. Quickly adjust the marketing strategy according to market demand	0.539	
	Market Capacity	4. Capability of the integrated use in marketing mix	0.534	31.26%
		5. New products quickly to market	0.615	
	Customer Service	6. Satisfaction of customers	0.511	33.25%
		7. The effect of handling complaints	0.623	
		8. The business flow balance of electronic channels and physical channels	0.582	

Table 1. Contd.....

Level Classification	Sub Level Classification	Classification Index Description	Factor Loads	Accumulated Contribution Rate Variance
Industrial integration capabilities Cronbach $\alpha$ =0.7742	Government Collaboration	1. Actively ask for support from governments at all levels	0.572	24.33%
		2. Using policy capacity of governments at all levels	0.523	
	The Expand Capacity of Industrial Chain	3. Develop the market, the formation of complementary coordination with suppliers of complementary persons / partners	0.447	35.61%
		4. The capacity of coordination with competitors / substitutes on easing competition	0.453	
		5. Interactive learning with customers, using innovation and customer participation	0.465	
		6. Make technical cooperation and innovation with suppliers / complementary persons / partners	0.667	
	Chain Control	7. Prevent the supplier / complementary persons / partners from becoming competitors	0.432	41.94%
		8. Use competitor / substitute to make it a partner	0.488	

loads is greater than 0.4, the variable can reasonably be classed into the factor. SPSS 17.0 software was used to evaluate the reliability and effectiveness of the model and further verify the model [8, 9]. The results shows that the indexes are significantly correlated and the model is valid for the practice., as is shown in Table 1.

## 5. THE PROMOTION STRATEGY OF TELECOMMUNICATION COMPETITIVENESS IN CHINA

Based on the model of telecommunication competitiveness above, telecommunication operators should enhance the adaptability of technologies, carefully arrange network constructions, the adaptability of networks for future business development, and reserve room for smooth upgrading to advanced networks. To achieve these goals, telecommunication operators need to improve their capabilities to expand and control the industrial chains. Specifically, they should cooperate with equipment manufacturers, software developers, content providers of value added service, server providers, and terminal manufacturers to jointly carry out technological cooperation and innovation. Telecommunication operators also need to ally themselves with those enterprises on market development while preventing those enterprises from becoming their competitors. That's to say telecommunication operators in triple play age should not only develop markets through terminal manufacturers and social sales channels, but also cooperate with radio and television companies to jointly develop markets to promote the business innovation in China [10].

## CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

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