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Evaluation of Core Competitiveness of Aerospace Enterprises Based on Dual Competence Perspective

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***Abstract*—In the face of the complex and fierce competition situation, it is very important and urgent to evaluate the core competitiveness of aerospace enterprises scientifically. This paper constructs the evaluation index system of the core competence of aerospace enterprises from the perspective of double capability, puts forward the comprehensive evaluation method of TOPSIS-entropy weight with improved connectivity, and analyzes the core competence of six aerospace enterprises in China. The results show that the evaluation index system of core competitiveness of space enterprises in China consists of 4 primary indicators, 8 secondary indicators and 16 tertiary indicators. The TOPSIS-entropy weight comprehensive evaluation method with improved connectivity is feasible and effective. The core competitiveness of the six space companies is not uniform, one is at the top, four are in the middle, and one is at the bottom; The proportion of personnel with senior professional titles, market share of products, and advanced number of core technology are the main factors of the core competitiveness of China's aerospace enterprises and have a great influence. The research results can be used for reference by the government and aerospace enterprises.**

Key words—core competitiveness；system of evaluation indicators；integrated evaluation methodology；empirical analysis；space enterprises；dual capabilities

I. INTRODUCTION

The Chinese space company is an innovative company responsible for the development and manufacture of aircraft(including satellites, spacecraft, rockets, and weapons) in the sky. It plays an important role in the modernization of national defense and the development of the national economy. Unlike ordinary enterprises, space enterprises, which have undergone institutional reforms, have also participated in business operations in the domestic and foreign military and civilian goods markets, following two kinds of competition mechanisms: the mechanism of complete competition and the mechanism of incomplete competition. It faces competition threats from large international military companies such as Lockheed Martin, Boeing, General Dynamics and Raytheon, as well as domestic military and private companies. In the face of the complex and fierce competition situation, space companies can maintain sustainable development and realize dual functions(military functions and economic functions) and dual benefits(military benefits and economic benefits) only by continuously improving their core competitiveness. However, at present, the academic research results specifically aimed at the evaluation of the core competitiveness of aerospace enterprises are extremely scarce. There is no systematic theory that can be used to guide aerospace enterprises in how to scientifically evaluate their core competitiveness.

What is the core competitiveness of an enterprise? Due to the different understanding of the core competence of the enterprise, the scholars have answered the different connotations of the core competence of the enterprise. At present, no consensus has been reached. The connotation of the core competence of foreign scholars mainly includes six schools: knowledge and skills, resource heterogeneity, system combination, ability composition, coordination and configuration, and system operation. The research angle is enterprise internal ability. The representatives of the concept of knowledge skills are Prahalad and Hamel. They believe that: The core competitiveness of the company is the cumulative knowledge of the company, especially how to coordinate different production skills and integrate knowledge of different technologies[1].The representative of resource heterogeneity is Olive[2],Montgomery[3],They believe that the core competitiveness of an enterprise is the unique ability of an enterprise to obtain and possess heterogeneous resources. The representative of the system combination concept is Coombs[4],He believes that: The core competitiveness of an enterprise is a combination of technology, management processes, group learning, technical ability, organizational ability, insight, and frontline execution ability. The representative of the ability configuration concept is Henderson and Cockburn,they believe that the core competitiveness of the company is composed of component capabilities and architectural capabilities[5]. The representative of the coordination configuration concept is Durand[6], He believes that the core competitiveness of the company is the coordinated allocation of various assets and skills. The representative of the system operation concept is Barenji and Hasemipour,they believe that: The core competitiveness of the company is the system and operation that the company owns and performs best in the industry, it divides the core competitiveness of the company into two categories: institutional ability and operational ability[7].

The connotation of the core competence of domestic scholars mainly includes: knowledge and skills, resource heterogeneity, ability combination. The concept of knowledge and skills, P. Lu believes: The core competitiveness of the company is the tacit knowledge referred to in the knowledge economy[8]. J. Wu believes that:The core competitiveness of the company is a hierarchical knowledge system that can help users achieve value through organizational and human carriers [9].Resource heterogeneity, J. Zhang believes that: The core competitiveness of the company is an intangible asset, including technology, skills, and knowledge, it is the ability of the company to integrate various technologies, skills, and knowledge[10]. H.Zhang believes that: The core competitiveness of the company is an important part of the core assets of the company,the core assets of the company include talents, core technology, and core products[11].In the view of ability combination, Q.Cao believes that: The core competitiveness of the company is an organic combination of several capabilities within the company,such as: technological innovation ability, transformation resilience, organizational collaboration, organizational learning ability [12]. Z.Jin believes that the core competitiveness of an enterprise is a dynamic knowledge system that is composed of various levels involved in the enterprise(including the operating environment, technology, products, core subsystems), capabilities, and capabilities, and can enable enterprises to obtain continuous competitive advantages[13]. J.Jiang believes that: The core competitiveness of the company is a comprehensive product of multiple resources and multiple capabilities[14].

At present, the shortcomings of domestic and foreign research are as follows: the study of core competence of enterprises only involves the internal competence perspective of enterprise core competition, and does not involve the external competence perspective of enterprise core competition. The research perspective is not comprehensive; As a special kind of enterprises, the space enterprise lacks the systematic research results of the core competitiveness of the space enterprise with the dual capability and full view.

Therefore, this paper takes the evaluation of the core competitiveness of aerospace enterprises as the research theme, constructs the evaluation index system of the core competitiveness of aerospace enterprises based on the perspective of dual ability, and carries out empirical analysis on six aerospace enterprises based on the TOPSIS-entropy power comprehensive evaluation method with improved connectivity. For the reference and reference of the government, aerospace enterprises, etc.

II. EVALUATION INDEX SYSTEM

According to the definition of the core competitiveness of the enterprises in the existing literature and the characteristics of the space enterprises themselves, this paper defines the core competitiveness of the space enterprises from the perspective of dual capabilities as "it is difficult for competitors to imitate, the sum of internal and external capabilities that provide long-term and stable competitive advantages for aerospace enterprises". The competitive advantage mentioned here includes two aspects: the function, use, quality of military products, and the economic benefits of civilian products. Among them, internal ability refers to the ability owned by the enterprise itself, and external ability is the ability of the enterprise to obtain external giving.

Prahalad and Hamel believe that the identification standard for a company's core competitiveness is the ability to meet the requirements of three characteristics: uniqueness, value, and extensibility.

According to Porter's value chain theory, corporate profits come from eight factors: basic environment(infrastructure), human resources, financial resources, technology development, procurement, product production, market sales, and transportation. We can combine eight factors into four factors: environment(basic environment), resources(human resources, market resources, financial resources), products(production, sales, procurement, transportation), and technology(technology development). And these four factors all meet the three characteristics of the core competitiveness identification standard, such as uniqueness, value, and ductility. According to this, the core competitiveness of the enterprise consists of four first-level indicators(factors) such as environment, resources, products, and technology.

Since aerospace enterprises are production enterprises, procurement, transportation and financial resources are not the main sources of profits for aerospace enterprises. Therefore, procurement, transportation and financial resources are not the core competitiveness of aerospace enterprises. The environment can be divided into internal environment and external environment. The development of technology can be divided into internal technological innovation and cooperation. Product production is the product feature, and product sales are the market possession. Therefore, eight secondary components of the core competitiveness of aerospace enterprises can be obtained. Namely: the inner capability of the core competitiveness of the space enterprise is composed of talent resources, technological innovation ability, product characteristics and internal environment of the enterprise, and the outer ability is composed of market resources, cooperation ability, market possession and macroscopic external environment.

According to the three characteristics of the next level of the eight secondary indicators(ie, the third level indicators) and the core competitiveness identification criteria, the three levels of indicators are initially designed. Later, through 33 expert questionnaires,33 experts unanimously agreed, finally formed our country's space enterprises core competitiveness evaluation index system,including 4 primary indicators,8 secondary indicators,16 tertiary indicators,as shown in table I.

III. COMPREHENSIVE EVALUATION METHOD

From the previous theoretical analysis, it can be seen that the evaluation of the core competitiveness of aerospace enterprises involves a large number of indicators and a complex relationship. Therefore, when evaluating the core competitiveness of aerospace enterprises, we should fully consider the different effects of each indicator on the core competitiveness of aerospace enterprises. In this paper, an improved TOPSIS-entropy weight comprehensive evaluation method is proposed. TOPSIS evaluation method with improved connectivity[15].It is to decompose each sample data into set pair data of the same, different, and opposite, and fully excavate the set logarithm of the same, different, and opposite implicit in the sample data. The entropy weight is to use the entropy value implicit in the existing sample data, and the obtained weight is objective and avoids subjective arbitrariness. The TOPSIS-entropy weight comprehensive evaluation method with improved linkage is a combination of the advantages of the TOPSIS method and the entropy method. The set logarithms of the same, different, and opposite values of the sample data and the entropy values of the sample data can be excavated at the same time. The basic idea of the TOPSIS-entropy power comprehensive evaluation method with improved connectivity is to decompose each sample data into set pairs of identical, different, and inverse data, and use entropy power to weight the data. Then we calculate the connection degree and the connection vector distance between the evaluated scheme and the positive and negative ideal scheme, and finally calculate the relative closeness between the evaluated scheme and the positive and ideal scheme.

There are m indicators $C_1, C_2, ..., C_m$, n schemes $A_1, A_2, ..., A_n$; X_{kt} is the indicator value of the scheme A_t under indicator $C_k(k = 1, 2, ..., m; t = 1, 2, ..., n)$; W_k is the weight of the indicator C_k, $W_k \in [0, 1]$, and $W_1 + W_2 + ... + W_m = 1$. The calculation steps are as follows:

Step1 calculate the proportion P_{kt} of the index value X_{kt} of the k indicator C_k under the t scheme A_t:

According to the entropy method, the original data matrix is $X=(X_{kt})_{m*n}$, and the original data is homogenized. We calculate the dimensionless matrix $P=(P_{kt})_{m*n}$.

$$P_{kt}=X_{kt}/(X_{k1}+X_{k2}+\ldots+X_{kn}) \quad (1)$$

Step2 calculate the entropy value E_k of the k indicator C_k:

$$E_k=-(P_{k1}*LnP_{k1}+P_{k2}*LnP_{k2}+\ldots+P_{kn}*LnP_{kn})/Ln\ n \quad (2)$$

Step3 calculate the entropy weight W_k of the k indicator C_k:

$$W_k=(1-E_k)/[(1-E_1)+(1-E_2)+\ldots+(1-E_m)] \quad (3)$$

Step4 consists of $Z = (X_{kt})_{v*n}$ and weight $W = (W_{v1},\ldots,W_{vr})^T$ (where $v_1+\ldots+v_r = v$, $1\le v\le m$) to form an initialization decision matrix.

Step5 determine the positive ideal point S^+ and the negative ideal point S^-.

$$S^+=(S^+_k) \quad (4)$$

$$S^- =(S^-_k) \quad (5)$$

When C_k is an efficiency indicator, $S^+_k=Max\{X_{kt},1\le t\le n\}$, $S^-_k=Min\{X_{kt},1\le t\le n\}$; When C_k is a cost-type indicator, $S^+_k=Min\{X_{kt},1\le t\le n\}$, $S^-_k=Max\{X_{kt},1\le t\le n\}$.Based on the set pair theory, the positive ideal point S^+ and the negative ideal point S^- in the system are considered to be opposite.

When $C_1,C_2,\ldots,C_m$ are all efficiency indicators, positive ideal points are represented by S^+ and negative ideal points are represented by S^-.

Step6 calculate the degree of connection U^+_t between A_t and S^+.

With the composition of A_t and S^+ for $H^+=(A_t,S^+)$, there is

$$U^+_t=a^+_t+b^+_t*i+c^+_t*j=W_{v1}*U^+_{v1\,t}+\ldots+W_{vr}*U^+_{vr\,t} \quad (6)$$

$$U^+_{vy\,t}=a^+_{vy\,t}+b^+_{vy\,t}*i+c^+_{vy\,t}*j \quad (vy = v1,\ldots,vr) \quad (7)$$

Where, when $X_{vy\,t}=S^-_{vy}$, $a^+_{vy\,t}=b^+_{vy\,t}=0$, $c^+_{vy\,t}=1$; When $X_{vy\,t}\in(S^-_{vy}, S^+_{vy}]$, $a^+_{vyt}=X_{vy\,t}/S^+_{vy}$, $b^+_{vy\,t}=1-a^+_{vy\,t}$, $c^+_{vy\,t}=0$.

Step7 calculate the degree of connection U^-_t between A_t and S^-.

With the composition of A_t and S^- for $H^-=(A_t,S^-)$, there is

$$U^-_t=a^-_t+b^-_t*i+c^-_t*j=W_{v1}*U^-_{v1\,t}+\ldots+W_{vr}*U^-_{vr\,t} \quad (8)$$

$$U^-_{vy\,t}=a^-_{vy\,t}+b^-_{vy\,t}*i+c^-_{vy\,t}*j \quad (vy=v1,\ldots,vr) \quad (9)$$

Where, when $X_{vy\,t}=S^+_{vy}$, $a^-_{vy\,t}=b^-_{vy\,t}=0$, $c^-_{vy\,t}=1$; When $X_{vy\,t}\in[S^-_{vy},S^+_{vy})$, $a^-_{vy\,t}=S^-_{vy}/X_{vy\,t}$, $b^-_{vy\,t}=1-a^-_{vy\,t}$, $c^-_{vy\,t}=0$.

Step8 calculates the distance between the contact vectors A_t and S^+.

The contact vector of S^+ is $U^+=(1,0,0)$,and the corresponding contact vector of scheme A_t is $U^+_t=(a^+_t, b^+_t, c^+_t)$,then the distance between A_t and S^+ is

$$D^+_t=[(1-a^+_t)^2+(b^+_t)^2+(c^+_t)^2]^{1/2} \quad (10)$$

Step9 calculates the distance between the contact vectors A_t and S^-.

The contact vector of S^- is $U^-=(1,0,0)$,and the corresponding contact vector of scheme A_t is $U^-_t=(a^-_t, b^-_t, c^-_t)$,then the distance between A_t and S^- is

$$D^-_t =[(1-a^-_t)^2+(b^-_t)^2+(c^-_t)^2]^{1/2} \quad (11)$$

From(4) to(11), it can be seen that a scheme that is closer to the contact vector of the positive ideal point is farther away from the contact vector of the negative ideal point, and vice versa.

Step10 Calculation of the relative closeness between A_t and S^+.

$$G_t=D^-_t/(D^-_t+D^+_t), \quad t=1, 2, \ldots, n \quad (12)$$

The larger the G_t,the closer the A_t is to the positive ideal point,and vice versa. Therefore,each scheme can be sorted according to the G_t size.

IV.EMPIRICAL ANALYSIS

A.Object of Evaluation

According to the status quo of Chinese space enterprises, six space enterprises were selected as samples to comprehensively evaluate their core competitiveness. Enterprise A is the general design department, which is responsible for the overall design and overall testing of the space system, and the coordination of technology and technology; Enterprise B is a space assembly plant and is responsible for the assembly, commissioning, and production of the space system; Enterprise C is a power research institute and undertakes the design, production, and testing of aerospace power systems; Enterprise D is a navigation research institute and undertakes the design, production, and testing of aerospace navigation systems; Enterprise E is the exploration Institute and undertakes the design, production, and testing of space exploration systems; Enterprise F is a launch research institute and undertakes launch system design, production, and testing. The six enterprises were established in the 1950s and have been engaged in the space industry for more than 50 years. They have made great contributions to the development of China's space industry and the construction of the national economy. They are all major backbone enterprises with a long history, high professional and technical level, and great contribution. In the existing space enterprises in China has a strong representative, so it was selected as the object of evaluation.

B.Data Sources

The first part of the 2016 business data published on the website of space enterprises. Including: proportion of college or above graduates(D_{111}), proportion of senior professional titles(D_{112}), customer growth rate(D_{121}), core technology advanced number(D_{211}), equipment advanced number(D_{212}), patent ownership number(D_{213}), new product projects(D_{214}), product market share(D_{321}), enterprise completion ratio(D_{411}) and other nine indicators.

The second part is based on the results of first-hand information obtained from interviews with relevant experts. Including: Brand Trust(D_{122}), Cooperation with Research Institutions(D_{221}), Product Performance(D_{311}), Product Quality(D_{312}), Enterprise Technical Service Conditions(D_{412}), Enterprise Support(D_{421}), Intellectual Property Protection (D_{422}) and other 7 indicators. In the second part of the data collection process, 33 experts who are familiar with aerospace enterprises and have worked for more than 10 years and have rich experience in actual work have been invited, and seven descriptive questions have been set. The questions are scored by the percentage system(100 optimal to 0 worst). Using the questionnaire method, 33 questionnaires were issued, 33 valid questionnaires were recovered, and the effective recovery rate of the questionnaire was 100 %. Each expert scored each enterprise participating in the evaluation, and the arithmetic average of each indicator was taken as the score of the indicator. The resulting data are shown in table II.

C.Evaluation Findings

According to the above evaluation method, weight and closeness can be calculated. The weight of the third-level indicators is detailed in the last column in table II. The weight of the secondary indicator, the weight of the primary indicator, and the degree of proximity are detailed in table III.

According to table III, it can be seen that the weights of senior professional titles(D_{112}), product market share(D_{321}), and core technology advanced number(D_{211}) are ranked in the top three of the third-level indicator D. It shows the importance of these three indexes to the core competitiveness of aerospace enterprises; The internal capacity weight of the third level indicator(D) is more important than the external capacity weight; The weights of human resources(C_{11}), technological innovation capabilities(C_{21}), and market ownership(C_{32}) are ranked in the top three of the secondary indicator C; The resource capacity(B_1) weight of the first-level indicator > Technical Capacity(B_2) Weight > Product Capacity(B_3) Weight > Environmental Capacity(B_4) weight.

The core competitiveness of the six space companies has not developed evenly. Enterprise A has excellent internal and external capabilities in terms of resources, technology, products, and environment, and has more advantages. However, there are many disadvantages in enterprise B, and the evaluation results of both internal and external capabilities are relatively backward. The remaining four space companies have similar levels of internal and external capabilities, and the gap is not obvious. From the perspective of the overall consideration, the core competitiveness of the six space companies evaluated, one is at the highest level, four are at the middle level, and one is at the lower level. The reasons for this are:

(1) Due to the strong awareness of enterprise A's core competitiveness, the core competitiveness has a large investment and early investment, and Enterprise A has excellent internal and external capabilities in terms of resources, technology, products, and environment, and has more advantages;

(2) Due to the weak awareness of enterprise B's core competitiveness, less investment in core competitiveness, late investment, and more disadvantages in enterprise B, the evaluation results of internal and external capabilities in all aspects are relatively backward;

(3) Due to the general awareness of the core competitiveness of four companies, including Enterprise C, Enterprise D, Enterprise E, and Enterprise F, the core competitiveness is cultivated and invested in a medium level, and the level is quite similar. The gap is not obvious.

V. CONCLUSIONS

In order to scientifically evaluate the core competitiveness of Chinese aerospace enterprises, this paper establishes the evaluation index system of the core competitiveness of aerospace enterprises, and puts forward a comprehensive evaluation method of TOPSIS-entropy weight with improved connectivity. The TOPSIS-entropy weight comprehensive evaluation method with improved connectivity is used to analyze the core competitiveness of six space companies in China. The research results of this paper can be used for reference by the government and space companies. The main findings of this paper are as follows:

(1) China's space enterprises 'core competitiveness evaluation index system consists of 4 primary indicators, 8 secondary indicators and 16 tertiary indicators.

(2) The TOPSIS-entropy weight comprehensive evaluation method with improved connectivity is feasible and effective. It can simultaneously excavate the same, different, and inverse set logarithm implied by the sample data and the entropy implied by the sample data.

(3) The core competitiveness of the six space companies has not developed evenly. Enterprise A has excellent internal and external capabilities in terms of resources, technology, products, and environment, and has more advantages. However, there are many disadvantages in enterprise B, and the evaluation results of both internal and external capabilities are relatively backward. The remaining four space companies have similar levels of internal and external capabilities, and

the gap is not obvious. Overall, the core competitiveness of the six space companies evaluated was one at the highest level, four at the middle level and one at the lower level.

(4) At present, the proportion of personnel with senior professional titles, the market share of products, and the number of advanced core technologies are the main factors of China's aerospace enterprises 'core competitiveness and have a great influence.

Although a variety of measures have been taken to try to evaluate the results close to reality, the specificity of the objects evaluated makes it impossible to collect all objective data. Only a limited number of experts can be used as part of the evaluation data. Therefore, the result of this study is of reference significance only. In the practical application, the relevant government administration department and the specific spaceflight enterprise can refer to the index system and evaluation method of this article, increase the number of scoring experts and optimize the composition of scoring experts and other measures to further improve the quality of evaluation.

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TABLE I. EVALUATION INDEX SYSTEM OF CORE COMPETITIVENESS OF AEROSPACE ENTERPRISES FROM THE PERSPECTIVE OF DUAL CAPABILITY

Target Layer	Primary Indicators	Secondary Indicators	Three-level Indicators
The core competitiveness of aerospace enterprise from the perspective of dual capability (A)	Resource capacity (B_1)	Talent resources(C_{11})	(D_{111}) Proportion of college graduates or above
			(D_{112}) Proportion of personnel with senior professional titles
		Market resources(C_{12})	(D_{121}) Customer growth rate
			(D_{122}) Brand reliability
	Technical skills (B_2)	Technological innovation capability (C_{21})	(D_{211}) Advanced core technology
			(D_{212}) Advanced equipment number
			(D_{213}) Patent ownership
			(D_{214}) New product project
		Cooperation ability(C_{22})	(D_{221}) Cooperate with scientific research institutions
	Product capability (B_3)	Feature of product(C_{31})	(D_{311}) Product performance
			(D_{312}) Product quality
		Market possession(C_{32})	(D_{321}) Market share of products
	Environmental capacity (B_4)	Internal environment (C_{41})	(D_{411}) Proportion of the company to complete the contract
			(D_{412}) Enterprise technical service conditions
		Macro external environment(C_{42})	(D_{421}) Enterprises get government support
			(D_{422}) Intellectual property protection

TABLE II. DATA INFORMATION

Indicator	Enterprise A	Enterprise B	Enterprise C	Enterprise D	Enterprise E	Enterprise F	Weight
D_{111}	53.5%	18.7%	35.6%	28.1%	38.8%	43.9%	0.045
D_{112}	4.7%	1.7%	2.7%	1.6%	3.5%	0.5%	0.157
D_{121}	14.2%	7.8%	11.2%	8.9%	10.3%	13.5%	0.020
D_{122}	94.2	28.3	63.6	33.9	43.1	87.8	0.090
D_{211}	9.0	2.0	8.0	4.0	4.0	5.0	0.098
D_{212}	8.0	7.0	6.0	6.0	6.0	6.0	0.006
D_{213}	48.0	32.0	45.0	40.0	36.0	47.0	0.010
D_{214}	17.0	5.0	10.0	9.0	8.0	7.0	0.070
D_{221}	66.6	12.8	39.9	63.3	58.5	55.5	0.081
D_{311}	88.8	24.4	56.6	78.7	86.8	66.3	0.060
D_{312}	92.2	26.6	61.1	86.6	76.8	90.1	0.056
D_{321}	22.2%	2.1%	12.3%	18.9%	20.8%	8.7%	0.147
D_{411}	88.3%	36.8%	72.3%	66.8%	77.6%	46.7%	0.037
D_{412}	63.7	37.3	50.3	39.8	55.7	61.3	0.018
D_{421}	66.8	12.3	61.0	62.7	58.9	52.6	0.077
D_{422}	22.0	48.0	32.0	36.0	46.0	34.0	0.028

TABLE III. WEIGHT AND CLOSENESS CALCULATION RESULTS

Closenesss G_t	Enterprise A	Enterprise B	Enterprise C	Enterprise D	Enterprise E	Enterprise F	Weight
Core competitiveness (A)	0.995	0.204	0.483	0.466	0.642	0.279	
B_1	0.604	0.461	0.504	0.496	0.506	0.439	0.312
B_2	0.580	0.417	0.497	0.495	0.495	0.495	0.265
B_3	0.577	0.421	0.504	0.509	0.509	0.504	0.263
B_4	0.518	0.455	0.502	0.502	0.530	0.501	0.160
C_{11}	0.561	0.491	0.520	0.499	0.532	0.458	0.202
C_{12}	0.531	0.469	0.506	0.487	0.495	0.517	0.110
C_{21}	0.552	0.447	0.479	0.470	0.468	0.470	0.184
C_{22}	0.522	0.478	0.506	0.516	0.514	0.513	0.081
C_{31}	0.531	0.468	0.507	0.520	0.519	0.517	0.116
C_{32}	0.542	0.461	0.516	0.531	0.535	0.506	0.147
C_{41}	0.514	0.486	0.503	0.501	0.505	0.499	0.055
C_{42}	0.514	0.486	0.515	0.517	0.518	0.512	0.105
Internal ability	2.158	1.892	2.009	1.99	2.024	1.944	0.557
External ability	2.109	1.894	2.043	2.051	2.062	2.048	0.443