

Structural capacity assessment of machine-building enterprises and associations

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Abstract. Multidirectional tendencies of machine-building enterprises integration and disintegration resulted in the emergence of the formal and informal associations. These associations consist of the obviously and/or implicitly affiliated legal entities. Thus, a new element appears in the direct enterprise environment, i.e. a management company or a head enterprise. The management company influences the participants even in an informal association. New environment restrictions led to the changes in the management structure. The paper considers the enterprise structures interrelation: organizational, financial, production, resource, and others. The authors draw a conclusion that the structures are hierarchy, and there are the coherence structures assessment criteria. The coordinated structures form the structural capacity of the enterprise. The suggested assessment coherence criteria (for example resource and functional structures) allow estimating the structural potential and defining the directions of the enterprise efficiency increase.

1 Introduction

The theory and practice of machine-building enterprises management convincingly prove that the enterprises possess the integrity property as social and technical systems. The integrity as the immanent organization characteristic can be visualized through the set of the enterprise structures and, also, can be a basis for the assessment of the organization structural capacity.

Scientists have been concerned about the problems of the enterprises structuring since 1880s. During the last decades the conceptual framework of the structural analysis theory was considerably extended [1]. Traditionally the organizational structure of the enterprise was considered the administrative model, and many of the researchers, starting with F. Taylor, studied only the organizational structures, without other approaches to the structural business management.

The essential contribution to the theory and methodology of the organizational structures development was made by R. Ackoff, L. Bertalanffy, S. Beer, V. Gosling D. Mago, M. Mesarovic, H. Mintzberg, U. Parter, I. Takahara, A. Hall, etc. Among the Russian scientists works by L. Gitelman, V. Krasnova, N. Maslennikova, B. Milner, V. Mishin, V. Mukhin, A. Privalov, V. Sai, N. Trenev are known.

Works by V. Hrutsky, V. Gamayunov, T. Sizov, K. Shchiborshch contain approaches to the industrial enterprises financial structures development, but do not offer tools to evaluate the balance between the enterprise structures, i.e. the integrity. Taking into account the current trends in the organization forms of the machine-building business development the question

of the balanced structures management formation is relevant.

2 Evolution of the machine-building enterprises organization forms

The main stages of the machine-building complex development in the Russian Federation

Development of the structure definitions is connected to the research object amplification. According to the civil code of the Russian Federation "the enterprise" is the independent property complex used for the business activity implementation [2]. The integration and disintegration processes in the enterprises which have begun in the 1990s led to the emergence of the various associations. The main stages of the modern Russian economic system formation and their influence on the machine-building enterprises development are described in Table 1

Models of the machine-building enterprises associations formation

As a result of the of machine-building enterprises integration and disintegration processes analysis, it is possible to create two models of the associations' formation:

Joining of the independent enterprises in the group controlled by the management company (Fig. 1). One of main goals is the achievement of synergetic effect: providing a full production cycle, formation of a single sales market, diversification for the decrease in risks. The management company is the center of the group, organizes the financial flows and economic relationships

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in the group. Its tasks also include distribution of the investment resources.

Table 1. The main stages of the modern Russian economic system formation and their influence on the machine-building enterprises development [3-5].

Stage	Characteristic	Number of machine-building enterprises	Prevailing forms of the business organization
Until 1985	Planned economy. Prevalence of the closed production structure - "subsistence economy".	Up to 6 thousand	State enterprises
1986–1992	Origin of a free market. Formation of the trade houses and marketing departments at the enterprises.	Up to 6 thousand	State enterprises. The first attempts of incorporation through the labor collectives shares.
1992-1994, the first property repartition.	Incorporation and privatization of the state enterprises. Emergence of private property in the industries, split of the assets.	Up to 60 thousand	Emergence of diversified regional associations, transfer of non-core productions to the independent enterprises
1994–1997, the second property repartition.	Monetary privatization, struggle for controlling interest.	Up to 60 thousand	Emergence of private Russian machine-building corporations, acquisition of the Russian enterprises by foreign owners
1998–2000, the first Russian financial crisis	Depreciation of the Russian currency.	Up to 30 thousand	Mass bankruptcy of the enterprises, transition to the improvement of the financial system.
2001–2007, the third property repartition.	Incorporating of the state enterprises.	Up to 30 thousand	Emergence of the Russian state corporations, generally in the military-industrial

			complex. Mass cutting down of non-core assets.
2008–2013, crisis and post-crisis development	Strengthening of the state support and regulation. Leasing schemes of the equipment updates.	Up to 50 thousand	Bankruptcy of the medium-sized private enterprises, integration and disintegration of the enterprises.
2013 – global crisis, political restrictions	Strengthening of the military enterprises state support.	Up to 50 thousand	Stabilization of the business structure

* The table is made by authors on the basis of data presented in the form of annual reports on the Federal State Statistics Service site

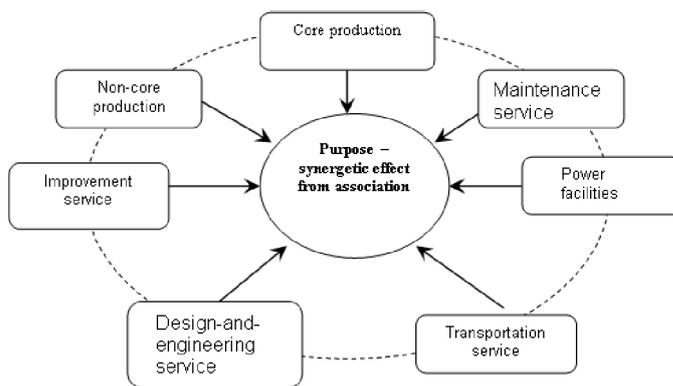


Fig. 1. Group formation on the basis of the independent enterprises association.

The enterprises which become the parts of the group, as a rule, do not lose their independence and work both on internal and external markets.

1. Restructuring of the large enterprise with a full cycle (Fig. 2). The result of this process is the creation of the legally independent companies, usually, these companies are technologically connected. One of the goals is to increase the efficiency by creation of more flexible, operating structure and transition to market relationship.

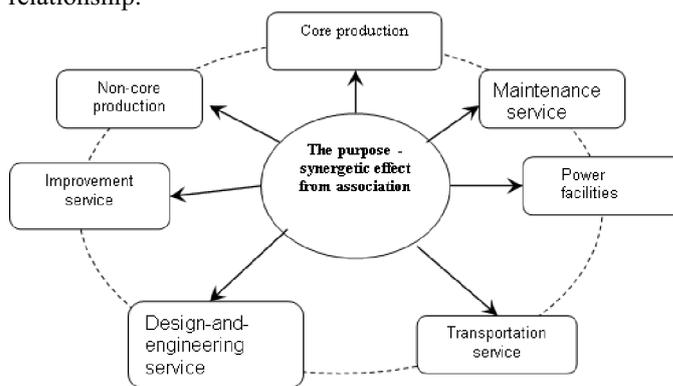


Fig. 2. Group formation on the basis of the large enterprise with a full cycle restructuring.

The initiator of such transformations is the owner. His main goal is the improvement of the finance indexes, which influence potential profitability of the core production and value of the business. The center of the group is the core production transformed into the independent legal entity. The rest of the enterprise in the association can be created as subsidiaries and can operate in the external and internal markets, or only in internal, fulfilling the requirements of the core production.

At the same time, production sites and idle capacities of the core productions are leased. It leads to the creation of a small specialized industrial enterprises buffer zone, which is necessary for the modern economy.

New, more complex organizational forms of business demanded the usage of the better management instruments based on the enterprises (associations) optimization structures and the integrity control. Obviously, modern machine-building enterprise is a polystructural object [6].

3 Polystructural approach to the business management

In addition to the organizational and financial structures mentioned above, the management system should include production, information and legal structures. The management structures correspond to the target and resource restrictions of the organization and should be optimized according to the established criteria. Table 2 contains the short characteristic of the machine-building enterprise key structures.

Table 2. Key types of the machine-building enterprise structures [7-10].

Type of structure	Design goal	Objects (elements)	Solved tasks
Organizational	Administration of the business processes	Divisions created according to the various criteria (functional, matrix, divisional structures)	Distribution of power and responsibility on the management levels
Financial	Control ensuring	Centers of the financial responsibility	Financial planning and management accounting
Production	Organization of the production processes	Core, subsidiary and services productions	Filling of the management accounting and the cost optimization
Informational	Organization of the information flows	Places of the information emergence and consumption, information flows	Definition of the access rights to the information, information

			flows optimization in the context of the chosen automation method for the company management
Legal	Tax optimization	Legally separated divisions (enterprises)	Assessment of taxes through the systems of transfer pricing and participation in the capital

The structural capacity of the enterprise (association) determines the structures coherence level. The complexity of the potential assessment is attributed to the structural contradiction existence, even if all conditions, the agreed targets, balanced resource and function abilities of the organization, are met. It should be noted that the capacity of the key structures can be initially higher than the goal potential due to SMART restrictions. In modern conditions competitiveness of machine-building enterprises and associations, characterized by the high level of the technological and organizational processes complexity, directly depends on the balance of the structures, i.e. structural potential.

4 Methodical approach to the assessment of the management structures integrity

At the first stage of the enterprise structural capacity diagnostics, the coherence assessment of the functional and resource structures on the basic level is proposed. These structures can be described by the means of the traditional quantitative figures that considerably simplify the assessment procedure [9,10]. Table 3 contains the comparison of three machine-building enterprises activity results. The criterion for comparison is the coherence of the functional and resource structures (integrity). As quantitative indicators of the assessment the following indicators were accepted:

ROA – return on assets shows the generalized index of working efficiency;

Kipm – productive capacity efficiency

VP - output per the worker

Krf - coefficient of claims on functions

Kpmr - coefficient of the material resources proportionality

KBB – the relation of development one working at the enterprise to the industry average development

Kvio - coefficient of the available equipment involvement

The majority of the indexes given in the table are integrated. For their calculation and analysis the system of private indicators (factors) should be used. When for various reasons calculation of the exact integrated

indicator was impossible, private indicators were considered in the final assessment. Influence factors for Kipm: specific weight of the installed equipment, coefficient of the available equipment involvement, coefficient of the equipment disposal, coefficient of the equipment renewal, equipment increase coefficient, specific weight of production made in cooperation. Influence factors for VP: production mechanization coefficient, production automation coefficient, average coefficient of norms performance, efficiency of working hours, coefficient of structural compliance of performers in the specialty, coefficient of structural compliance of performers on qualification.

5 Conclusion

Table 3. Comparison of the three machine-building enterprises activity results on criterion of functional and resource integrity.

Year	Indexes					Conclusion	
	Generalised	Resource integrity			Functional integrity		
Indexes	ROAб %	Kipmб %	% deterioration	VP (thousand rubles)	Krf		
Standard indicators:	6 ÷ 7	85	10÷15	1000	0	Insufficient level of the resource and functional integrity (the enterprise is in a difficult situation)	
Drilling and metallurgical equipment factory	2006	7.1	34.3	97	-		6/12
	2007	17.55	42.9	85	703.2		6/12
	2008	28.7	75.2	78	725.3		5/12
	2009	-2.23	42	76.2	563.8		5/12
	2010	0.5	42	80.25	434.1		5/12
2011	-1.75	42.6	83.8	533.7	5/12		
Indexes:	ROA	Kipm	deterioration	VP (thousand rubles)	Krf	General, structural and resource integrity is at the accepted level for the modern economic situation	
Standard indexes:	6 ÷ 7	85	10÷15	0.1÷0.36	1.5 ÷ 2.0		
Telephone factory in Shadrinsk	2006	21.32	46.6	67.2	0.19		1.637
	2007	30.58	64.3	62.4	0.18		1.610
	2008	44.67	88.4	57.8	0.18		1.597
	2009	8.17	46	54.9	0.21		1.763
	2010	8.83	81.5	56.1	0.25	1.758	
2011	13.6	80	50.9	0.21	1.813		
Indexes:	ROA	Kipm	deterioration	VP (thousand rubles)	Krf	Excess level of the resource integrity	
Standard indexes:	6 ÷ 7	85	10÷15	0.8÷0.9	1.5 ÷ 2.0		
Electroengineering factory in Karpinsk	2006	6.3	55.2	55.4	0.43		1.67
	2007	8.7	53.6	55.0	0.45		1.65
	2008	11.1	51.7	56.9	0.456		1.65
	2009	11.8	52.1	53.4	0.521		1.69
	2010	5.28	55.3	53.9	0.553	1.61	
2011	15.35	55.9	56.7	0.559	1.349		

The following conclusions can be made, based on the results of the research:

Modern economic conditions led to the management objects complication: as a result of the machine-building enterprises integration and disintegration processes the polystructural associations were created.

Quality of polystructure demands the formation of the approaches to design the business management (association) key structures: organizational, financial, production, informational, legal.

It is expedient to apply the management structures integrity indicator for the assessment of the difficult objects activity.

The current efficiency and development possibilities of the enterprises (associations) are defined by the structural potential size, characterizing the balance level of the management structures. For the structural potential assessment, indicators of the structures integrity can be used as elements.

By the example of the basic level structures, functional and resource, the application expediency of the integrity assessment approach on the basis of the indicators system of the enterprise overall performance is proved.

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