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### Formation of modules of the mechanism of managing innovative activity on the basis of the system integrator

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**Abstract:** The article presents the results of the study of issues of managing business activity of science-intensive enterprises, innovative and marketing activity being its key components. It considers the aspects of formation of key modules of the mechanism of organizational system integrator of activity of the companies participating in the federal development programs in the field of formation and clustering of participants of the development program, balanced planning, formation of a sales market in the conditions of transformation of business, arrangement of foresight research and intellectual assets, and formation of the “road map.”

It considers the peculiarities of a technique of formation of the mechanism of managing innovative (including marketing) activity, which includes the establishment of criteria of managing the innovative activity, definition of thresholds of allowable innovative activity using the criterion of financial stability, evaluation of economic losses in the transition period of development, balanced planning of innovative development, evaluation of impact of marketing activity on the implementation of the development program, and evaluation of the efficiency of innovative development.

**Keywords:** innovative and marketing activities, mechanism of managing, organizational system integrator, non-equilibrium state, innovation, clustering

#### INTRODUCTION

In the context of Russia’s innovative development, the innovative activity of economic entities rises objectively sharply. A number of development programs of various levels (state, regional, sectoral, corporate) increases, within which innovations that are competitive on the world markets are developed.

Innovative activity is reflected in the pace of emergence of innovations in production and other systems. The process of creation of innovations is carried out within the framework of the innovation

cycle, which includes stages of R&D, production preparation (organizational, technological, social and psychological) and, finally, the industrial development of output of new products.

The result of each innovation cycle implementation is innovation, which is a subject of a subsequent stage of commercialization in the process of industrial production of new goods.

Thus, an innovative product goes through a complex and cost-intensive cycle until the emergence of similar products in the competitive environment. It must be understood and taken into consideration that each process of the product update disturbs the relative balance of the production system, because part of the production capacity during the product update is allocated for the purpose of industrial development of output of serial production and ensuring the economic growth in the period of development. This means that during the period of the innovation cycle implementation, there is an objective emergence of a non-equilibrium state of the company, which has a negative impact on the financial stability of the company during the transition period of development.

## **RESULTS OF THE RESEARCH**

According to results of our research (Aniskin et al., 2015), the absolute liquidity ratio has decreased from 0.71 to 0.27 during the period of 3 years of development, while the working capital to current assets ratio has decreased from 0.6 to (-0.12). Other indicators change in a similar manner.

Duration and depth of the non-equilibrium state directly depend on the level of innovative activity of the company. For instance, the development of the output of 12 new products per year at the same production capacity (development rate is 1 product/month) is far less reflected at the level of financial stability than in the case of development of 24 products per year (rate is 2 products/month).

As such, a need emerges to establish a mechanism of managing innovative activity using the criterion of ensuring the required level of financial stability in the transition period of development of the company. The core of such a mechanism is rational allocation of production capacity for the serial production to ensure financial stability and for the purposes of development of production of the combination of new product types.

The results of our research (Aniskin et al., 2015, Aniskin et al., 2010) revealed that the allowable rational ratios are in the range of the “golden mean” – 62:38, i.e. 62% of production capacity is allocated for the purpose of serial production, while 38% is allocated for the development of new products.

Based on the established capacity and parameters of the development quality, the allowable level of innovative activity is set in the case of maintaining the necessary financial stability during the development period.

The target figures of economic (resource) and financial indicators of production are defined on this basis in the mechanism of managing.

It is no less important to create conditions in the mechanism of managing the development for the timely development of a product with advancing level of innovation quality that ensures their competitiveness on the world markets, which directly depends on the marketing activity of the company and its ability to promote its products to the consumer.

As a rule, many organizations possessing various types of professional competencies, required for creation of competitive innovation, participate in each development program. During the process of creation of an innovative product, participating firms with various levels of innovation potential actively cooperate, which leads to emergence of the problems of timeliness, quality and consistency in the creation of system innovation.

This results in overrun of the target duration of realization of innovation cycles, growth in the volume of raised investments and insufficient level of progressiveness of the created innovations. In such conditions, a key factor of successful management of development programs is the availability of the mechanism of organization of interaction between participating firms and stakeholders in the period of realization of innovation cycles. Such a mechanism is required not only for streamlining the organizational cooperation between the participants, but also for the exchange of professional competences and motivation of participants' activity.

It is proposed to form the mechanism of managing innovative activity on the basis of the organizational system integrator, which ensures efficient interaction of the participants of innovative development and a high level of competitiveness of created innovation, including through maximum use of marketing tools.

When forming the development program, it is necessary to include and be guided by the results of foresight studies that reflect the level of future innovation and outrun the level of existing entities in the world practice. This will ensure the guaranteed conditions for creation of the competitive product and its recognition on the world market.

However, the innovation development based on foresight studies requires a specific approach to the professional competences of participants of the development programs. Urgency of specific requirements is determined by the need to solve the problem of balancing innovation and marketing potentials of participating firms, which always differ. The conditions for realization of advanced technical tasks are ensured only when potentials of the companies are balanced.

If this problem is not solved, the level of the innovation quality will correspond to the "weak link" among the participants, in accordance with the "law of least" (by A.A. Bogdanov).

The solubility of the following key management issues must be provided when developing organizational system integrator for managing the interaction of the participating firms in the conditions of marketing instability:

- Non-observance of economic proportions in the scientific and production activity, which leads to unbalanced planning and, as a consequence, to a decrease in financial stability;
- Unevenness of investment intake, which fails to ensure timely and qualitative execution of technical tasks;
- Non-observance of the stakeholders' interests, which hinders the realization of stages of the innovation cycle;
- Insufficient use of the results of marketing and foresight studies, which reduces the level of innovation competitiveness;
- Underdevelopment of the controlling system, which influences the timeliness and quality of innovative solutions;

- Inefficiency of the mechanism of motivating the participating firms, which influences the personnel productivity;
- Absence of a mechanism of organizational, financial, marketing and legal support of the development program, which leads to overrun of the target duration of works and growth of the project cost-intensity.

The proposed system integrator represents a combination of interconnected modules, procedures and organigrams that ensure the conditions for concerted complex management influence from a single center.

The key condition in the work of the integrator is a focus on the balance of the pace of innovative activity of participating firms in the context of market instability. This condition is met only if rational economic proportions are observed in the use of various factors and resources in the innovation cycle. Due to this, the integrator is included in the module “Definition of basic economic proportions and activity ratios.”

Content-related algorithm of this module is focused on:

- Identification of capabilities of participating firms (scientific, technical, industrial, investment, marketing, resource, information, personnel, etc.);
- Results of the analysis and calculations of the participants’ potential are used to define economic proportions;
- Establishment of basic proportions by the use of production capacity for research and industrial purposes, as well as definition of rational ratios of economic indicators in the current innovation activity.

These are groups of indicators that describe cost-intensity of activity, financial condition and sustainability of the company in the market environment, movement of investment resources and, finally, efficiency of the innovation cycle in the context of the corresponding marketing activity.

Taking into account the activity of the companies’ relations with stakeholders in innovative activity, the integrator provides the module “Formation of interests and motivation of stakeholders’ activity.” The fundamental basis of the module is Mitchell’s model (Mitchell et al., 1997), which allows to identify the importance of stakeholders, to form a network model of mutual relations, and to build a resource model of relations.

Availability of formulated requirements for future innovation gives grounds for searching for potential participants, which is carried out in the module “Formation and clustering of participants of the innovation cycle.” Project managers analyze the obtained list of potential participants and select the highest priority ones for further interaction (Rygalin et al. 2010).

Clustering is carried out across all the levels of integration of the created innovation:

1. Element base;
2. Instrument cluster;
3. System cluster.

The module of management “Arrangement of foresight studies” is formed for the synthesis of the results of foresight studies, where the information about the emergence of future innovations, which can be included in the created product, is concentrated. Results of foresight studies are used in the development of the “road map”, the work on which is carried out in the module “Formation of a road map” of innovation creation.

The idea of the formation of the “road map” is set out in the paper (Aniskin et al., 2015).

Activity in other modules is conducted on the basis of the road map.

Let's consider the peculiarities of building the module of the mechanism of an organizational system integrator in the area of formation of a sales market in the conditions of transformation of business. Analysis of the activity of various firms (both in domestic and foreign sources) reveals that market-driven production expansion on the one hand and improvement of products on the other hand put the company before the necessity to make a financial and strategic choice of solutions. The firm either ramps up production and arranges sales at the expense of proprietary or borrowed funds by investing them in the equipment, rent of premises, hiring and paying salary to the production, sales and administrative personnel (in this case, a significant amount of time is spent on searching for premises, commissioning and startup of additional capacities, hiring and training of personnel, etc.), or part of the functions is delegated to third parties, thus minimizing time spent on the development of expanded production and required resources.

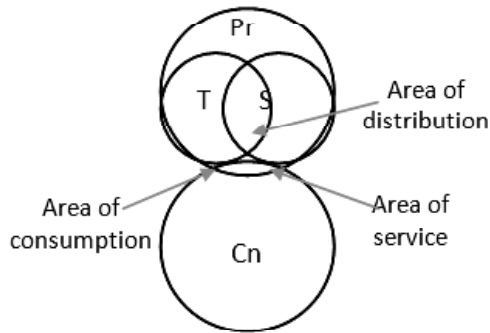
Choice of the form of organizational interaction between business partners depends on a range of factors. Studies have revealed that three types of organization of marketing relations are the most common (Figure 1) (Sedova et al., 2015).

Choice of the option of organization of marketing interaction between the producer and the areas of consumption and servicing depends on a range of circumstances:

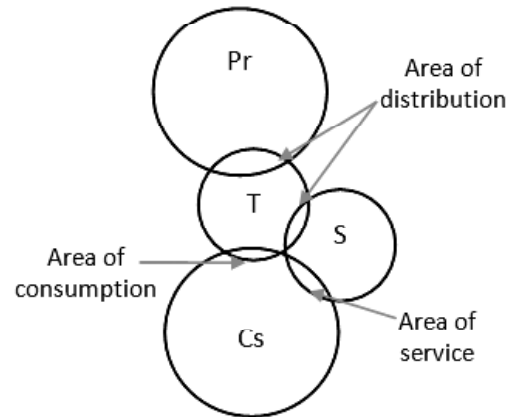
- Technological development drives both the growth of output of high-tech products and their complicating. The more complex the device is, the higher is the number of requirements for the organization of the process of production and sales service.
- As the market develops, the producer tends to focus on its core functions – producing goods, and therefore seeks to minimize the number of transactions by delegating their expansion to the companies responsible for the organization of interaction with the consumption area. As the market grows, those, in turn, will seek to fulfill their primary function – sale of products, and therefore will reduce the provision of resources for secondary functions. As a result, the choice of the option of organization of marketing interaction between the market players will depend on the degree of the market development.

Transformation of relations in result of the evolution of sales markets determines the need for managing the marketing activity of the enterprise. This can be done by regulating the proportions of the components of the marketing activity, such as: ME – the value of the firm's marketing expenses at the moment of time  $t$ ; MP – the value of the firm's marketing potential at the moment of time  $t$ ; SQ – the value of the quality of the firm's strategy as a component of the firm's potential at the moment of time  $t$ ; QMM – the value of the quality of the firm's marketing “mix” at the moment of time  $t$ , Figures 2-5.

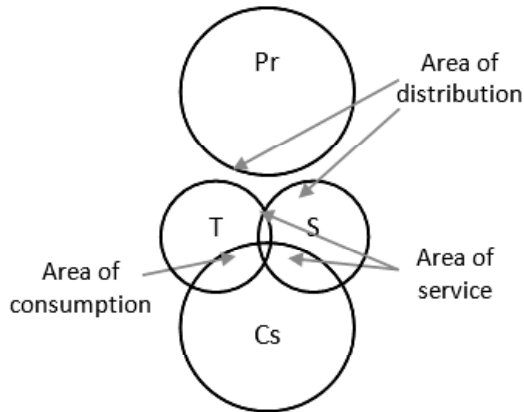
a) Option I



b) Option II



c) Option III



d) Conditions of the choice of options of marketing interaction given the market LC

LC stage	Option		
	I	II	III
Formation	+		
Growth		+	
Saturation			+
Decline		+	
Dying	+		

Figure 1: Options of marketing interaction between the players of the market of high-tech products. Explanation of symbols: Pr – production sector, T – trading sector, S – servicing sector, Cs – consumption sector.

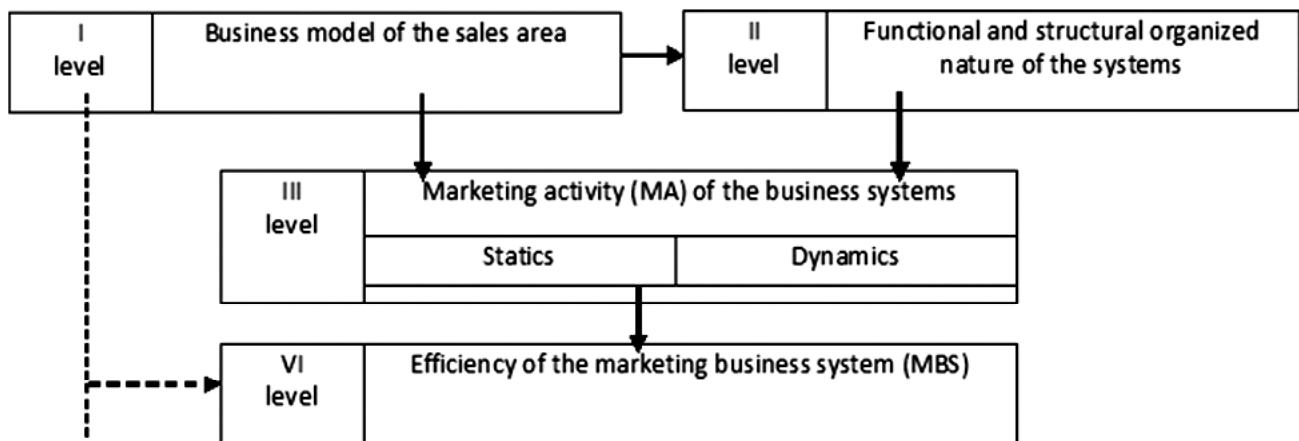


Figure 2: Four-level model of the marketing activity of the business system

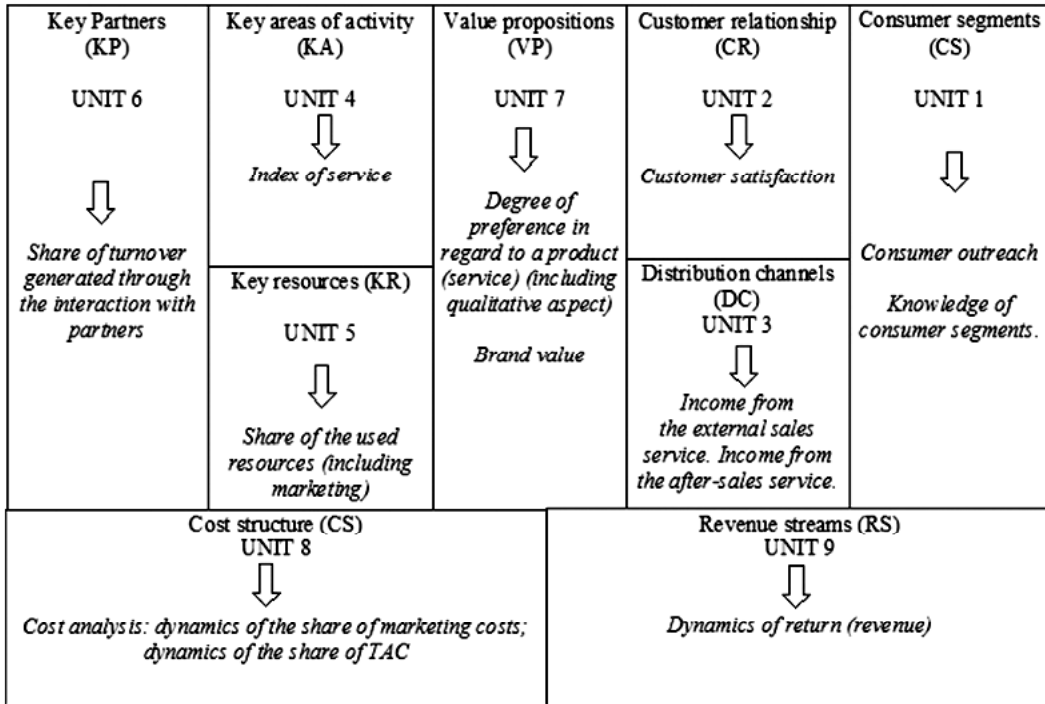


Figure 3: Business model of the sales area

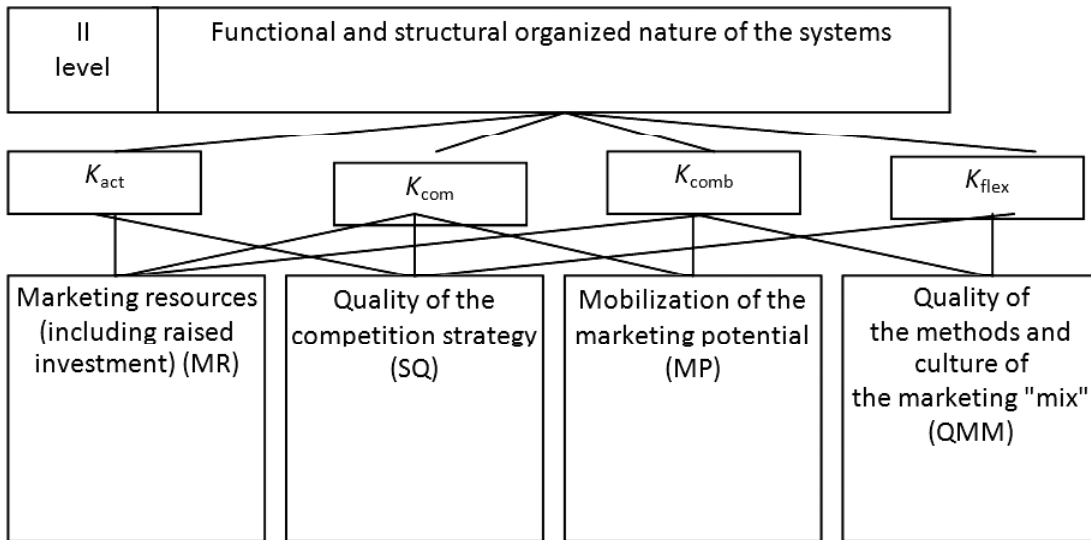


Figure 4: Functional and structural organized nature of the systems

A derivative of the function of marketing potential in time can serve as an indicator describing the pace of marketing changes:

$$\frac{\partial MP(t)}{\partial t} = \frac{MP_{t+1} - MP_t}{\Delta t}$$

where  $MP_{t+1}$  is a value of the marketing potential in the period following period  $t$ ;  $MP_t$  is a value of the marketing potential in period  $t$ ;  $\Delta t$  is time elapsed from period  $t$  to period  $t + 1$ .

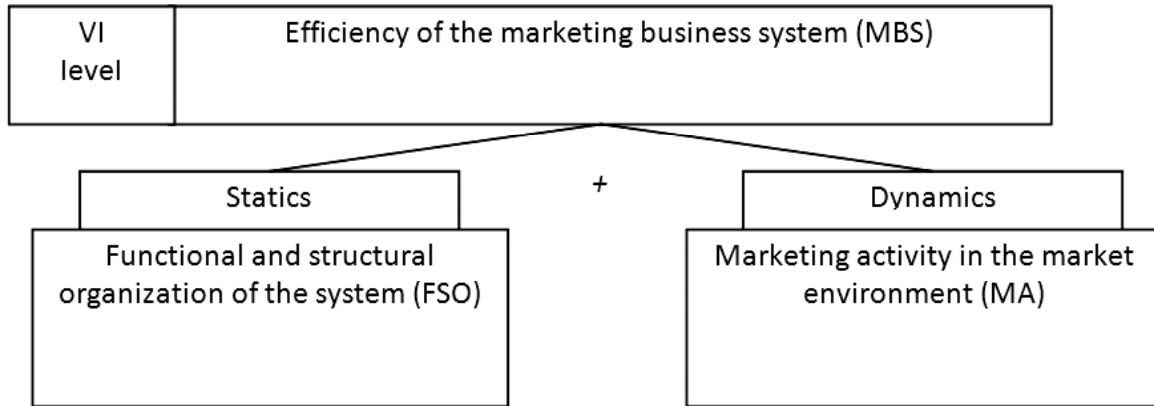


Figure 5: Efficiency of the marketing business system (MBS)

The bigger this figure is, the higher is the pace of marketing changes, and vice versa.

Rationality of this scale of the marketing activity can be assessed through the chart of dependency of marketing investments on their volume.

From a mathematical point of view, such an analysis can be performed based on the value of the tangent of angle  $\alpha$  of the tangent slope:

$$\tan \alpha = \frac{\Delta \left( \frac{\text{Profit}}{MC} \right)}{\Delta MC}$$

The smaller angle  $\alpha$ , the smaller the slope ratio, the closer the enterprise to the optimum point  $B$ , and the more rational the scale of the marketing activity. Correspondence of the reaction to the nature of the competitive situation can be represented as a derivative of the function of the quality of the competition strategy in time, i.e.:

$$\frac{\partial SQ(t)}{\partial t} = \frac{SQ_{t+1} - SQ_t}{\Delta t}$$

where  $SQ_{t+1}$  is the value of the quality of the competition strategy in the period following period  $t$ ;  $SQ_t$  is the value of the quality of the competition strategy in period  $t$ .

Marketing activity of the firm is not constant. It reflects the firm's reaction to the changes at different levels: in the economy, sector and firm, and is cyclical in its development. Cycles of the macro environment influence the development of the firm and that of the industry as a whole and must be taken into account in defining the required level of marketing activity and investment in marketing.

The existence of the time lag between investment in marketing and return on it must be taken into account when forecasting the level of the marketing activity. The investment multiplier effect assumes a delay in the regulation of demand in relation to investment. Investment (including marketing) is minimal when the value of demand reaches its maximum (during booms) and is maximal in slowdown periods. This investment triggers the growth of marketing activities in dynamics, which coincides with the functions of demand and return on investment.



Since the marketing activity is a multifactor indicator, the proper method must be used, modularity being its peculiarity. The method consists of six modules that reflect the main areas of work:

Module 1: "Preparatory stage."

Module 2: "Evaluation of the level of raised investment in marketing (MC)."

Module 3: "Evaluation of the level of mobilization of the marketing potential (MP)."

Module 4: "Evaluation of the quality of methods and culture of the use of the marketing mix (QMM)."

Module 5: "Evaluation of the quality of the competition strategy (SQ)."

Module 6: "Evaluation of the level of the marketing activity (MA) of the firm given the cyclicity".

The following formula is used to determine the return on marketing investment (in a similar way to the approach proposed by I. Ansoff for calculation of the investment component SFR):

$$MC = (MC_a - MC_c) / (MC_{opt} - MC_c)$$

To find the marketing potential of the firm, resources should be identified for each element, which can ensure the achievement of the marketing goals of the firm in a given period of activity of the firm. The indicators of correspondence of actual parameters to the required ones for each element of the strategic potential can be defined by comparing the values of the actual and required parameters of resources. These indicators can be combined in roundup evaluation given the significance of each element.

It is recommended *to evaluate the marketing potential* with regard to possible strategic goals in view of how the enterprise meets the target requirements to the quantity and quality of resources, the condition of functions of marketing projects and programs.

The marketing potential of the firm is calculated using the following formula:

$$MP = 1/4 \sum_{j=1}^m \beta_j \sum_{i=1}^n K_{ij}^{corresp}.$$

Quantitative evaluation of the firm's MP allows to conduct a targeted search of the most preferred options for establishing and supporting (at all stages of the cycle) the favorable prerequisites to ensure a high level of the firm's competitive advantage.

*To evaluate the quality of the marketing "mix"*, a set of indicators is recommended, which reflect the efficiency of the methods and culture of the use of marketing tools. This index in its essence reflects the tactical marketing component, i.e. the key one in determining the current marketing activity, since it directly describes the efficiency of the conducted marketing works (Figure 6).

Comprehensive evaluation of the actual achieved level of the firm's marketing activity at the moment of time  $t$  is performed using an additive model, in accordance with the following formula (Moiseeva, 2015):

$$I_{ma_t} = 0,25 \left( \frac{MC_{at} - MC_c}{MC_{opt_t} - MC_c} + \frac{MP_{at}}{MP_{opt_t}} + \frac{SQ_{a_t}}{SQ_{opt_t}} + \left| \frac{QMM_{a_t}}{QMM_{opt_t}} \right| \right)$$

where  $I_{ma_t}$  is an indicator of the firm's marketing activity at the moment of time  $t$ ;  $MC_a$  is an actual value of the firm's marketing costs at the moment of time  $t$ ;  $MC_c$  is a critical point of the volume of marketing costs, located on the border of profits and losses and revealing that the volume of marketing costs below this point does not bring any revenue;  $MC_{opt}$  is a point of optimum volume of marketing costs, after which the growth in marketing costs leads to a decline in revenue;  $MP_a$  is an actual value of the firm's marketing potential at the moment of time  $t$ ;  $MP_{opt}$  is an optimal value of the marketing potential;  $SQ_a$  is an actual value of the quality of the firm's strategy as a component of the firm's potential at the moment of time  $t$ ;  $SQ_{opt}$  is an optimal value of the quality of the firm's strategy as a component of the potential;  $QMM_a$  is an actual value of the quality of the firm's marketing "mix" at the moment of time  $t$ ;  $QMM_{opt}$  is an optimal value of the quality of the marketing "mix".

The obtained index of the marketing activity can be used in the analysis of the firm's marketing activity during the formation of a sales market in the conditions of transformation of business in the process of managing the innovative development of the enterprise.

The economic results of the marketing activity of the leading companies on the world and domestic markets (GE, Alcatel, Siemens, etc.) can serve as an example (Kotler & Keller, 2014), (Moiseeva, 2013), (Moiseeva et al., 2011).

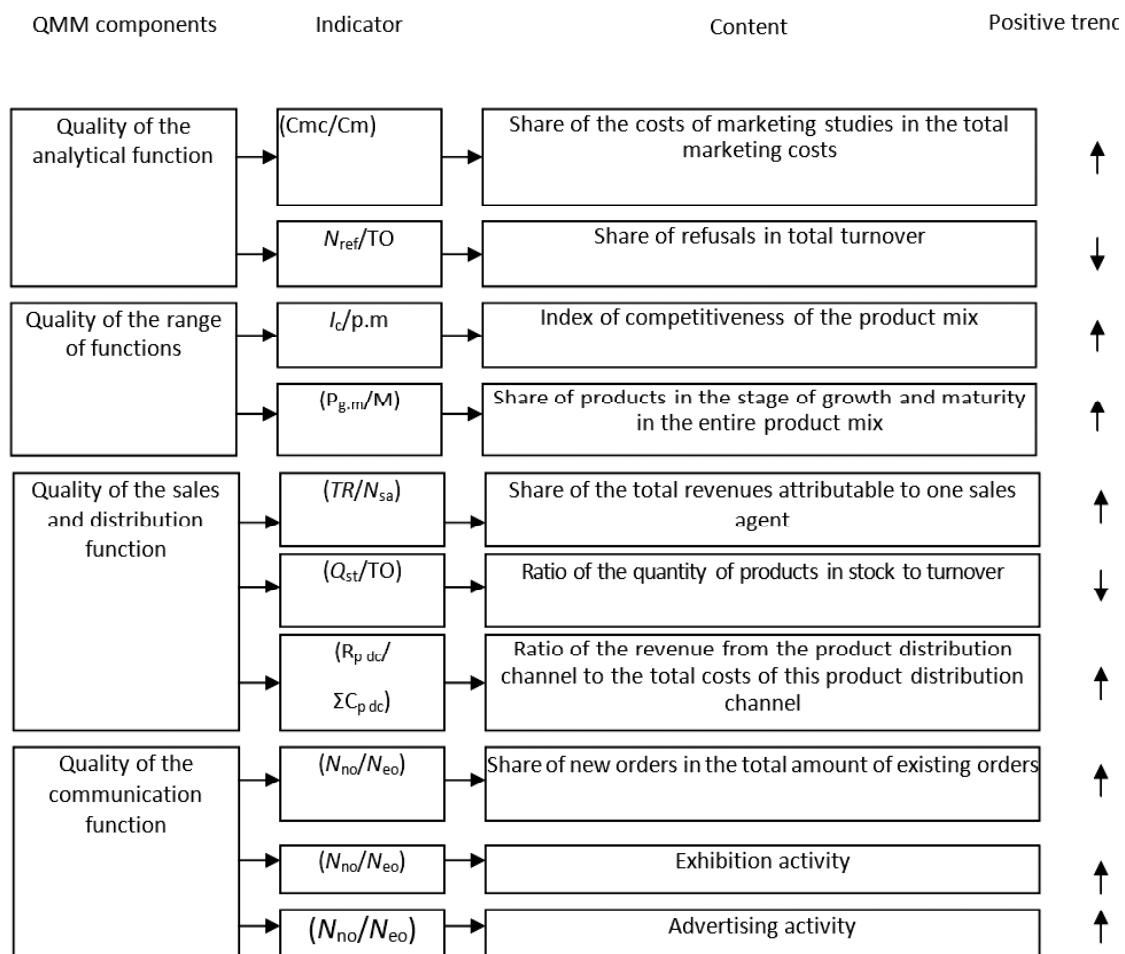


Figure 6: Grouping of indicators reflecting the quality of the methods and the culture of use of marketing "mix" (QMM)

As such, the marketing activity becomes not just an object of managing, but also a kind of indicator of the firm's development in the innovative environment.

Results of activity for each module are combined in the final module "Balanced planning of innovation cycles" and are used in the system of controlling of the development program.

## CONCLUSION

The use of the systems integrator contributes to a balanced planning of innovative activity of the development program participants, and ensures the timeliness and quality of execution of technical tasks related to creating competitive innovation.

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