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ENTERPRISE MARKETING POTENTIAL MODELING
TAKING INTO ACCOUNT OPTIMIZING AND DYNAMIC ESSENCE
OF THE POTENTIAL

The article deals with models system of b2b-enterprise marketing potential results-based estimation, which takes into consideration optimal essence concerning potential, its hierarchic structure and marketing resources dynamics. The suggested models system belongs to the simulation-optimization class, because it has both constrained optimization blocks and marketing resources dynamics simulation blocks, and also includes consequent enumeration of the alternative values of controllable parameters.

Key words: enterprise marketing potential estimation; dynamic modeling; *simulation* and optimization modeling; operative, tactic and strategic management; prognostication of demand.

Problem statement. Enterprise potential is formed by internal factors dynamic system ability to conduct its work in various environmental conditions. The enterprise potential is necessary to estimate, analyze, plan and control.

The marketing potential is functional constituent of the enterprise potential. Based on the marketing classics' works ([1-3]), one can say, that marketing potential of the enterprise is the enterprise ability to satisfy consumers' needs and to get maximal economic benefits from it.

The estimation of the marketing potential is a necessary constituent concerning complex potential evaluating process. That's why the important scientific task is to develop theoretical grounds to estimate marketing potential.

Analysis of the last research and distinguish of the unsolved questions. The today's widespread methods to evaluate marketing potential (see, e.g., [4 – 9]) have the same mistakes, which are particular for traditional approach to evaluate the enterprise potential in general:

estimation of the marketing potential is based on the resource approach;

estimation of the marketing potential doesn't correspond to the optimization essence of the potential;

estimation of the marketing potential doesn't take into account marketing resources dynamics;

also it doesn't take into account variety of variants to control existing resources.

In the work [10] author suggested a mathematical model, which allows to get result-based estimation of the enterprise marketing potential, considering hierarchic potential levels, multivariate processes to use resources and enterprise internal space uncertainty. In the mentioned model marketing potential estimation is formed in view of managerial potential levels – operative, tactic and strategic. It means it shows operative, tactic and strategic possibilities of the enterprise to promote and sale products. But this model doesn't provide either optimization parameters of the enterprise sales-marketing activity, or marketing resources dynamics consideration. That's why this model needs to be improved.

The object of the article is to create a system of models of b2b-enterprise marketing potential results-based estimation, which would take into consideration optimization essence of the enterprise potential, its hierarchic structure (i.e. strategic, tactic and operative potential) and marketing resources dynamics.

Main material. If we observe enterprise potential from the optimization point of view, the result-based estimation of L (strategic, tactic or operative) level concerning enterprise marketing potential is the set of the best results, which the sales and marketing subsystem can achieve in the prognosticated period t^L in view of environment conditions variants.

Dynamic system of models, which allows to estimate optimal results concerning enterprise sales and marketing subsystem activity with given potential resource characteristics and environment parameters, is:

$$\sum_{\tau^L=1}^{N^{L\tau}} r_{\tau^L}^{optY\,L\mu}(\mu_{\tau^L}^L,\ z_{\tau^L}^{L\mu},\ \tilde{s}_{\tau^L}^{L\mu},\ s_{\tau^L}^{L\mu}) \to \max_{s^{L\mu} \in S^{L\mu}}\ , \tag{1}$$

$$r_{\tau^L}^{optY\,L\mu}(\mu_{\tau^L}^L,\ z_{\tau^L}^{L\mu},\ \tilde{s}_{\tau^L}^{L\mu},\ s_{\tau^L}^{L\mu}) = \max_{y_{\tau^L}^{L\mu}} r^{L\mu}(\mu_{\tau^L}^L,\ z_{\tau^L}^{L\mu},\ \tilde{s}_{\tau^L}^{L\mu},\ s_{\tau^L}^{L\mu}, y_{\tau^L}^{L\mu})\ , \tag{2}$$

де $y_{\tau^L}^{L\mu} \in D^{L\mu}(\mu_{\tau^L}^L, z_{\tau^L}^{L\mu}, \tilde{s}_{\tau^L}^{L\mu}, s_{\tau^L}^{L\mu})$, $\tau^L = \overline{1..N^{L\tau}}$, $\tag{3}$

$$\mu_{\tau^L}^L = \mu_{\tau^L-1}^L + \Delta\mu_{\tau^L}^L(\mu_{\tau^L-1}^L, r_{\tau^L-1}^{L\mu}, z_{\tau^L}^{L\mu}, \tilde{s}_{\tau^L}^{L\mu}, s_{\tau^L}^{L\mu}), \ \mu_{\tau^L=0}^L = \tilde{\mu}_0^L, \ \tau^L = \overline{1..N^{L\tau}}\ , \tag{4}$$

where: $L \in \{O,T,C\}$, O – operative, T – tactic, C – strategic level of the marketing potential;

t^L – prognosticated period (short-term, medium-term or long-term – depending on the L potential level);

$\mu_{\tau^L}^L$ – vector of the enterprise sales and marketing resources characteristics in the period τ^L (it is calculated endogenously);

$z_{\tau^L}^{L\mu}$ – vector of the environment parameters, which influence sales and marketing subsystem activity results of the enterprise in the period τ^L;

$y_{\tau^L}^{L\mu}$ – vector of the enterprise production realization amounts in the period τ^L;

$s_{\tau^L}^{L\mu}$ – vector of values of the marketing complex parameters, which are controlled in the L– management level, in the period τ^L;

$\tilde{s}_{\tau^L}^{L\mu}$ – vector of values of marketing complex parameters, given in the higher management levels, in the period τ^L;

$r_{\tau^L}^{L\mu} = r^{L\mu}(\mu_{\tau^L}^L,\ z_{\tau^L}^{L\mu},\ \tilde{s}_{\tau^L}^{L\mu},\ s_{\tau^L}^{L\mu},\ y_{\tau^L}^{L\mu})$ – estimation of the income from production realization in the period τ^L with given characteristics of marketing resources, parameters of the environment and marketing complex parameters;

$D_{\tau^L}^{L\mu} = D^{L\mu}(\mu_{\tau^L}^{L}, z_{\tau^L}^{L\mu}, \tilde{s}_{\tau^L}^{L\mu}, s_{\tau^L}^{L\mu})$ – set of constraints, which are put on the production realization amounts of the enterprise in each period τ^L ;

$\Delta\mu_{\tau^L}^{L}$ – vector of the values growth concerning sales and marketing subsystem resources characteristics at the enterprise in the period τ^L (it's calculated endogenously); $\tilde{\mu}_0^L$ – given vector of the enterprise sales and marketing subsystem resources characteristics at the prognosticated period initial point.

The suggested system unites models to estimate three managerial levels of the marketing potential (operative, tactic and strategic), which are different from each other by: the set of the given managerial decisions; the set of the changeable managerial decisions; descriptions of the environment parameters; specification of the resources featured describing.

Formula (1) shows the objective function, that is income sum from production realization during the whole prognosticated period.

Formulas (2) – (3) describe a problem of the constrained optimization. It is oriented to determine maximum possible value of the income from production realization in each elementary period τ^L with given values of the marketing resources features, environmental parameters and marketing complex parameters.

Formula (4) describes the process of enterprise marketing resources dynamics.

Model (1) – (4) relates to the simulation class, because the optimal decision search is conducted in it by consequent enumeration of the controllable parameters alternative variants $s_{\tau^L}^{L\mu}$. At the same time, the constituent of this model is the optimization model (2) – (3). Thus, model (1) – (4) can be classified as simulation and optimization one ([11]).

Let's examine the constituents of the suggested models system in more details.

Controllable parameters of the models system. The marketing complex parameters are controllable parameters in the models of enterprise marketing potential estimation.

In the strategic level the set of products, realized by the enterprise, is controlled. Also in the strategic level the pricing policy is determined.

In the tactic level price parameters for production are specified.

In the operative level price for products is given. But we consider that the following parameters to pay for products as delay in payment and overpay percentage can be changing in the operative level model.

Set of constraints for production realization at the enterprise. Restriction on the sales is given, firstly, by the demand for the production.

In the suggested models system the demand amounts are not the optimization parameters, but the restriction on the production realization amounts. It is connected with the fact that the given models system is the constituent of the integral models system to estimate complex enterprise potential, where production realization amounts are the optimization parameters and marketing restrictions are added by productive and financial restrictions. Besides, the restrictions on the production realization amounts can be put by factors of the sales logistics, i.e. transport resources and personnel number. And if one takes into account costs for advertisement in the model objective function, the optimal amount of the production realization will differ from amount of demand for it.

In the strategic level the constraints concerning the production realization amounts are:

$$y_{i\tau^C}^{C\mu} \le v_{i\tau^C}^{C\mu d}, \quad i \in S_{\tau^C}^{\mu Cw}, \quad \tau^C = \overline{1..N^{C\tau}}, \tag{5}$$

where $v_{i\tau^C}^{C\mu d}$ – prognosticated amount of the effective demand (in the natural value) for the production i of the analyzed enterprise in the elementary period τ^C in long-term prognosticated period;

$S_{\tau^C}^{\mu Cw}$ – controllable set of product types, which the enterprise will sell in the elementary period τ^C.

In order to determine the prognosticated demand amount $v_{i\tau^C}^{C\mu d}, i \in S_{\tau^C}^{\mu Cw}$ for production of the analyzed enterprise, working in the sector b2b, we suggest approach, based on detecting groups of enterprises-sellers with similar *market characteristics of the production* (price and quality of the service) and groups of enterprises-buyer with similar *advantages* in estimating market features of the products. According to this approach, prognosticated demand amount for the analyses enterprise production depends on market features of this production (price and quality of service), and also on the existing supply of such production in each group of sellers and existing demand for the production in each group of buyers.

Within suggested approach, based on the analysis of samples of enterprises-buyers and enterprises-sellers, one should define:

$Z_i^{C\mu v}$ – set of groups of enterprises-sellers of production i with similar market features – price and level of service (we point out that each group of enterprises-sellers is determined not by its participants, but by the marketing features of the realized production; participants composition of each group is changed in time);

$z_i^{C\mu vp} = (z_{in}^{C\mu vp})$, where $z_{in}^{C\mu vp}$ – price of production i in group of sellers n;

$z_i^{C\mu vq} = (z_{in}^{C\mu vq})$, where $z_{in}^{C\mu vq}$ – level of sales service in group of sellers n;

$z_{i\tau^C}^{C\mu v\%} = (z_{in\tau^C}^{C\mu v\%})$, where $z_{in\tau^C}^{C\mu v\%}$ – percent of the supply amount of production i by group of sellers n in elementary period τ^C (it is formed on the basis of real values till the beginning of the prognosticated period and revealed tendencies in branch development);

$Z_i^{C\mu d}$ – set of groups of enterprises-buyers with similar advantages in estimating production i by price and service quality criteria;

$f_i^{C\mu d} = (f_{imn}^{C\mu d})$, where $f_{imn}^{C\mu d}$ – value of the utility function of production i of sellers group n from viewpoint of buyers group m;

$z_{i\tau^C}^{C\mu d\%} = (z_{im\tau^C}^{C\mu d\%})$, where $z_{im\tau^C}^{C\mu d\%}$ – percent of the demand amount for production i in buyers group m in elementary period τ^C (it is formed on the basis of real values till the prognosticated period beginning and revealed tendencies in consumers' branch development).

Then the demand amount for production i of the analyzed enterprise in the elementary period τ^C is calculated as function:

$$v_{i\tau^C}^{C\mu d} = v_{i\tau^C}^{C\mu d}(s_{i\tau^C}^{C\mu 1}, \mu_{\tau^C}^{Cq}, z_{i\tau^C}^{C\mu v}, z_{i\tau^C}^{C\mu v\%}, z_{i\tau^C}^{C\mu d}, z_{i\tau^C}^{C\mu d\%}, f_i^{C\mu d}), \tag{6}$$

where: $s_{i\tau^C}^{C\mu 1}$ – price of production i of the analyzed enterprise in the elementary period τ^C (it is determined by the enterprise price policy, which is the controllable parameter in the strategic management level);

$\mu_{\tau^C}^{Cq}$ – level of the sales service at the analyzed enterprise in elementary period τ^C ;

$z_{i\tau^C}^{C\mu v}$ – whole amount of production i supply of enterprises-competitors in the region in the elementary period τ^C (it is formed on the basis of the supply amount real values till the prognosticated period beginning and branch development tendencies);

$z_{i\tau^C}^{C\mu d}$ – whole amount of production i demand in the region in the elementary period τ^C (it is formed on the basis of the demand amount real values till the prognosticated period beginning and consumers' branches development tendencies).

In the tactic level the constraints concerning the production realization amounts are:

$$y_{i\tau^T}^{T\mu} \leq v_{i\tau^T}^{T\mu d}, \quad i \in \tilde{S}_{\tau^T}^{\mu Tw}, \quad \tau^T = \overline{1..N^{T\tau}}, \tag{7}$$

where: $v_{i\tau^T}^{T\mu d}$ – prognosticated amount of the effective demand (in the natural form) for production i of the analyzed enterprise in middle-term prognosticated elementary period τ^T ;

$\tilde{S}_{\tau^T}^{\mu Tw}$ – given set of product types, which the analyzed enterprise will sell in the elementary period τ^T .

We suppose that in tactic level value $v_{i\tau^T}^{T\mu d}$ is reasonably to define as in the strategic level, based on analyzing groups of enterprises-sellers with similar market characteristics of the production and groups of enterprises-buyer with similar advantages in estimating market features of the products.

In the operative level the constraints concerning the production realization amounts are:

$$y_{i\tau^O}^{O\mu} \leq v_{i\tau^O}^{O\mu d}, \quad i \in \tilde{S}^{\mu Ow}, \quad \tau^O = \overline{1..N^{O\tau}}, \tag{8}$$

where: $v_{i\tau^O}^{O\mu d}$ – prognosticated amount of the effective demand (in the natural form) for production i of the analyzed enterprise in the short-term prognosticated elementary period τ^O ;

$\tilde{S}^{\mu Ow}$ – given set of product types, sold by the enterprise in short-term prognosticated period.

We consider that for sector b2b within short-term period value $v_{i\tau^O}^{O\mu d}$ may be defined on the basis of individual approach, collecting and analyzing the information about each enterprise plans from clients' base:

$$v_{i\tau^O}^{O\mu d} = \sum_{m \in I_i^{O\mu d}} v_{im}^{O\mu d} \cdot z_{im\tau^O}^{O\mu d} + v_{i\tau^O}^{O\mu d \#}, \ i \in \tilde{S}^{\mu Ow}, \tag{9}$$

where: $I_i^{O\mu d}$ – set of enterprises, which are real or potential buyers of the analyzed enterprise production i and are ready to give information concerning their future needs in this production;

$v_{im}^{O\mu d}$ – indicator, which shows if buyer m ($m \in I_i^{O\mu d}$) makes an order for the production i of the analyzed enterprise in the prognosticated period:

$$v_{im}^{O\mu d} = \begin{cases} 1, \ if \ the \ condition \ works \\ 0, \ if \ the \ condition \ doesn't \ work \end{cases} \tag{10}$$

where: $\tilde{s}_i^{O\mu 1}$ – given price of the analyzed enterprise production i in the short-term prognosticated period;

$s_i^{O\mu 2}$ – duration of the payment relay for production i in the prognosticative period (controllable parameter in the operative level),

$s_i^{O\mu 3}$ – percentage of the prepayment for production i in the prognosticative period (it is also the controllable parameter);

$D_{im}(\tilde{s}_i^{O\mu 1}, s_i^{O\mu 2}, s_i^{O\mu 3})$ – conditions concerning rules to pay for products (with given prices), under which client m ($m \in I_i^{O\mu d}$) agrees to buy production i of the analyzed enterprise (conditions D_{im} depend from the clients' expectations concerning service level at the analyzed enterprise);

$z_{im\tau^O}^{O\mu d}$ – demand amount for production i of buyer m in the elementary period τ^O (it is formed, based on information, given by the buyer);

$v_{i\tau^O}^{O\mu d \#}$ – prognosticative demand amount for production i of the analyzed enterprise among buyers, who don't belong to the variety $I_i^{O\mu d}$ (it is formed on the basis of last periods information and revealed tendencies of the consumers' branches development).

Dynamics of the enterprise marketing resources characteristics. The block to describe enterprise marketing system characteristics is the important constituent of the suggested

models system. This block creation logic is demonstrated with example of enterprise sales service level:

$$\mu_{\tau^L}^{Lq} = \mu_{\tau^L-1}^{Lq} + \Delta\mu_{\tau^L}^{Lq}, \quad \mu_{\tau^L=0}^{Lq} = \tilde{\mu}_0^{Lq}, \quad \tau^L = \overline{1..N^{L\tau}}, \tag{11}$$

where: $\mu_{\tau^L}^{Lq}$ – level of the sales service at the analyzed enterprise in the elementary period τ^L;

$\Delta\mu_{\tau^L}^{Lq}$ – growth of the service level at the analyzed enterprise in the period τ^L, which depends on amounts of the enterprise sales-marketing subsystem development financing;

$\tilde{\mu}_0^{Lq}$ – real service level at the analyzed enterprise to the beginning of the prognosticative period t^L.

Conclusions and perspectives of further investigations. The suggested simulation and optimization models system of b2b-enterprise marketing potential result-based estimation has the following advantages: it corresponds optimizing essence of potential, takes into account marketing resources dynamics and allows to get estimation in the view of enterprise potential hierarchic levels.

The suggested models system is the instrument for estimation and analysis of the future enterprise sales and marketing abilities, comparison of which with producing and financial abilities will allow to define narrow places in the analyzed enterprise activity and increase its general potential.

The given models system is a part of mathematical providing to manage future enterprise abilities.

The further investigations on research area have to be oriented to build models of the enterprise marketing potential estimation in integral system concerning enterprise integral potential estimation.

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МОДЕЛЮВАННЯ МАРКЕТИНГОВОГО ПОТЕНЦІАЛУ ПІДПРИЄМСТВА З УРАХУВАННЯМ ЙОГО ОПТИМІЗАЦІЙНОЇ ТА ДИНАМІЧНОЇ СУТНОСТІ

Запропоновано систему моделей результатної оцінки маркетингового потенціалу підприємства з сектору b2b, яка враховує оптимізаційну сутність потенціалу, його ієрархічну структуру та динаміку маркетингових ресурсів.

Розроблена система моделей відноситься до класу імітаційно-оптимізаційних, так як вона містить і блоки умовної оптимізації, і блоки імітації динаміки маркетингових ресурсів, а також передбачає перебір альтернативних значень керованих параметрів.

Маркетинговий потенціал підприємства трактується як здатність підприємства задовольняти потреби споживачів та отримувати на цій основі максимальні економічні вигоди.

Результатною оцінкою маркетингового потенціалу підприємства вважається множина найкращих результатів (значень прибутку від продажів), які може досягти збутово-маркетингова підсистема підприємства в прогнозному періоді в розрізі варіантів умов зовнішнього середовища.

Ключові слова: оцінка маркетингового потенціалу підприємства; динамічне моделювання; імітаційно-оптимізаційне моделювання; оперативне, тактичне та стратегічне управління; прогнозування попиту.

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Моделирование маркетингового потенциала предприятия с учетом его оптимизационной и динамической сущности

Предложена система моделей результатной оценки маркетингового потенциала предприятия сектора b2b, которая учитывает оптимизационную сущность потенциала, его иерархическую структуру и динамику маркетинговых ресурсов.

Разработанная система моделей относится к классу имитационно-оптимизационных, так как она содержит и блоки условной оптимизации, и блоки имитации динамики маркетинговых ресурсов, а также предусматривает перебор альтернативных значений управляемых параметров.

Маркетинговый потенциал предприятия трактуется как способность предприятия удовлетворять потребности потребителей и получать на этой основе максимальные экономические выгоды.

Результатной оценкой маркетингового потенциала предприятия считается множество наилучших результатов (значений прибыли от продаж), которые может достичь сбытово-маркетинговая подсистема предприятия в прогнозном периоде в разрезе вариантов условий внешней среды.

Ключевые слова: оценка маркетингового потенциала предприятия; динамическое моделирование; имитационно-оптимизационное моделирование; оперативное, тактическое и стратегическое управление; прогнозирование спроса.

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Англійська анотація:

Aim. The aim of the research is to develop models system concerning b2b-enterprise marketing potential result-based estimation, which will consider enterprise potential optimizing essence, its hierarchic structure (i.e. strategic, tactic and operative potential levels) and marketing resources dynamics.

Scientific result. The simulation and optimization models system of the b2b-enterprise marketing potential estimation is suggested.

The suggested models system is based on the following theoretical grounds:

1) enterprise marketing potential is interpreted as enterprise ability to satisfy consumers' needs and to get maximum economic benefits from it;

2) the result-based estimation of the enterprise marketing potential is set of the best results (profit from sales), which sales and marketing enterprise subsystem may achieve in the prognosticative period in the view of environmental conditions variants.

The suggested system unites models to estimate three managerial levels of the marketing potential (operative, tactic and strategic), which are different from each other by: the set of the given managerial

decisions; the set of the changeable managerial decisions; descriptions of the environment parameters; specification of the resources featured describing.

Model of each marketing potential level has the following constituents:

objective function, which is the sum of profit from production realization during the whole prognosticative period;

model of the constrained optimization, oriented to define maximum possible profit value from production realization in each elementary period with given marketing resources features values, environmental parameters and marketing complex parameters;

model of the enterprise marketing resources dynamics.

Developed models system belongs to the simulation class, because search of the optimal decisions there is conducted with method concerning controllable parameters alternative variants consequent enumeration. At the same time, the constituent part of the models system is constrained optimization block.

Conclusions. The suggested simulation and optimization models system of b2b-enterprise marketing potential result-based estimation has the following advantages: it corresponds optimizing essence of potential, takes into account marketing resources dynamics and allows to get estimation in the view of enterprise potential hierarchic levels.

The suggested models system is the instrument for estimation and analysis of the future enterprise sales and marketing abilities, comparison of which with producing and financial abilities will allow to define narrow places in the analyzed enterprise activity and increase its general potential.

The given models system is a part of mathematical providing to manage future enterprise abilities.

The further investigations on research area have to be oriented to build models of the enterprise marketing potential estimation in integral system concerning enterprise integral potential estimation.