Розділ 2

Інновації у маркетингу

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INFORMATION IN MARKETING SYSTEMS

The article deals with the questions of conducting and evaluating the quantitative optimum set of system constraints in marketing organizational and information systems. It is shown that in each marketing system there is a certain ratio of entropy and received marketing information, the optimal number of bounded states of the system is determined in accordance with the conditional total number of permissible system states; the share of actual (topically-demanded) system information; the measure of the annual update of information in a system that corresponds to a specific quantitatively defined interval from the amount of system information.
Keywords: marketing systems, organizational and information systems, sets of system constraints, marketing information, relevant information.
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Problem statement. One of the main conditions for the stable functioning of any system (physical, biological, and even more economic or social) is the presence in such a system of constraints that arrange its structural framework. The above statement fully applies to the marketing system. On the one hand, a set of restrictions focuses on the manufacturer's attention to the quantity of goods that is backed by demand. On the other hand - it attracts the attention of potential buyers to a specific advertised product, limiting the attempts of the consumer to buy other goods. This approach makes it possible to formulate a harmonized marketing policy both in individual firms and in branch industries. The principle of structuring in the development of effective marketing systems determines the need for justification of the goal, the establishment of functions, the selection of criteria for assessing the achievement of goals and imposing restrictions on the system. The defined position is relevant, because in recent years marketing has developed rather rapidly, but unsystematically. Under such circumstances, a scientifically grounded approach to establishing the quantity and quality of system constraints will enable not only to harmonize the functioning of marketing systems, but also to optimize the indicators of economic activity of commodity producers.

Analysis of the recent research and publications. Studies on the quantification-optimal set of systemic constraints involved were found in scientific papers W. Ashby [1], V. Derevyanko [5], L. Horbunova [6], K. Shannon [7], M. Volkenshtein [8], R. Nemova [10], V. Krydenko [11] and A. Karminskaia [12]. In the context of the presented study, the questions of quantitative optimization of the restrictions introduced in the organizational-information systems of the marketing direction, aimed at decreasing entropy and chaos in such systems are considered.

The proposed approach to organizing organizational and information marketing systems involves the implementation of a set of rules, norms, prohibitions of some kind of incentives, which, by their content orientation, will restrict arbitrary chaotic preferences and actions of separate entities (producers and consumers of a particular product), transforming their arbitrary probabilistic behavioral actions on a typed-reasoned format of agreed purchasing preferences in the market of commodity products.

Since the essence of system constraints for producers and buyers is the information product in the form of advertising clips, booklets, and other public messages, the task of research is becoming urgent: 1) the mechanism of the introduction of portions of information to socio-marketing systems; 2) quantitative and qualitative characteristics of the formed portions of information-restricting products. The determinants obtained as a result of scientific research will make it possible to streamline the process of forming an array of restrictions in the context of their quantitative and qualitative composition.

The purpose of the article. The purpose of this article is to study the processes occurring in the marketing (organizational and information) systems, and the definition of attribute parameters of the restrictive information products of such systems.

Basic material. The main material should start from the thesis to the effect that the amount of information that can perceive manufacturer and purchaser of certain goods has the most effective and cannot exceed a specified index. Such a limitation is due to the fact that the volumes of individual portions of the latest advertising or some other information cannot be arbitrary, but should be compared with those volumes of already existing information that are in the memory of a particular subject.

By adapting the presented considerations to the process of encouraging a potential buyer to acquire a particular product, we must determine that: 1) the number of restrictive methods that will be directed to the consumer cannot be arbitrary, since their unjustified reduction or increase leads to both disorganization and the organization of system processes within the limits of promotional actions; 2) the volume of a discrete portion of a posteriori information in a quantitative index should be in the range of an acceptable norm against the background of the subject accumulated in the memory of the previous information.

Analyzing the problem of establishing the optimal volume of information as the ideal essence of the real constraints that the consumer must perceive, one should turn to the research of W. Ashby, in which the scientist admits that the presence in the system of constraints is an indicator of the presence in the investigated system of structural information. And, conversely, the lack of restrictions indicates the lack of structural information and the presence of unlimited diversity – the maximum number of degrees of freedom [1; 3]. Since the existing elements of the system (both objects and entities) are not free and independent, but bear the traffic constraints imposed on them, the region of the real variety of states of the system will be less than the region of potentially possible states of the given system [1, p. 349]. Thus, for socio-economic systems in general and the marketing system in particular, it is possible to distinguish between two inherent behavioral modes: first, the system can have a finite number of unconstrained states M; the second – is the finite number of restricted states $N - M$, where N – total number of possible states of the system [2, p. 40-44; 3, p. 86].

In accordance with the provisions of the information theory, any system is in working mode only if it is in a state other than equilibrium. That is, when systems, including marketing systems, along with free information contain information that builds the structural structure of the system, forms the necessary

restrictions, reduces the number of free movements and actions of individual elements. The given type of information has the definition of structural information, which is equal to the difference between the total number of free information in a system with N states and the total amount of free information in the system with M states. In the above constructed model, the amount of structural information (Y) in a system with N - M bounded states is equal to:

$$Y = J - J^* = N \log_2 N - M \log_2 M. \tag{1}$$

If we introduce into formula (1) two typical, but different sign, mathematical expressions, which are the definition of the total amount of free information in the constrained systems, we obtain the equation of the following configuration:

$$Y = J - J^{**} + J^{**} - J^* = (N \log_2 N - M \log_2 N) + (M \log_2 N - M \log_2 M). \tag{2}$$

In this given interpretation deterministic information will have the meaning:

$$Y_D = (N - M) \log_2 N. \tag{3}$$

Probabilistic information will be taken into account according to the equation:

$$Y_V = M (\log_2 N - \log_2 M). \tag{4}$$

According to the law of storing information, the amount of structural and free information is theoretically unchanged, we can assume that the value of structural information will reach its maximum (Y * = extr Y) under the conditions when the amount of free information in the system will be minimal. In accordance with equation (4), a given problem will be achieved if the number of free states (M) in the system with constraints becomes optimal in the background of the total number (of varieties) of possible states (N) of the system. Given that the number "e" as a fundamental mathematical constant is the maximum possible result for a single time period (state or cycle) of the development (evolution) of the system, the correct working hypothesis for determining the number of free states (M) for the acquisition of a structural information (Y*) of its extremum according to the equation M = N/e. Presenting expression (4) in the form:

$$Y_V = M \log_2 \frac{N}{M} \tag{5}$$

and following the corresponding transformations, we have the equation:

$$Y^* = Y_{V\,max} = \frac{N}{e} \log_2 e. \tag{6}$$

Using in the calculations (6) the value of the number e = 2,7 (2,718281), we obtain Y* = YV max ≈ ≈0,5 (0,530738) N. Thus, the extreme value at which the structural information reaches the optimum (Y*) will be 0,53N. That is, the number of restrictive advertising techniques for the optimal organization of marketing activities should be on average 0,53N, where N – the conditional total number of arbitrary actions of manufacturers and buyers of advertised products (Fig. 1).

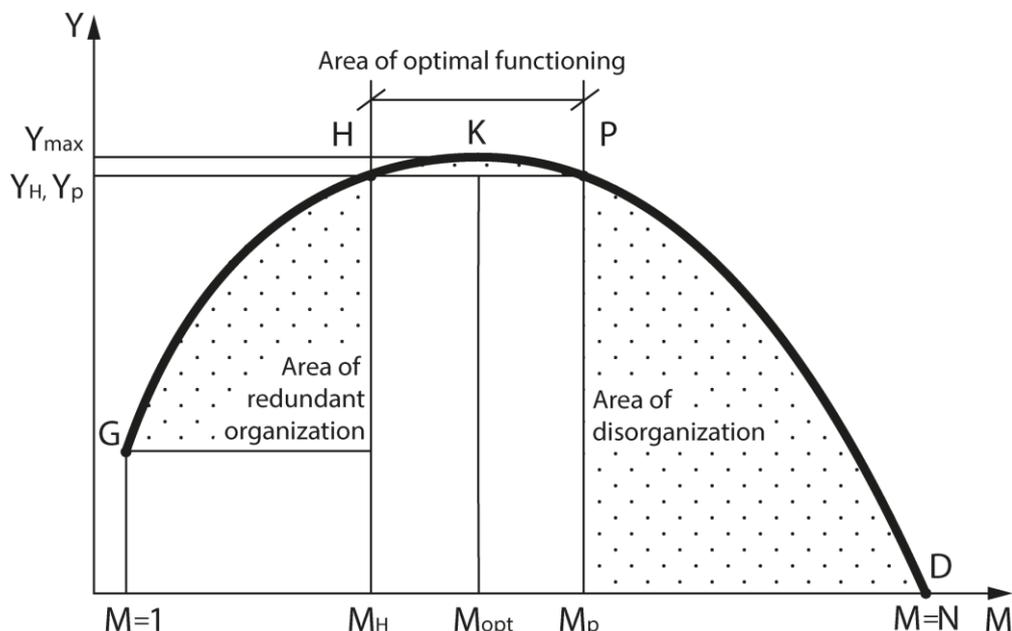*Figure1 –* **Graphical interpretation of the dependence of structural information (Y) from the number of free states (M) in the restricted system**

By studying the graphical interpretation of the dependence of structural information (Y) on the background of the number of free states (M) in a system with constraints, one can design related-conditional areas of system development within one cycle. By this, the region of recovery (GH) is characterized by an increase in the amount of structural information (Y) and its achievement of the maximum value at the point K, provided: Y * = Y max. The subsequent increase in the number of free states (M) of the constrained system characterizes the downturn zone (PD) and leads to the transformation of structural information (Y) into free information (J). By this, the optimal state of the system is the HP area.

$$Lifting\ range:\quad 1 < M < M_{opt}\quad log_2\ N < Y < \frac{N}{e}\ log_2\ e, \tag{7}$$

$$The\ fall\ area:\quad M_{opt} < M < N\quad \frac{N}{e}\ log_2\ e > Y > 0. \tag{8}$$

The boundaries of the optimal functioning of the system (HP) can be intuitively determined by installing a portion of the information that remains relevant (useful, in demand) in the general array of information over a period of time. When to take into consideration the results of research of V.S. Kreidenko, V.L. Basanets and others [5, p. 425; 6, p. 233; 11], the share of topical (important in existing realities) information does not exceed 10-15% of the total amount of information in the system. In the aspect of the conducted research, it is possible to establish a confidence interval (MH – MP) in the process of changing the number of free states of the system with restrictions from M = 1 to M = N. The

concept of "confidence interval" in the given case will be understood as a certain area of the functioning of a system that has information parameters closest to the information optimum, and provides for the actual operation of the actual (useful for user preferences) and reliable (adequate for his understanding and assimilation) information in the trajectory of the effective implementation of promotions related to the promotion of certain goods or services on the market.

If we define quantitative parameter confidence interval MH – MP through LD, then its display (percentage or as a decimal point) can be used to establish a formalized algorithm indicator M:

$$M = \frac{N}{e} \pm \frac{L_D}{2} \, N. \tag{9}$$

The boundary values for the confidence interval will look like:

$$M_H = \frac{N}{e} - \frac{L_D}{2} \, N; \quad M_P = \frac{N}{e} + \frac{L_D}{2} \, N. \tag{10}$$

Structural information at the border points of the confidence interval for the given conditions will be determined by the equations:

$$Y_H = M_H \, log_2 \frac{N}{M_H} \; ; \quad Y_P = M_P \, log_2 \frac{N}{M_P} . \tag{11}$$

According to the estimation of the values of structural information in the system on the interval MH - MP it can be argued that the optimal functioning region is characterized by the number of forbidden (restricted) states (YH – YP) maximally approximated to the information optimum $Y^* = YV$ max = 0,53 N. Percentage of actual (topical) information according to the research carried out on the basis of mathematical statistics is approaching 15%, which is equal to ± 7,5% Y max from the total amount of information in states N.

Determination of the quantitative measurement of the particle ("portion") of "fresh" information may take place by taking into account the percentage of unused data subject in its total volume. Now, according to research results cited V.S. Kreydenko [11, p. 9; 12, p. 18], in the amount received by the subject of information, the share of unused information may reach 95%. According to the curve of forgetting T. Ebbinghaus, six days after the acquisition of information in the memory of a person remains 20% of the total original volume, that is, almost 80% of the information is unused [10, p. 233-243]. If we recognize the amount of unused information as YH and the total volume as YZ, then the portion of information (YS) to be entered into the system to replace the obsolete a priori information will be determined according to equation (12) and will be: at YH = 95% , YS = 5%; at YH = 80%, YS = 20%. This condition can only be explained by the fact that the information does not disappear and, should it remain unused or naturally forgotten, the process of reminding should be caused by the restoration of the available system information. Under such circumstances, in the case of a relatively large amount of untapped information, a smaller portion of the information reinforcement is required and, conversely, a small amount of backup information provides a larger portion of the information reminder.

$$Y_S = (1 - \frac{Y_H}{Y_Z}) \, N \, 100\%. \tag{12}$$

Based on the above, we can state that: 1) the provision to the potential buyer of the goods of structural information, as the ideal essence of restrictive techniques, occurs during periods of promotion of certain goods or services on the market; 2) the optimal number of restrictive techniques is equal to 0,53 N, where N is the conditional total number of possible states of the potential buyer; 3) the share of actual very needed system information of a potential buyer is not more than 15% of its total number for states N; 4) the annual update of the information in the system corresponds to an interval of 5-20% of the volume of system information.

The task of optimizing the economic marketing system in comparison with physical, technological and biological systems is a more complex process, because we must take into account the subjective factor whose essence lies in the behavioral characteristics of each individual, It is well known that if people agreed to wear the same clothes, use the same furniture, live in identical apartments and ride on identical cars, marketing, in terms of subjective commodity philosophy, would have no demand, and companies would receive guaranteed income for Typified forms of commodity products. Because the mentality of the majority of Ukraine's population is based on different principles from the given scenario, each individual wants to look like a person and, accordingly, if it is possible to buy for him what he likes.

Perceiving the motivation of the isolated subjects of the commodity market, the earlier statements can be set forth in such an interpretation. On the segment GH (Fig. 1), the system of structural information is acquired both in relation to the variety of types of products produced and the quantitative measurement of each type, and in terms of consumer awareness and their motivation to acquire a particular product. At this stage, the study of the urgent possibilities of the supply and local preferences of demand for the corresponding change in the diversity of states of the subjects of the marketing system (producers and consumers of goods) from the situation when M = 1, to the situation when M acquires its optimum (M_{opt}) is underway. In this case, the situation according to which M = 1 corresponds to the state of the system with a significant number of restrictions and a rigid structure, built on the principle: give, that and consume. A certain increase in the index M (the number of unconstrained states) leads to a decrease in the N-M indicator (the number of restricted states) and, accordingly, to the deployment of market (in contrast to the normalized) relations in the "manufacturer-buyer" system.

The achievement of the structural information (Y) of the maximum value, according to which $Y^* = Y_{max}$, implies the entry of the system into the zone of optimal functioning of HP, at the point K of which there is a fair relation $Y^* = YV_{max} \approx 0,53$ N. Accordingly it becomes possible assertion that, in the area of confidence interval for the optimal organization of marketing policy, the quantitative restrictions of the variety of manufactured products and certain advertising techniques should average 0.53 N, where N is the conditional total The potential of arbitrary actions by potential buyers of advertised products is a technologically permissible list of manifolds of products produced.

The subsequent increase in the number of arbitrary states (M) of entities in the system characterizes the region of decline (PD) and leads to the transformation of structural information (Y) into free information (J) with the establishment at the end point of the ratio M = N, according to which structural constraints are impossible and the system is considered disorganized. This state of affairs is similar to the situation when manufacturers place on the market what they can and consumers buy something else but what they want. In fact, there is a disparity in demand and supply, and, accordingly, the imbalance of economic mechanisms of market management of commodities of mass consumption.

In the situation of staying the Ukrainian economy in conditions of deformation crises and upheavals, taking into account demographic transformations and a sharp decline in the standard of living of the population and its solvency, the support of the field of mass commodity production should be borne in mind by state institutions. At the same time, having declared the course to a market economy, the power structures, moving from the state from M = 1 to a certain extreme at M = M_{opt} (Fig. 1), must not only ensure the expansion of the diversity of products of domestic origin, but also form boundary norms of

managerial, economic, financial, marketing orientation in the investigated branch.

At the same time, it would be incorrect to determine that attempts to implement marketing principles at the state level are not applied. The given concerns the development of the relevant programs of activities of the Cabinet of Ministers of Ukraine, "Ukraine-2010" Program, the National Development Strategy "Ukraine-2015", created for the practical participation of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine, the Institute of Demographic and Social Studies of the National Academy of Sciences of Ukraine, etc. Unfortunately, the consistent implementation of all these programs is not enough, because they did not take into account that in the conditions of a critical increase in the degree of freedom in the economy of Ukraine, the role of the state as a regulatory body changes qualitatively. Program creators often not even imagine the degree of difficulty, which should have a marketing system of state-level hierarchy, and isolation from the realities of the relevant ministerial structures are not allowed to cover a significant variety of both public companies and newly formed private cooperatives, firms or companies.

According to the aforementioned items, the philosophy of state approach to optimization of marketing organizational information system should be awareness of the urgent need to harmonize the interests of producers and consumers ordering their connections and relationships in the context of minimizing chaos and inconsistency in behavioral actions of individual actors in the system. In other words, the institutional provision of the process of production and consumption of goods of mass demand should be the formation of a set of information-restrictive rules of conduct that would, on the one hand, determine the legislatively defined interest of the social environment in increasing the range of available and quality goods (the process of minimizing the organization of the system), and , on the other hand, has browned the behavioral trajectories of the subjects of marketing systems, thus transforming their arbitrary chaotic effects on an acceptable behavior. niche format (process of disrupting the disorganization of the system). The presented approach harmonizes and harmonizes the components of the marketing system and ensures its operation in the optimum area of HP (Fig. 1).

Based on these studies, we can express an opinion on the identity of processes that illustrate the evolution of organizational and informational, including marketing systems. Realizing the objective laws of the functional development of system processes, it is extremely important not only the preliminary design of effective models of marketing structures, but also the transfer of basic ideas about their formation into real economic stocks of the commodity market.

Conclusions. Consequently, the above studies show that marketing organizational and information systems in their complexity should correspond to the degree of diversity of the object of management. The determinants obtained in accordance with the results of the scientific survey will provide an opportunity to streamline the process of formation of restrictive information norms for individual system entities (producers and consumers of goods) in terms of the relation of restrictive rules to the array of potentially possible actions of these entities. The perception of the acquired patterns of the functioning of marketing systems and their transfer to the realities of the market will provide an opportunity to more accurately assess the complexity of market relations, to form areas of optimal functioning of systems and to harmonize the relationship between individual system elements.

Among the main indicators of the optimal functioning of the marketing system in the market environment, subject to the application of restrictive behavioral rules and procedural rules in relation to the subjects of the design "manufacturer – consumer", should recognize the following: 1) the optimal number of restrictive techniques is 0,53 N, where N – conditional total number of possible states of producers and buyers; 2) the share of actual (necessary – necessary) system information for the manufacturer and the buyer is not more than 15% of its total number for states N; 3) the annual update of information in the system corresponds to an interval of 5-20% of the total amount of system information. At the same time, the provision of structural information to the potential consumer of goods,

as the ideal essence of restrictive techniques, takes place during periods of promotion of certain goods or services on the market.

Further studies. Following the current economic situation in Ukraine, further research in terms of functional optimization of organizational and information marketing systems should be devoted to solving macro-marketing problems on the basis of well-founded support of priority directions for the state's economy, namely, those industrial environments where domestic producers have maximal advantages or, at least, minimal disadvantages. In this sense, the market for mass demand goods is perhaps the most profitable area of effort and profit for both certain business structures and for relevant state institutions. Formation of the preconditions for harmonized system designs becomes not only organizationally justified, but also economically necessary task.

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Інформація в маркетингових системах

У статті розглядаються питання щодо впровадження і оцінювання кількісно-оптимальної множини системних обмежень у маркетингових організаційно-інформаційних системах. Показано, що в кожній маркетинговій системі існує певне співвідношення ентропії і одержуваної маркетингової інформації. Визначені: оптимальна кількість обмежених станів системи відповідно до умовної загальної кількості дозволених системних станів; частка актуальної (злободенно-затребуваної) системної інформації; міра річного оновлення інформації в системі, що відповідає конкретному кількісно визначеному інтервалу від обсягу системної інформації.

Ключові слова: маркетингові системи, організаційно-інформаційні системи, множини обмежень систем, маркетингова інформація, актуальна інформація.

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Информация в маркетинговых системах

В статье рассматриваются вопросы относительно внедрения и оценки количественно-оптимального множества системных ограничений в маркетинговых организационно-информационных системах. Показано, что в каждой системе маркетинга имеется определенное соотношение энтропии и получаемой маркетинговой информации. Определены: оптимальное количество ограниченных состояний системы относительно к условному общему количеству разрешённых состояний системы; доля актуальной (злободневно-затребованной) системной информации; мера годового обновления информации в системе, что отвечает конкретному количественно определенному интервалу от объема системной информации.

Ключевые слова: маркетинговые системы, организационно-информационные системы, множества ограничений систем, маркетинговая информация, актуальная информация.