

# Formalization of marketing management approaches from the perspective of system analysis

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**Abstract.** The article is devoted to the study of the implementation of the key goal of marketing, which is the satisfaction of public needs through commodity-money exchange, within the framework of the implementation of various concepts and approaches in marketing. A feature of the study is the consideration of this issue from the standpoint of system analysis. That allowed to formalize the problem, hindering the achievement of the main goal of marketing: the discrepancy of the current potential of the manufacturer to the needs of the customer. As a result, logical schemes were constructed to eliminate the systemic problem of achieving a marketing goal for the following marketing concepts: traditional, cognitive, sales, interaction (co-creation), development and marketing of advanced development. Mathematical models were proposed for the developed logic schemes.

## 1 Introduction

Modern methods of strategic management, and in particular strategic marketing management, have a clear bias towards expert assessments and qualitative analysis (SWOT, PEST analysis and their modifications) [1].

In the Russian scientific practice of recent years, the authors have attempted to formalize certain aspects of strategic management: the adequacy and objectivity of strategic targets [2], the introduction of documentation of the strategic management process [1], marketing management models [3, 4], mathematical modeling of individual business processes [5] and regional strategies [6] and a number of others.

From the point of view of system analysis, the problem is a mismatch between the goal and the resources necessary to achieve it, if interpreted classically – the mismatch of the state of the system with the necessary (reference) characteristics.

The object of the study is the process of satisfying the needs of customers within the framework of the implementation of the key (strategic) marketing paradigm.

The subject of the study is to ensure that the level of the strategic potential of the manufacturer corresponds to the level necessary to meet social needs.

Abstracted **manufacturer** (seller) and customer (buyer) will act as subjects of the study.

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The purpose of the study is to develop a basic mathematical model of the marketing strategy of advanced development based on the formalization of the development of the implementation of the key marketing paradigm.

## 2 Materials and methods

Within the framework of the study, it is supposed to stratify the implementation of the problem solution within the framework of various marketing concepts. Based on the allocation of the logic of eliminating the discrepancy between the potential of the enterprise and the needs of the market, a formalization of this process (marketing strategy) will be proposed.

At the same time, it is necessary to specify some limitations and assumptions when constructing mathematical models.

1. The model is limited to two main participants in the process of satisfying social needs: the manufacturer (seller) and the customer (buyer).
2. The influence of competitors, suppliers and other participants of the contact audience is not taken into account. Accordingly, the model does not reflect the competition and the marketing task "advance" covers only the changing needs of society.
3. The impact of government influence on the market (regulation, protectionism of own markets, expansion into new markets) is not taken into account.
4. When constructing the model, the required result is conditionally determined in the form of equality of the strategic potential of the enterprise, to the level required to meet demand. In practice, when solving this problem, the prospective strategic potential of an enterprise in terms of production capacity may exceed the required level, or be lower (that is, it does not provide 100% satisfaction of demand).

The inequality characterizing the problem under consideration has the following interpretation: the potential of the enterprise (aggregate, strategic or marketing), which is responsible for the ability of the enterprise to produce and provide products to the market in the required quality and quantity, is less than the needs of the market (qualitative and quantitative). The potential of the enterprise will be denoted as  $X$ , while the current potential of the enterprise will have the designation  $X_0$ , and the prospective potential – formed in the future – we will denote as  $X_1$ . The needs of the market (customers) were designated  $Y$ , respectively – the current needs of the customer –  $Y_0$ , those that will be formed in the future (promising) –  $Y_1$ . The totality of factors determining the development of social needs is denoted by the symbol  $Z$ .

Mathematically, the inequality expressing the problem under study has the following form:

$$X < Y \tag{1}$$

During the implementation of marketing activities, first of all in the strategic aspect, this inequality should be eliminated and both components will move into a state of equality (the assumptions in this requirement are specified in paragraph 4 of the list of assumptions and limitations of the model):

$$X = Y \tag{2}$$

It is assumed that the resulting model will be a basic element of the marketing strategy architecture [7].

## 3 Results

The paradigm of modern marketing, voiced by F. Kotler and other prominent economists, define the key task of marketing activities to create conditions for commodity exchange in which the social needs of its participants will be met [8].

The marketing system faces the question: do the company's capabilities meet the public needs in full? In most cases, the answer is negative, due to the fact that the needs of the customer have a dynamic nature, in other words, they are constantly changing.

This allows us to hypothesize that from the point of view of system analysis, the key problem (or one of the key problems) is the discrepancy between the potential of the enterprise to produce a product and the needs of the market (qualitative and quantitative).

Strategic marketing management faces a key task – the elimination of this discrepancy, which should ensure the achievement of the main goal of marketing.

In the framework of this scientific work, we will consider a number of marketing concepts, within which there were significant differences in understanding how to ensure that the needs of society are met. In accordance with this, the marketing system formed the logic of bringing the potential of the enterprise (which by its properties can be described as strategic) in line with market requirements in general, and the needs of the target audience in particular. The task set in the study also correlates with the marketing management of the company's interests [9].

Traditional marketing determines the need to produce goods that consumers need, and accordingly it is assumed that the potential of the enterprise should correspond to the possibilities of producing products that consumers need.

The paradigm of traditional and holistic marketing coincides with the modern understanding of marketing goals and is reduced to ensuring effective satisfaction of the needs of society.

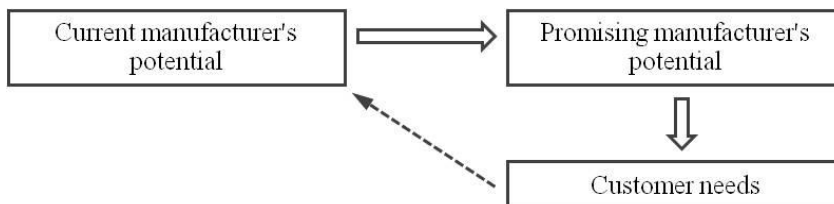


**Fig. 1.** The logic of eliminating the problem in traditional marketing. A source: [Compiled by the authors].

However, at this stage of formalizing the solution to the problem of the discrepancy between the potential of the enterprise and the level of the customer's requirements, we need to define the potential of the enterprise into two categories:

- 1) the current potential of the manufacturer, reflecting its initial state;
- 2) the promising potential of the manufacturer, which the company strives to provide.

In accordance with this division, the logical scheme is transformed as follows (Fig.2). The dotted arrow indicates the formative effect of the customer's needs on the level of the manufacturer's potential.



**Fig. 2.** The logic of eliminating the problem in traditional marketing (modified version). Source: [Compiled by the authors].

The presented logic of interaction can be formalized as follows (3):

$$X_0 < Y_0 \rightarrow X_1 = f(Y_0) \rightarrow X_1 = Y_0 \tag{3}$$

The elimination of the inequality of the current potential to the needs of customers  $X_0 < Y_0$  was solved by influencing the potential of the enterprise, which would ensure its growth and achieve a level sufficient for the production of goods that meet the requirements of the market.

Cognitive and sales marketing. The sales marketing concept, being the earliest, involves the emphasis of marketing management efforts on maximizing the sale of goods and services that have already been produced. Cognitive marketing is aimed at creating additional demand by studying the mechanism of making a purchase decision and influencing it.

These marketing concepts, despite the different mechanisms for achieving results, have one critical feature in their logic – bringing the level of the target audience's needs to the existing level of the producer's potential (Fig.3).

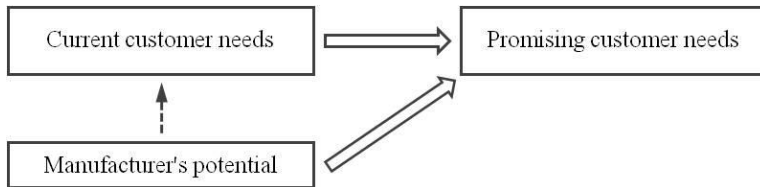


**Fig. 3.** The logic of eliminating the problem in cognitive and sales marketing. Source: [Compiled by the authors].

Within the framework of the mathematical interpretation of model (4), we see that the potential of the manufacturer has remained the same, and only the needs of the customer have been changed, which have changed their state from the current  $Y_0$  to the promising  $Y_1$  (Fig.4).

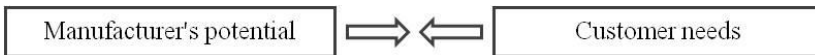
$$X_0 < Y_0 \rightarrow Y_1 = g(X_0) \rightarrow X_0 = Y_1 \tag{4}$$

Modeling the elimination of the problem under study requires inclusion in the logical diagram of the above two states of customer's needs (Fig. 4). The dotted arrow indicates the determining effect on the customer's needs on the part of the manufacturer (seller).



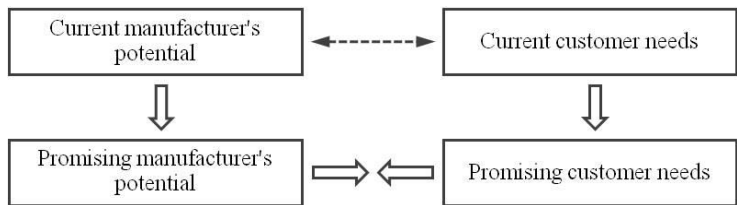
**Fig. 4.** The logic of eliminating the problem in cognitive and sales marketing (modified version). Source: [Compiled by the authors].

Interaction (co-creation) marketing relies on the joint cooperation of the producer and the consumer in the issue of creating a product that best meets social (market) needs. In accordance with this postulate, the level of the manufacturer's potential and the level of the customer's needs will be in oncoming traffic (Fig. 5).



**Fig. 5.** The logic of eliminating the problem in interaction marketing. Source: [Compiled by the authors].

There are four elements in the logical model of interaction marketing: the current and promising potentials of the enterprise and, by analogy, the current and promising needs of the customer (Fig. 6). The dotted arrow reflects the mutual impact of the potential of the enterprise and the needs of the customer in the process of forming (determining) their prospective level.



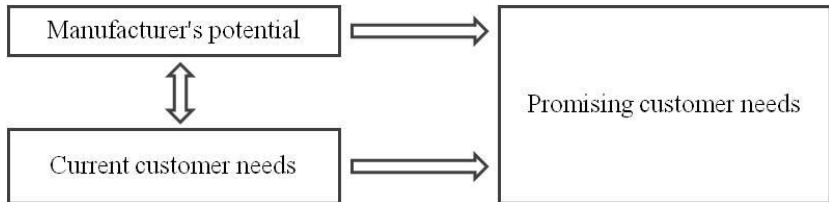
**Fig. 6.** The logic of eliminating the problem in interaction marketing (modified version). Source: [Compiled by the authors].

The formalization of the logical scheme within the framework of interaction marketing can be presented as follows (5).

$$X_0 < Y_0 \rightarrow \begin{matrix} X_1 = f(X_0, Y_0, Z) \\ Y_1 = g(Y_0, X_0, Z) \end{matrix} \rightarrow X_1 = Y_1 \tag{5}$$

Unlike previous models, the influence of external factors  $Z$  becomes decisive, that's why they are included in this mathematical model.

Advanced marketing as a concept was presented by R.R. Tolstyankov and was based on the premise that during the creation of a product or the provision of a service with a long operational period, the needs of the target audience may change [10]. Accordingly, there is a problem that by the time the product enters the market, it will not meet the actual needs of customers. As a solution to the voiced problem, it is proposed, by applying and developing interaction marketing approaches, in the process of creating a product, focusing on market trends, to create a product that fully meets public needs. The logic of solving the problem under study is shown in Fig. 7.



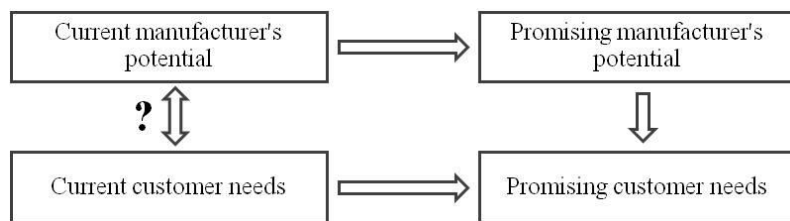
**Fig. 7.** The logic of eliminating the problem in advanced marketing. Source: [Compiled by the authors].

The mathematical model has the following form (6):

$$X_0 < Y_0 \rightarrow \begin{matrix} X_1 = f(X_0, Y_1) \\ Y_1 = g(Y_0, X_1, Z) \end{matrix} \rightarrow X_1 = Y_1 \tag{6}$$

Advanced development marketing is a development of the previous concept. The key difference is the postulate about the need to develop the manufacturer's potential as an attribute of the company's ability to create a competitive product in the future that meets the prospective needs of customers [11]. Moreover, it is necessary to solve this problem before the competitors.

In our case, this marketing concept considers the fundamental need to develop the enterprise's strategic potential and its elements.



**Fig. 8.** The logic of eliminating the problem in advanced development marketing. Source: [Compiled by the authors].

Unlike advance marketing, the interaction between the manufacturer and the potential customer is not a *fait accompli*, that is, it may or may not be present. In Fig. 8, this position is reflected by the sign "?". The same situation arises when creating a new market or market segment [12].

In the mathematical model (7) we see a change relative to the previous approach:

$$X_0 < Y_0 \rightarrow \begin{matrix} X_1 = f(X_0, Y_1) \\ Y_1 = g(Y_0, Z) \end{matrix} \rightarrow X_1 = Y_1 \quad (7)$$

## 4 Conclusion

During a formal study of achieving the main goal of marketing, satisfaction of social needs, five marketing concepts having distinctive features in logical schemes were identified:

- traditional marketing;
- cognitive marketing and sales marketing;
- interaction marketing (co-creation);
- development marketing;
- advanced development marketing.

Depending on the paradigm implemented within each marketing concept, we observe special solutions aimed at eliminating the problem of the impossibility of meeting social needs due to the discrepancy between the manufacturer's potential and the level of customer needs.

The proposed scientific approach is not complete, but its results have prospects for development in subsequent scientific works.

The results obtained can be used to create a marketing management construct in a corporation [13]. The model of achieving the main marketing goal can act as a basic indicator of the mechanism for implementing a particular marketing concept [14].

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