

# Features of Modeling the Market of Software

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**Abstract**— The analysis of models of diffusion of innovations in the software market is carried out. The optimization of the model of diffusion of innovations is realized, the optimal values of the corresponding parameters are found. The influence of significant factors on the dynamics of software distribution on the market is analyzed. The peculiarities of the interaction of manufacturers and users of software in the conditions of existence of the market of illegal (pirate) copies are considered.

**Keywords**— software, market, diffusion of innovations, model, dynamics

## I. INTRODUCTION

Increasing the efficiency of the economy depends on the development of innovative potential and the creation of new competitive products and services to a large extent. Competition in the intellectual property market (first of all, due to the peculiarities of knowledge as a commodity) is significantly different from competition in traditional goods markets. A typical example of the intellectual property market, which demonstrates its distinction from traditional markets, is the software market in the modern economy.

The modern market of software, unlike traditional industry markets, is characterized by its asymmetry: some participants maximize their profits, while others do not. In addition, the well-known competition models in the sectoral markets do not reflect the fundamental differences in knowledge and innovation from other products, therefore, are unsuitable for researching the software market.

The purpose of this work is to determine the optimum conditions and methods for researching the behavior of software market participants.

The active use of diffusion models for marketing innovations began with work [1], where the process of distribution of a new product is proposed to be considered an “epidemic” when people who have not yet become consumers of innovation, “are infected” by actual consumers, and are exposed to external factors, in particular, advertising. There are many works in which competition is investigated through various modifications of the model of diffusion of innovations

[2-4], and the coefficients of the model are considered as functions of prices, advertising costs, etc.

## II. APPROACH TO DETERMINING THE OPTIMUM VALUES OF MODEL PARAMETERS

The diffusion of innovations is considered to be the solution of the Cauchy problem  $N = N(t)$  for the differential equation

$$\frac{dN(t)}{dt} = f(t, N(t)), \quad (1)$$

with the initial condition  $N(0) = N_0$ . Here  $t$  is the time;  $N(t)$  is the amount of innovation spread by  $t$  (which is usually determined by the number of copies sold or the number of active consumers of the innovative product);  $f(t, N(t))$  is a function that determines the shape of the diffusion curve and reflects certain assumptions about the nature of the process of disseminating innovation. It is usually assumed that the function  $N(t)$  is continuous and differentiable for all non-negative  $t$ , and the function  $f(t, N(t))$  is unimodal.

The right side of equation (1) takes into account the extent of external and internal influences on the rate of adaptation and, consequently, the speed of the spread of innovation. External influences on the speed of adaptation are determined by the need of individuals in innovations and the level of marketing and advertising communications. Internal influences are caused by communications between current users of innovations and potential consumers, as a result of which information about an innovative product is passed on to potential consumers.

Based on known statistical data on the dynamics of software distribution, in particular server operating systems, optimization of the solution of equation (1) was performed in this paper. The optimal values of the parameters of the model are found, according to which the calculated market distribution is in good agreement with the actual data (Fig. 1,2).

