

Features of Modeling the Market of Software

<https://doi.org/10.31713/MCIT.2019.02>

Ivan Karpovych

Department of Computer Science
National University of Water and Environmental Engineering
Rivne, Ukraine
karpivan@ukr.net

Olena Hladka

Department of Computer Science
National University of Water and Environmental Engineering
Rivne, Ukraine
o.m.hladka@nuwm.edu.ua

Maxim Ustymchik

2nd year student
National University of Water and Environmental Engineering
Rivne, Ukraine

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).

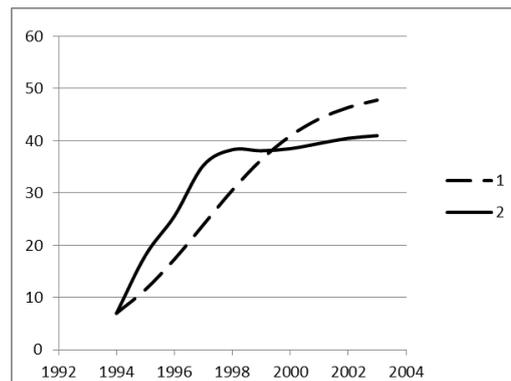


Figure 1. Dynamics of the market share (%) of the operating system Windows in the world for 1994-2003:
1 - calculations based on the model (1); 2 - data from the IDC portal [5]

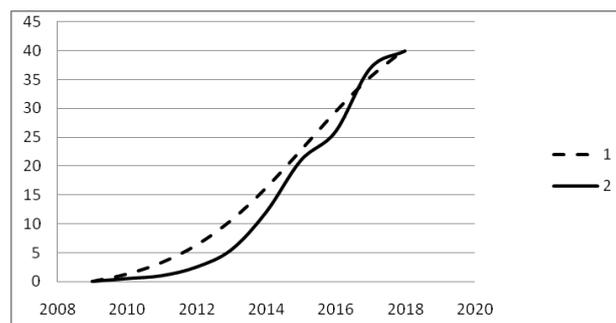


Figure 2. Dynamics of the market share (%) of the operating system Android in the world for 2009-2018:
1 - calculations based on the model (1); 2 - data of the service StatCounter [6]

A detailed study of the problem of illegal distribution of software products, in particular, the reasons for the illegal use of software, the model of demand and supply in the software market is considered, taking into account the offers of legal and pirate [7] copies, constructed models of behavior and interaction of software market agents.

CONCLUSIONS

Thus, the market of software, which is significantly different from the traditional markets, requires a more detailed analysis using economic and mathematical modeling. The dynamics of development, the cooperation and competition of suppliers of commercial and non-commercial software is in close contact with the performance of hardware manufacturers.

The models and methodological approaches considered in the work can be used not only for research of the software market, but also for research of other markets of innovative products and intangible assets, which differ significantly from traditional markets.

REFERENCES

- [1] F. Bass, "A new product growth for model consumer durables", *Management Science*, 1969, Vol. 15, No.3, pp. 215–227.
- [2] V. Mahajan, R. Peterson, "Models for Innovation Diffusion", Beverly Hills, USA: Sage, 1985, 88 p.
- [3] V. Mahajan, E. Muller, F. Bass, "New product diffusion models in marketing: A review and directions for future research", *Journal of Marketing*, 1990, Vol. 54, No. 1, pp. 1–26.
- [4] A. N. Kozyrev, "The Use of Real Options in Innovation Projects": A Report at the General Meeting of the Branch of Social Sciences of the Russian Academy of Sciences: 2.03.2005 [in Russ] URL: <http://kozyrev.labrate.ru/doklad-02-03-2005.pdf>
- [5] Portal of International Data Corporation (IDC). URL: <http://www.idc.com/>
- [6] "Total rating of operating systems" (market shares of different OS in the world according to StatCounter service). URL: <http://gs.statcounter.com>
- [7] P. T. Devanbu, S. Stubblebine, "Software engineering for security: A roadmap", Proceedings of the Conference on The Future of Software Engineering: International Conference on Software Engineering: Limerick, Ireland, June 04-11, 2000, Piscataway, USA: IEEE, 2000, pp. 3–22.