

INFORMATION GAINING FOR UKRAINIAN SOFTWARE MARKET DEVELOPMENT STRATEGY FORMING

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ABSTRACT

One of the information society components is a perfect software market. Market strategy forming is available under conditions, when priorities of state policy and other market subjects' behavior are defined. Changes of demand dependent on value of influenced factors are accepted as the market development main characteristic. The investigation of determinants model is accomplished with Neural Network modeling technology. The scaled factors are inputs of neural net, the change of demand increase is output of neural model. On the neural net are made experiments in case of realization on Ukrainian software market the known in the world scenarios: "National", "Indian", "Scandinavian". Restriction of underground level is a condition and source of software market development in Ukraine. One of the possible tools for reduction of unlicensed software using can be software using accounting.

Keywords: software, copyright, market, demand, model, neural network, scaling, scenarios, governing.

1 INTRODUCTION

Spreading of the Information Technologies in Ukraine, in particular software market development, determines actuality of task of this market development ways analysis. This problem is examined in works of Ukrainian and foreign researchers (Gengler, 2003; Bagchi, Putnam&Tang, 2004; Chernikov, 2004 etc.) [1-7, 9], but the used software market development models are descriptive and does not includes all features of market.

The construction of classic economic-mathematical model of this market is problematic. At the same time for development of adequate public policy in this important sphere according to the conditions of the market it is important to have the instrument for tracing the influence of different factors on demand at the market. The possible approaches to the decision of this task are models based on the fuzzy sets theory, fuzzy nets models and probabilistic Bayesian networks. However, the most developed for today is the theory of neural networks, which provides the construction of high quality model in the case of linear and nonlinear processes and allows to include in the model qualitative factors. That is why neural networks are used in this work.

2 THE FEATURES OF UKRAINIAN SOFTWARE MARKET

The main characteristic of the market development are changes of demand, which are influenced by determinants (McConnell, Brue, 1995).

For the analysis of market development it is necessary to formalize and estimate influence of these factors on the market condition. Usually such estimation is conducted by facilities of multivariable cross-correlation analysis, but the use of this methodology requires a probabilistic nature of influence factors on market development and statistical information in the proper volume for analyze the interdependence of factors.

The Ukrainian software market 2007-2008 has the following features:

- the market in Ukraine is saturated by software less than 20%, 80% make «piratic» products;
- at the Ukrainian software market is present the phenomenon of computer underground;
- the relevant statistical data does not allow to make a quantitative estimate of factors influence on the market.

So for determination of market condition it is possible to use qualitative descriptions (verbal descriptions) of determinants.

Based on this features there are defined such Ukrainian software market determinants: competition, clusterization, cooperation, underground, personnel qualification, technologies, financial infrastructure, research and development,

legislation, state priorities and programs, investment conditions, international certification, international corporations on the market, influence of diaspora, trust to developers, governing on the market.

Based on this factors a Ukrainian Software Market Development Determinants Descriptive Model was formulated.

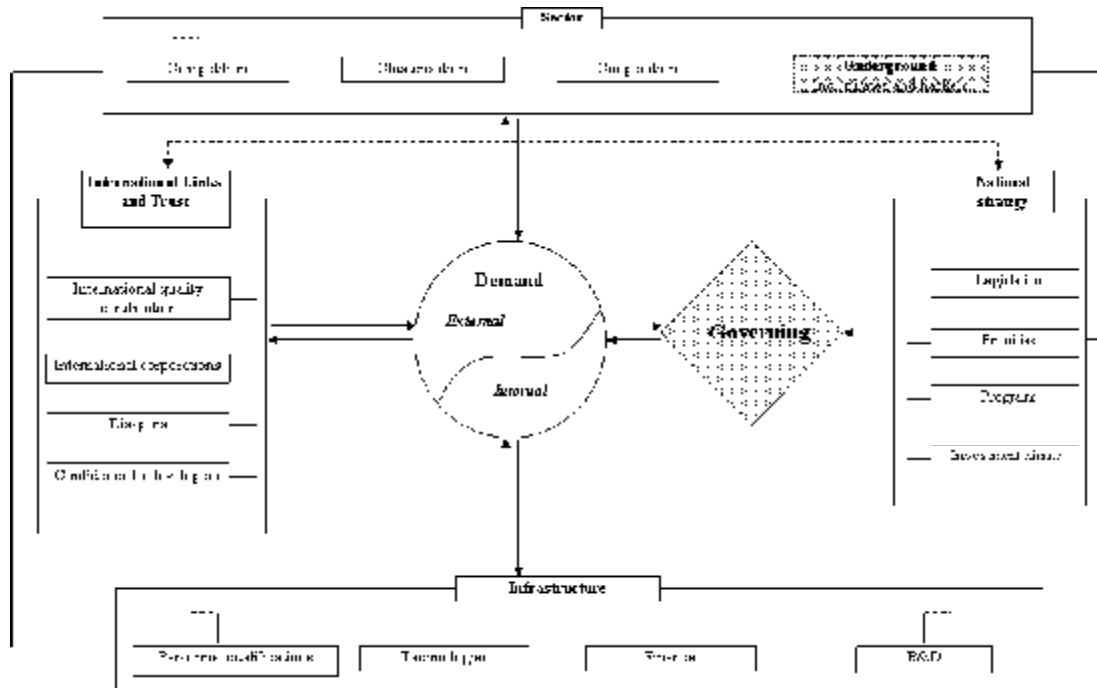


Figure 1. Ukrainian Software Market Development Determinants Descriptive Model

3 MODELLING AS A WAY TO INTEGRATION OF QUALITATIVE INFORMATION ABOUT THE MARKET

A basic problem at the construction of computer model is in transformation of qualitative descriptions of factors consideration their weight and interconnection. For this purpose to the factors are applied the scaling methods (Malhotra, 2002). The categories of every scale of factors of influencing can have verbal, numeral and graphic descriptions. To scale the determinants of Ukrainian Software Market Development Determinants Descriptive Model it is build a semantic differential scale for every determinant.

For the construction of computer model it is applied the neural networks theory. Exactly in neural networks weight and durability of transneuronal connections is determining, that answers the purpose of market determinants description.

The training case is the row of input factors values, which is compared output factor value. The amount of such cases depends on the amount of input factors and determines exactness of results.

The package of STATISTICA Networks Neural divides cases into three groups:
 learning - for training of neural network;
 verification - for determination of results exactness;
 test - for model verification.

The number of determinants causes a problem of training cases building for a neural network model of software market.

For the decision of this task the arguments group account method approach was taken. The set of input factors is $F = \{F_i\}$, $i = \overline{1,18}$, each of factors takes on a value from a scale $F_i = \{f_j^i\}$, $j \in J_i$, $J = \bigcup_i J_i$, $i = \overline{1,18}$, where J_i is a set of scale values of factor i .

Then the learning cases TR are built as follows:

$$TR = OY^T YV,$$

$$\text{where } O = \prod_{n=1}^n \prod_{i=k}^i f_j^i, k = \overline{1,n}, n = \overline{1,18}, j \in J_k, T = \prod_{i=1}^{18} f_j^i, j \in J_i, V = \prod_{i=1}^{18} f_j^i, j \in J_i.$$

Applied approach allowed to build a neural network MLP 18-16:16-1 (multi-layered perceptron) in the trial-version of Statistika Neural Networks (554 training cases, error 0.003022) and to conduct on it the experiments in relation to the analysis «National», «Indian», «Scandinavian» scenarios of Ukrainian software market development.

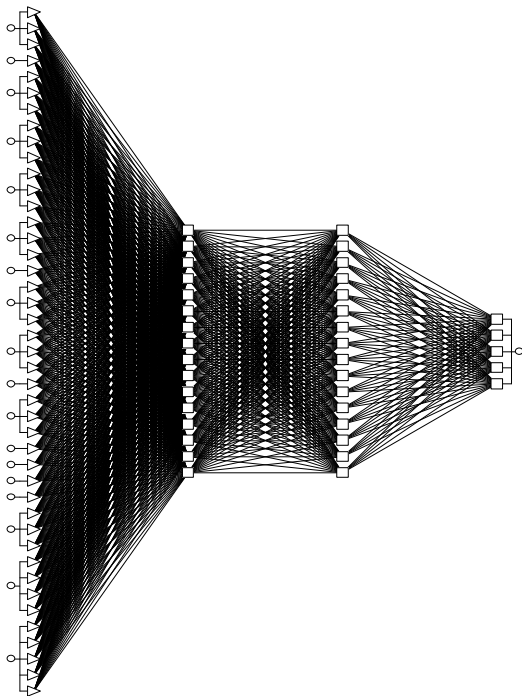


Figure 2. Neural network MLP 18-16:16-1

4 SCENARIOS OF UKRAINIAN SOFTWARE MARKET DEVELOPMENT

To realize the tasks which stand before the economy of Ukraine in connection with distribution of the IT use it is important to determine on a state level the strategy of IT market development, in particular, software market development. A few ways of this market development are already realized in the world.

For today for forming and market development of Ukraine software it is possible to choose one of three ways, or models of development. De bene esse they can be named "National", "Indian" and "Scandinavian" models.

The purport of «National» model is on sale of goods and services at the internal market. A model structure includes computer commerce, software business, oriented to the Ukrainian clients, and Internet companies in the segment of new media and e-commerce in the UA-area. On this way the Ukrainian companies have a few large advantages before international competitors. First and exactly the main is awareness of local features. The next advantage is wide participation of specialists from Ukraine in development of IT-services in the world. However a national model

has a natural border. It is a level of national economic development. For a separate branch it is impossible to exceed this level.

The purport of the "Indian" model is the development of the contract programming. If the software product that is booked to company from the USA or Europe, requires especially nothing, except of plenty of laborious work, the company tries to pass this order to local developers. This way build their business offshore programmers in India, Taiwan, Singapore, Malaysia, Ireland and Brazil. But it is impossible to forget that in the conditions of Ukraine exist also a few basic problems with this model realization. First is necessity constantly to generate the order, success of a company depends on work with its client service and contacts all over the world. Besides, the programmers commands need a basic confirmation of quality of their work and should be certificated for example according to ISO 9000, CMM, COBIT etc. Comparative with developers from India or Brazil staff in Ukraine is now more expensive and it is difficult to compete with them in contract programming.

"Scandinavian" model shows itself the export of the developed products and decisions to the international market. To this model belong Israel, Finland, Sweden, Iceland, Norway, Scotland etc. The model means a market infrastructure building and allows to apply national intellectual potential the most effectively.

To compare the known in the world ways of software market development the experiments were conducted on the above described neural network model. The experiments defined dependence of demand on the governing (paternalistic, regulative, neutral, impedimental), and also the values of demand in the case of realization at the Ukrainian software market of the scenarios of development known in a world: «National», «Indian», «Scandinavian».

At a «National» scenario demand will extensively slowly grow at the Ukrainian software market. The «Indian» scenario will provide extensive quick growth. A «Scandinavian» scenario which shows intensive quick growth of market is the most favourable. The proper activation of neural network model is presented on Figure 3.

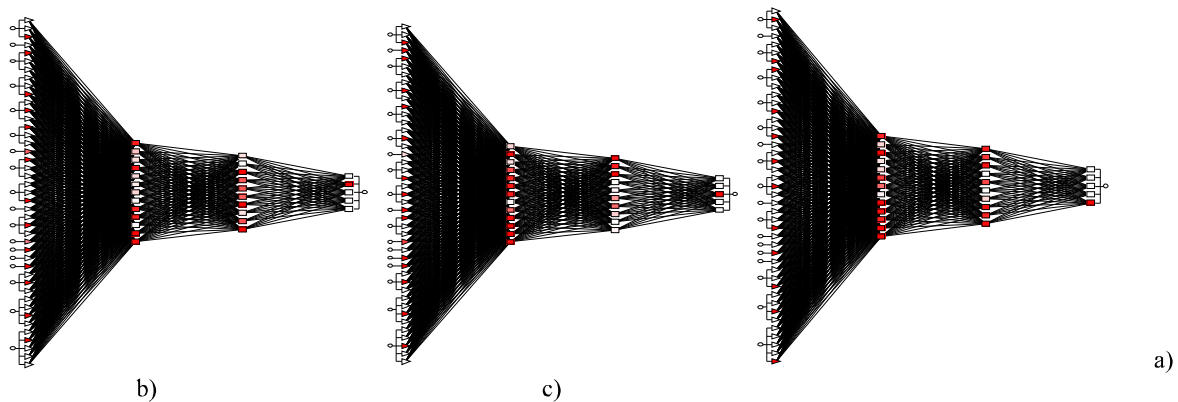


Figure 3. a) «National» Scenario, b) «Indian» Scenario, c) «Scandinavian» Scenario

Substantial differences between scenarios consist in determination of priorities, presence and stage of implementation of the government programs and investment climate. Priorities determine importance and place of industry for the state. The government programs are the instrument of realization of priorities. By the index of investment climate the credits ratings of Ukraine were select at the international financial markets.

Obviously, if market subjects can not influence directly on an investment climate market, other components of state strategy are in some sense consequences of subjects strategy on the market.

The results of the experiments shows that intensive quickly growth of demand was observed during realization of «Scandinavian» scenario, which corresponds with certain and realized priorities, the completed programs, indifferent legislative and favourable investment climate.

5 TOOLS FOR SUBJECTS' STRATEGY FORMING

Based on the results of experiments of neural network model it is possible to determine the governing vector for the Ukrainian software market, namely:

- development of market infrastructure (for example, access to the Internet);
- organization of assistance to bringing in foreign investments through the funds of the common investing;
- diminishing of the of unlicensed software using level, including improvement of normative acts in relation to registration of copyrights on the computer programs.

For enterprises the IT-budget is the way of realization of their strategy on the software market. The information basis for preparation IT budget includes:

- statistical accounting;
- fiscal accounting;
- financial accounting;
- «*outboard*» accounting;
- orders and policies of the IT-technologies using.

The necessity «*outboard*» accounting is based on impossibility to consider all features of software use within the financial accounting.

For example «*outboard*» accounting can be organized as database of all used on the enterprise software including the information about developer, reseller, license conditions and operation conditions. «*Outboard*» accounting can be used for the decision of the following tasks:

- planning of IT-budget on an enterprise in part of software;
- accounting of the licensed and unlicensed software using;
- cash flow control according software buying and support as intangible assets.

6 CONCLUSION

Since 2004 government in Ukraine doesn't collect any statistics about software use of Ukrainian enterprises. Under this conditions forming of market subjects' strategies is available based on analyze of neural network model of qualitative factors values, that have an influence on market development, namely competition, clusterization, cooperation, underground, personnel qualification, technologies, financial infrastructure, research and development, legislation, state priorities and programs, investment conditions, international certification, international corporations on the market, influence of diaspora, trust to developers, governing on the market. Changes of demand dependent on value of determinants are accepted as the market development main characteristic.

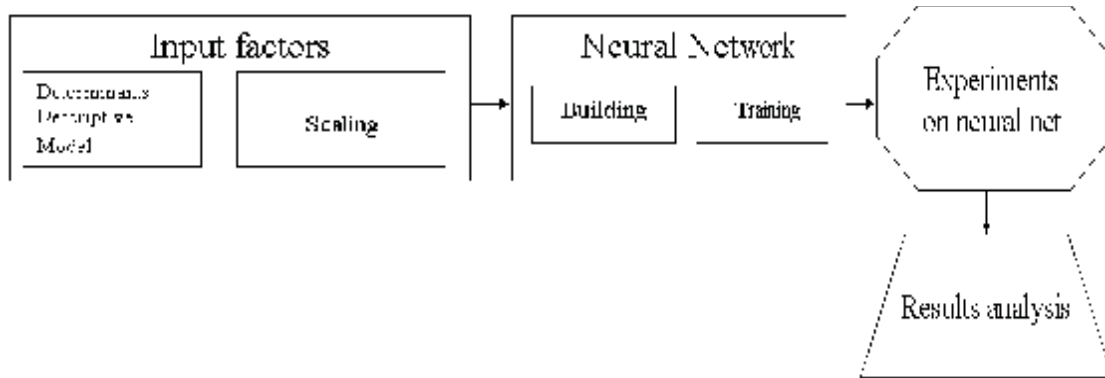
The investigation of Ukrainian Software Market Development Determinants Descriptive Model is accomplished with Neural Network modeling technology. The scaled factors are inputs of neural net, developed by means of Statistika Neural Networks package, the change of demand increase is output of neural model. In view of a great deal of input factors is appeared a problem of training cases building. As decision of this problem is proposed an approach, that allow to build a multilayer perceptron with error 0.003022 on 554 training cases.

On the neural net MLP 18-16:16-1 (multilayer perceptron) are made experiments in case of realization on Ukrainian software market the known in the world scenarios: "National", "Indian", "Scandinavian". For the experiment these scenarios were described with Ukrainian Software Market Development Determinants Descriptive Model factors according to value of each factor for each scenario. According to modeling results intensive fast growth of software market conform to realization in Ukraine the "Scandinavian" scenario. Based on the results of experiments it is possible to determine the governing vector for the Ukrainian software market.

The proposed "outboard" accounting can be used for monitoring of software products using by Ukrainian enterprises, that allows to reduce the risk of responsibility for using of unlicensed software.

The proposed in the work Ukrainian Software Market Development Determinants Descriptive Model will allow to consider tendencies of forming and segmentation of the market and increasable influence of foreign developers and consumers on Ukrainian software market development 2007-2008 and to analyze possible scenarios of its development according to changes of subjects' behavior on all segments of the market.

Under conditions the deficiency of quantitative data about the Ukrainian Software market and presence on the market difficult formalized features (for example, high level of underground) the information gaining can be made according to next scheme:



The results analysis are the part of information about the possible conditions on the market. It can be also included in tools for forming strategy of market subjects, namely state policies on the market, IT-budget for enterprises, tools for software copyright control etc.

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