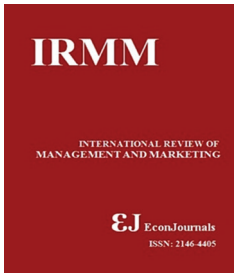

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Modeling of Network Mechanisms of Management in the Conditions of Organizational Development

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ABSTRACT

In this article, the organization is considered as open system, which due to virtualization of economy has an expansion of information and economic space. The information technologies applied in management of the enterprise allow to transform its organizational structure to a network form. Therefore, the organization gains new qualities not comparable to its previous traditional form of existence: Management of the organization improve, there is a flexible reconfiguration of all resources of the company, its flexibility and adaptability to external and internal problems increases, competitiveness increases. The set of components of the virtual organization and features of its management has been analysed. Authors have developed the priorities valuation technique for the management decision on choosing the business model for the organization on the networking electronic market.

Keywords: Competitiveness, Meta-Market, Business Model
JEL Classifications: M21, O10

1. INTRODUCTION

The success of the organization depends in a decisive way on external forces acting in a global external environment. In today's difficult world for effective implementation of administrative functions, it is necessary to understand action of these external variables.

Today's changes in the outside world force you to pay greater attention to the environment. The organization as open system depends on the outside world concerning deliveries of resources, energy, stuff, and consumers. As the survival of the organization depends on the management, the manager is obliged to be able to reveal essential factors in an environment, which will affect its organization.

Prompt development of telecommunication means and obviously overlooked tendencies of involvement of all management forms by enterprises economic activity of in the conditions of a common information space force to consider more fixedly the features of the networking management form, inherent in activity of any enterprise. With transferring the economic activity into the internet, information communications become the direct economic connections providing the information movement, financial means and goods on uniform communication channels.

2. MAIN PART

The analysis of a market situation has shown (Yefimov and Fomenko, 2009) that the network management form for the enterprise is the come-true fact. Consequently, it is the problem of research of the management forms by the organization at integrating the business into the network electronic environment becomes a pressing problem for the economic relations subjects. This is because the use of modern information and communication systems and technologies in management of the organizations creates a number of additional benefits in competitive fight, reduces transaction expenses, increases labor productivity and provides improvement of structure of management of the enterprises (Pavlov, 2005; Parinov, 2000; Parinov, 2000).

Thus, in the conditions of network business the enterprise has an expansion of its information and economic space (Woodpeckers, 2000; Fomenko and Yefimov, 2007; Fomenko and Yefimov, 2009). The first step on this way is forming the corporate information environments. Created (as a result of embedding of information technologies in organization management) company's own and corporate information networks historically are predecessors of the global network environment. Use of information technologies will transform organizational structure of business management in the network that gives it new quality not comparable to its previous traditional form of existence. The main prize from it consists in improvement of management and as a result – the improvement of all organization resources use, in increase of its flexibility and adaptability to external and internal problems, in improvement of the made decisions quality that in turn will lead to the competitiveness increase (Kostyaev, 2002; Fomenko and Yefimov, 2009).

Features of network business mean that in case of the enterprise's unpreparedness to enter fully into the corporate environment, there is a possibility of creation of the virtual corporations united only in the internet meta-markets. Thus, the enterprise can be the participant of one actual and several virtual corporate associations, forming own information economic space.

In the virtual organizations requirements to the material and intangible assets received for ensuring production from outside change; also – to the used technologies, which have to be on-line; there is a need for network infrastructure. We will notice that any organization is dual in character since it consists of a set of both physical and virtual components. It is possible to carry traditional production factors to physical components: Work (staff of the company), territory (land), capital (buildings, equipment, and share capital). Virtual components are presented by intangible assets of the enterprise: Culture of the organization, brands, reputation of the organization, and knowledge of the employees.

Therefore, managers of the enterprises of any type have to develop the "creative" organizational form consisting of the listed set of components, which is coordinated with the purposes of the enterprise and ability of their achievement. In addition, each organization needs to define independently its own, suitable only for it, set of virtual and actual components (Karepova et al., 2015).

We will analyze a set of components of the virtual organization and their management features (Table 1). This set is not final and all-including, and can be expanded when carrying out further researches in the field of new organizational forms management.

We will examine the analyzed components in more detail:

A. Virtual coordination, unlike usual one, demands investments into technology and trainings. Employees have to be familiar with systems of virtual coordination, be able to operate the information technologies independently. The main advantages of virtual coordination may include reducing the time, costs for coordination, and increase the efficiency of the company. However, the man is a "social being," and with a decrease in personal contacts with colleagues working on a project there may be social problems: Deteriorating attitude to partners and customers. Therefore, to improve the functioning of the team members is necessary for them to establish personal contacts at least from time to time. This will help increase the level of trust in each other and develop a spirit of team.

Table 1: Features of the virtual organizations components management (developed by authors)

Organization component	Management in the virtual organization
Activity coordination	In an every spot on the globe if there is an Internet connection; creation and maintaining of the atmosphere of trust in team, network control
Activity	The distributed production type, self-management, information and logistic nature of cooperation, the increasing role of the customer in the course of production
Innovations	Management of an innovative business model within an innovative stream of the enterprise
Motivation	Self-motivation of workers, motivation work
The relations in organizational networks	Are based on a series of agreements and mutual possession of property

B. Virtual way of integration into the business space corresponds to the distribution type of production, governance, information and logistical cooperation, the increasing role of the customer in the process of creation and production-needed products. These key success factors of virtual organizations contribute to the efficient production organization. The innovative business model originally founded a new type of manufacturing process, which allows the customer to become a co-producer of the products. Working in tandem with the consumer, virtual network creates a unique, personalized product that is "paid for" and "bought" even before its creation. Using the core competencies of partner companies one can keep technological superiority in competition with other companies in the market. The loss of competence by any virtual organization member leads to automatic replacing him or her with another market player with all the necessary qualities to fulfill the order.

C. The innovative business model of the innovation organizational form is closely linked to the flow, which is a set of innovative projects, within which innovations are being made at various stages of the life cycle. As part of the innovation flow from the totality of partner a company belonging to the virtual network there forms the innovation chain. Moreover, a specific type of virtual enterprise can be a member of several chains. Currently, there is no need to focus innovation in one place any longer, only greater corporations can afford that now. The team working on the project can be effectively completed even by the geographically distant members, carrying out the work in the office and at home. However, the virtual work restrictions may apply (paragraph – A).

D. The use of a single external stimulus organizational environment cannot maintain a constant interest in the work, so the content of the work to a virtual personnel must be designed in such a way that it would cause the employee the direct interest and sense of responsibility.

This can be achieved if the work is:

- Completed - the employee must submit the finished result;
- Diverse - an employee in its operation must use different types of knowledge and skills; important both for the worker and for other people;
- Autonomous - should ensure freedom of action in its implementation;
- Has feedback - the work should provide the employee complete and accessible information on its implementation.

E. Networking with suppliers and customers makes it possible to implement the "virtual supply chains," which allows you to:

- To reduce transaction expenses of agents of a network;
- To increase effective management of business processes of the organizations of virtual type;
- To carry out if necessary a reconfiguration of agents in the virtual project for the fullest satisfaction of clients;
- To raise information feedback between members of a chain.

The set of systems for creation and management of a virtual network of suppliers and customers will depend on four factors: Character of the supplier, needs of the customer, essence of the made production or the rendered service, opportunities and competences of the virtual organization.

Therefore, any virtual organization consists of a set of the physical and virtual elements supplementing each other. For this organizational form there is no problem of a "or-or" choice. The problem of a choice will consist in search of the best structure of elements allowing gaining the greatest synergetic effect at their connection. Here designing of the mixed system providing the best results in any situation has to become the purpose. Therefore, for creation of the maximum value of the virtual organization elements it is necessary to carry out a constant assessment of the available components and to understand the available requirements and possibilities of their use.

Having united in virtual corporation, the companies and the enterprises can carry out communication with headquarters, the offices, branches located in different regions and with the foreign representations through internet. In this case, internet appears as natural development of local networks of the companies. The hidden benefit from it is that there is no need for the uniform standard for internal networks if they have a lock in internet. The virtual corporation imposes much weaker organizational requirements to participants, but at the same time allows to realize all advantages of uniform IEP to business management: The closed chain of production trade operations, data of various risks to a minimum, ability to resist to monopolies in a network, collective marketing (Berezhnov, 2003; Shpolyanskaya, 2005).

Internet facilitates to the companies development of new forms of functioning and development of manufacturing execution systems that leads to receiving profit by creation of additional value to the existing products and services, and allows developing a basis for production of new products and services.

For the solution of administrative problems of advance of goods and services in the electronic market it is important to know what this market and the audience of the internet network represents, dynamics of its development, a tendency of change of demographic structure actually is. In addition, the most important, at what measure in a network is present target audience.

Today there is a considerable tool kit of modeling on the studied subject (Shtoyer, 1982; Scherbakov See Questions of an Assessment of Economic Efficiency of Application of Internet Technologies, 2005; Skripkin, 2002; Hubayev, 2010), which modeling with use of expert methods, including the technique offered by professor Hubayev (Yefimov and Fomenko, 2007) is among.

In this article the author offers a technique according to priorities at adoption of the administrative decision on a choice of a business model of the enterprise in the network electronic market (approbation carried out on the basis of JSC BKP Energiya), which differs in sharing of expert methods and methods of multi-criteria optimization. The technique is based on the analysis of interaction structure of economic subjects and models of the business organization in the electronic network market and allows:

- To increase quality of the made decisions;
- To receive an integrated assessment of each of the considered models of the organization business – the relations in internet-space;
- To receive reference points for entry of the enterprises into network electronic business.

The author carried out the analysis of business models of integration of the enterprises (Hubayev, 1975), the most significant categories of business models, the companies and organizations in Internet were chosen as a result. All of them in a varying degree promote obtaining additional value, offer the buyer a new product or provide additional information or service along with traditional products or services, and at the prices, much lower, than at traditional approach. These are the following categories: Web site (S_1), portal (S_2), electronic show-window (S_3), electronic catalog (S_4), market concentrator (S_5), electronic shop (S_6), information broker (S_7), operational broker (S_8), aggregator (S_9), integration of business (S_{10}).

Each category is characterized by the parameters, which cannot be estimated precisely before the project begins being realized. Generally, at an assessment of Internet-system consider such indicators as the cost of its creation (development/acquisition) and operation, functional completeness, the interface, level of support and maintenance, scalability, shipping, safety and others.

Considering the large number of criteria for evaluating internet-systems that need to be taken into account when making management decisions to choose the means joining the company in a virtual business environment is offered to a certain set of criteria: Functionality (f_1), costs (f_2), the complexity of the project (f_3), the expected effect (f_4), the amount of lost profits (f_5). Loss of profit is determined as the difference between the expected effects of the project and selected the best for the project. For each of

the above categories we define the values of f_1-f_5 by the expert values (the invited experts were business leaders and university professors holding this subject).

For the most objective group assessment of quality criteria of different e-business categories there has been chosen Delphi method (Trakhtengerts, 2009; Novikov et al., 2015). Under this method, expert survey has been carried out in several stages, during which there has been a number of iterations (experts are informed about the results of the previous stages of the survey and are offered in a number of cases to justify their opinions), which reduced fluctuations in individual responses restricts intra fluctuations (Beshelev and Gurvich, 1980; Novikov et al., 2015).

Opinion poll of nine experts was carried out in three phases (for example, Table 2 shows the results of ranking experts characteristics "The complexity of the project" after the third round of the polls). At each stage of the survey, experts have established the rank of importance for each criterion, and a significant criterion gives a higher rank (Multicriteria Optimization: Mathematical Aspects, 1989; Karepova et al., 2015). To handle these estimates the automation program of peer review "expert" has been used.

For a quantitative analysis of the degree of convergence of views of experts after each round of interviews, agreed to identify groups of experts and assess the feasibility of the completion of examination used Kemeny distance, which numerically characterizes the degree of mismatch between the rankings of experts and is calculated as follows:

$$d_{AB} = \frac{1}{2}\sum_{i=1}^{m}\sum_{j=1}^{m}|a_{ij} - b_{ij}|$$

Where, m – Number of characteristics,
a_{ij} and b_{ij} – Ordering matrix elements in an initial form for experts of A and B respectively.

The mismatch matrix calculated on this formula after the third round is given in the Table 3.

The sum of the i-y elements of a line of a matrix of a mismatch corresponds to the size of a mismatch of i-go of the expert with the others. The sums of all elements of a matrix of a mismatch received after each round of poll were used as a measure of an assessment of speed of convergence of opinions of experts, and as criterion of completion of procedure of poll.

The total value of a mismatch calculated after the first round made 576. After the second and third rounds, size was equal 372 and 352 respectively. It is visible that after the second round the total value of a mismatch decreased, in comparison with the first. After the third decrease is insignificant Therefore, the decision to stop poll procedure is made.

We will construct mismatch matrixes in an initial form for different threshold values. On the received matrix of a mismatch, we will construct interrelation matrixes in an initial form for different threshold values:

$$r_{ij}^0 = \begin{cases} 1, r_{ij} \le e_r, \\ 0, r_{ij} > e_r \end{cases}$$

Where, e_r - Threshold value.
Columns, constructed on an interrelation matrix, it is presented in Figure 1 and shows that we managed to receive enough consensus of experts (Table 4).

By consideration of basic data, it becomes obvious that before us there is a multi-criteria task. At a choice of the decision on several criteria it is necessary to create the vector criterion function of F, which is monotonously depending on criteria of $f_1, f_2, \ldots, f_5$. This procedure is called folding of criteria. We will use the most often used additive convolution of criteria. Thus, the additive criterion can be presented as follows:

$$F = \sum w_i f_i, \text{ для } i = 1, 2, \ldots, 5,$$

Table 2: Results of poll of experts after the third round

	Experts									
Category	***A***	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	**Total**
S_1	1	1	1	1	1	1	1	1	1	9
S_2	3	4	3	3	2	3	3	4	2	27
S_3	2	2	2	2	3	2	2	2	3	20
S_4	4	3	4	4	4	4	4	3	4	34
S_5	5	6	6	5	5	5	6	5	6	49
S_6	9	10	9	9	10	10	10	10	10	87
S_7	6	5	5	6	6	6	5	6	5	50
S_8	7	8	7	7	7	7	7	7	8	65
S_9	8	7	8	8	8	8	8	9	7	71
S_{10}	10	9	10	10	9	9	9	8	9	83

Table 3: Matrix of a mismatch of experts after the third round

Experts	***A***	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	**Total**
A	0	8	2	0	4	2	4	6	8	34
B	8	0	6	8	8	6	4	6	4	50
C	2	6	0	2	6	4	2	8	6	36
D	0	8	2	0	4	2	4	6	8	34
E	4	8	6	4	0	2	4	6	4	38
F	2	6	4	2	2	0	2	4	6	28
G	4	4	2	4	4	2	0	6	4	30
H	6	6	8	6	6	4	6	0	10	52
I	8	4	6	8	4	6	4	10	0	50
Total										352

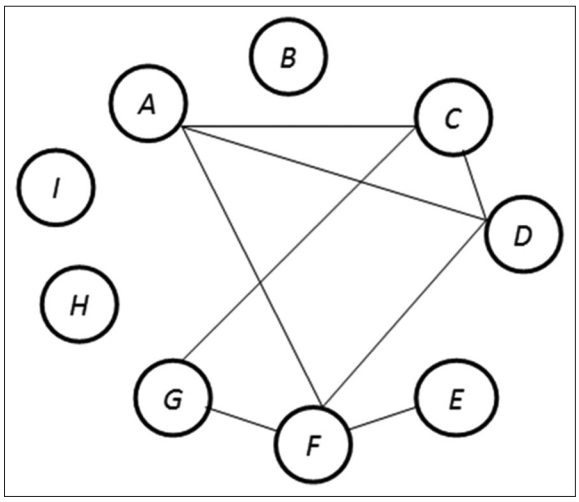
Table 4: Matrix of experts interrelation in an initial form

Experts	***A***	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***
A	1	0	1	1	0	1	0	0	0
B	0	1	0	0	0	0	0	0	0
C	1	0	1	1	0	0	1	0	0
D	1	0	1	1	0	1	0	0	0
E	0	0	0	0	1	1	0	0	0
F	1	0	0	1	1	1	1	0	0
G	0	0	1	0	0	1	1	0	0
H	0	0	0	0	0	0	0	1	0
I	0	0	0	0	0	0	0	0	1

Table 5: The normalized values of criteria

Category	Functionality, f_1'	Expenses, f_2'	Complexity of the project, f_3'	The expected effect, f_4'	The size of the missed benefit,
S_1	0.000	1.000	1.000	0.000	0.000
S_2	0.111	0.959	0.769	0.093	0.093
S_3	0.235	0.797	0.859	0.120	0.120
S_4	0.333	0.716	0.679	0.227	0.227
S_5	0.432	0.568	0.487	0.373	0.373
S_6	0.852	0.081	0.000	1.000	1.000
S_7	0.568	0.419	0.474	0.560	0.560
S_8	0.691	0.338	0.282	0.627	0.627
S_9	0.778	0.189	0.205	0.733	0.733
S_{10}	1.000	0.000	0.051	0.867	0.867
Calculated weights	0.201	0.190	0.200	0.186	0.223
Expert weight	0.300	0.250	0.100	0.200	0.150
Optimum weight	0.300	0.250	0.200	0.125	0.125

Figure 1: Count of interrelation of opinions of experts



Where the sizes w_i are the weight coefficients defining degree of preference (importance) of one criterion in relation to another ($\sum w_i = 1$, for $i = 1, 2,\ldots, 5$).

If the problem is solved on a maximum, local criteria need to be normalized. For criteria, which are maximized (f_1, of f_4), normalization is carried out on a formula: $f_i^{'} = (f_i - f_i^{-})/(f_i^{+} - f_i^{-})$, где f_i^{-} and f_i^{+} – minimum and maximum of each criterion respectively. For criteria, which are minimized (f_2, f_3, f_5), normalization is carried out on a formula: $f_i^{'} = (f_i^{+} - f_i)/(f_i^{+} - f_i^{-})$ [21]. The normalized values of criteria are given in Table 5.

For equivalent criteria for which it is impossible to establish a priority on importance, values of weight coefficients of chosen as identical. For unequal criteria for which it is possible to establish a priority on importance, values of weight coefficients are chosen according to importance of criterion.

We will consider three options of purpose of weight coefficients. The first option – settlement for what the dispersion coefficient is determined by each criterion of $\delta_i = (f_i^{+} - f_i^{-})/f_i^{+}$, which determines the greatest possible deviation by i-mu to private criterion.

Table 6: Results of calculation of criterion function on categories

Category	1 option	2 option	3 option	The categories sorted by decrease		
				1 option	2 option	3 option
S_1	0.390	0.350	0.450	S_6	S_6	S_{10}
S_2	0.390	0.383	0.450	S_{10}	S_{10}	S_6
S_3	0.411	0.398	0.471	S_9	S_9	S_7
S_4	0.415	0.426	0.472	S_7	S_8	S_9
S_5	0.417	0.451	0.462	S_8	S_7	S_8
S_6	0.522	0.626	0.526	S_5	S_5	S_4
S_7	0.477	0.519	0.510	S_4	S_4	S_3
S_8	0.470	0.539	0.505	S_3	S_3	S_5
S_9	0.480	0.558	0.505	S_1	S_2	S_2
S_{10}	0.502	0.608	0.527	S_2	S_1	S_1
Total	4.474	4.858	4.878			

And then the weight coefficient by each criterion from calculation is appointed $w_i = \delta_i/\sum\delta_i$ ($i = 1, 2,\ldots, 5$). The second option – establishment of weight coefficients of criteria in the expert way. The third option – finding of optimum values of weight coefficients. This option alters statement of the main objective of multi-criteria optimization a little.

As well as earlier, the general criterion of optimization F by finding of values of weight coefficients of criteria of w_i at the following restrictions is maximized:
$\sum w_i = 1$, $i = 1, 2,\ldots, 5$;
$0{,}05 \le w_i \le 0{,}3$, для $i = 1, 4$;
$0{,}05 \le w_i \le 0{,}25$ для $i = 2$;
$0{,}05 \le w_i \le 0{,}2$, для $i = 3, 5$;

All options of establishment of weight coefficients are given in the bottom of Table 5 (the last three lines).

Three options (according to options of purpose of weight coefficients) of calculation of optimization criterion for each category are given in Table 6. Their optimum definition (the sum of criteria by the third option more than on the first to two) became the best option of purpose of weight coefficients in this task.

As the first five most effective models of entry of the enterprises into network business it is possible to recognize categories S_6, S_{10}, S_9, S_8 and S_7.

3. CONCLUDING REMARKS

Based on the above we can draw the following conclusions:

1. Today the market - is a virtual exchange of values on the web-site. The modern economy contains a complex network of interacting markets and related exchange processes. The emergence of the network community from the macro level to the micro level puts the company management task adaptation of business processes and technology to the new conditions and the definition of true innovation and investment policies. On the one hand, the new information technologies prove that a market system still contain a lot of reserves, is not demanded even in countries with a long market tradition. On the other hand, they create fundamentally new economic conditions, bringing economic activity (from production to marketing of products) in a new network environment, which acquires properties that are different from the market economy
2. To estimate the cost of entering parameters and producers in the network business the multi-criteria calculation has been made, which allows you to get an integrated assessment of each of the above categories of business - processes. The calculation results are reference points for the entry of manufacturers in electronic business network.

REFERENCES

Berezhnov, G.V. (2003), Development of the Versatile Enterprise in the Competitive Environment: Thesis. Doctors of Economics: 08.00.05. Moscow. p324.

Beshelev, S.D., Gurvich, F.G. (1980), Mathematico-Statistical Methods of Expert Estimates. Moscow: Statistics. p263.

Fomenko, N.M., Yefimov, E.N. (2007), Models of integration of the enterprises into network business. Information systems, economy, management of work and production. Uch. RGEU Notes. Vyp.11. - Rostov-on-Don: RGEU "RINH". p95-107.

Fomenko, N.M., Yefimov, E.N. (2009), Agentny approach at integration of the enterprises in the network environment. Modern Aspects of Economy, 9(146), 131-137.

Fomenko, N.M., Yefimov, E.N. (2009), Sinergiya of business processes in the virtual enterprise. The Bulletin of the Rostov State Economic University "RINH", 1(27), 87-96.

Hubayev, G.N. (1975), Mathematical methods and computer facilities in problems of streamlining of objects and at selection of significant factors. Rostov-on-Don: RINH. p69.

Hubayev, G.N. (2010), Receiving a group expert assessment of values of indicators: Procedure and tools. Questions of the Humanities, 4(48), 82-87.

Karepova, S.G, Karabulatova, I.S., Novikov, V.S., Klemovitsky, S.V., Stratan, D.I., Perova, A.E. (2015), New approaches to the development of methodology of strategic community planning. Mediterranean Journal of Social Sciences, 6(3), 357-365.

Kostyaev, R. (2002), Business on the Internet. SPb.: BHV-St. Petersburg, 2002. p656.

Multicriteria Optimization: Mathematical Aspects. (1989), Otv. P.S. Krasnoshchekov; Academy of Sciences of the USSR, Ying t Probl. Managements. Moscow: Science. p128.

Novikov, V.S., Klochko, E.N., Yarushkina, E.A., Zhukov, B.M., Dianova, V.A. (2015), On peculiarities of the virtual economy of modern Russia: Categories, virtual relationships, educational constructs. Mediterranean Journal of Social Sciences, 6(3), 247-257.

Parinov, S.I. (2000), On-line communities: Methods of research and practical designing, RVLES. Available from: http://www.dissercat.com/content/stanovlenie-informatsionnoi-ekonomiki-v-sovremennykh-usloviyakh.

Parinov, S.I. (2000), On-line communities: Methods of research and practical designing. Avtoref. yew. Dr. Sci.Tech.: 05.13.16. Novosibirsk. p26.

Pavlov, A.S. (2005), The comparative analysis of consumer quality of software products for electronic trading. Avtoref. yew. Cand. Econ. Sci.: 08.00.13 - Rostov-on-Don. p23.

Scherbakov See Questions of an Assessment of Economic Efficiency of Application of Internet Technologies. (2005), The Account and Statistics, 3(7), 199-205.

Shpolyanskaya, I.Y. (2005), Imitating Modeling of Business Processes and Systems: Scientific and Practical Grant. Rostov, N/D.: RGEU "RINH". p224.

Shtoyer, R. (1982), Multicriteria Optimization: Theory, Calculations, Appendices. Moscow: Science. p14-29, 146-258.

Skripkin, K.G. (2002), Economic Efficiency of Information Systems. Moscow: "DMK Press". p256.

Trakhtengerts, E.A. (2009), Computer Methods of Implementation of Economic and Information Administrative Decisions. Moscow: Синтег. p172.

Woodpeckers, S.A. (2000), Principles of information society. Information Society, 2, 77-85.

Yefimov, E.N., Fomenko, N.M. (2007), Analysis of ways of integration of the enterprises into network business. Economic Messenger Rostovskogo State. Un-that. T. 5. No. 3 Part 2. p128-133.

Yefimov, E.N., Fomenko, N.M. (2009), Tendencies of development of the network electronic environment. Control System and Information Technologies, 2.1(36), 122-126.