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47 Nakhimovsky prospect, 117418, Moscow, Russia

Phone (7) (495) 129 07 44

Fax (7) (495) 129 14 00

E-mail: albert@artsoc.ru

Web: www.artsoc.ru

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Scientific articles

Can a machine create new knowledge?

© *T.M.Gataullin (Moscow)*

Economy, based on manual labor and agriculture, was replaced by industrial economy, based on the use of natural resources, almost in all countries. International tendency demonstrates that the latter is recently being replaced by post-industrial economy which is supported by knowledge, an intellectual resource. Post-industrial society economy is specifically called knowledge economy. This deals with the fact that in the framework of knowledge economy the latter become the fundamental economic resource.

One of the authors of the US constitution, the third US president Thomas Jefferson once noted that one who accepted an idea from him, used it without making him poor, in the way one who received light from his lamp did not put him into darkness. This deep idea became the basis for a new science — «knowledge economy». The first systematic research in this area was directed in 1960s by Vienna University Prof. Fritz Machlup ([1]).

The very term «knowledge» is one of the most important terms in knowledge economy. Knowledge economy poses a number of new interesting questions, which require at least partial answers.

May the consequence contain more knowledge than the premise? May knowledge be increased with the help of only mental deduction? Can new knowledge emerge as a result of an algorithm-machine work? Patent bureaus are particularly aimed at detailed filtering all constructions that do not contain an essentially new feature. Indeed, it has always been believed that only discoveries contain new knowledge! In court, only facts and not logical deductions are important (it is facts that bring about new knowledge which does not follow from deductions!) On the other hand, if we teach a computer to calculate any decimal digit of π only by digit's number (previously it was considered impossible and became feasible only

recently) and computer calculates, say, 1 000 000 000th digit – will it be a piece of new knowledge or not? There is Shore theorem on existence of quantum calculations algorithm allowing (with creation of corresponding quantum computers) prime factorization of a 1000 digit natural number. As most fast modern computers are capable of doing it in billions of billions hours, does this theorem contain new knowledge? If not, why intelligence services are ready to assign billions of dollars to such research? (An answer may be: Because they accumulated large non-deciphered data arrays which can be deciphered on the basis of Shore theorem!) If logical deductions are not capable of increasing the volume of knowledge, then how does the whole modern mathematics with its theorems logically obtained from only about 10 Zermelo-Frenkel axioms, contains more knowledge than is accumulated in these axioms? The whole mathematics, which Burbaki failed to describe due to its permanent growth, all this huge field of science contains not more knowledge than there is in those 10 axioms? However, when we come to think of it, there is nothing astonishing – mathematicians themselves agreed to deduct theorems only from axioms! So how can new knowledge, not present in axioms, emerge?

However, at this point we face a new important issue. To formulate it, it is necessary to remember that the process of obtaining new knowledge, e.g. search for proof of mathematical theorems, is often difficult, tangled, and time consuming. Is this reflected in the volume of the knowledge accumulated in this way? In other words, is it true that the harder the proof of the theorem, the more knowledge it contains?

Let us give an answer to both of the questions. The solution is the necessity to regard the way of obtaining knowledge, i.e. to study obtaining knowledge in time or as a process of obtaining knowledge from previously obtained knowledge. Then the more theorems are deducted from axioms, the more knowledge they contain. Potentially, this knowledge may be infinitely large. However, the very potentiality

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must be rejected here. We can remember the institutionally spirited saying of Weil on natural series: "The series of numbers, growing without interruption at any stage, is a variety of possibilities open up to infinity. It infinitely remains at the stage of formation, and is not a kingdom of things existing in themselves" (back translation according to [2, P.234].

It may be considered that in the sense of deductions from Zermelo-Frenkel axioms the whole mathematics is even better illustrated by the above Weil saying than natural series.

2. Brief description of formal systems

Knowledge consists of systems of knowledge in different fields. In axiomatic approach the field is described by a system of terms, a system of axioms and deduction rules. A new true statement is obtained from a number of true statements with the help of these rules.

The system of knowledge in a certain field of science is a dynamic (i.e. changing in time) system of terms, and statements on the properties of these terms. A system of statements is a set of axioms, theorems and corollaries. Axioms are considered true, although occasionally may change with time. Corollaries are obtained by logical deductions from previous corollaries, axioms and theorems. Axiom is always a discovery; in general, a discovery is a statement which logically does not follow from existing knowledge. If deducing a corollary from existing knowledge is complicated or long, then this statement is called theorem.

Each axiom and each discovery contains new knowledge or just knowledge. There is no more knowledge in corollary than in the premises, from which it is conducted. The more corollaries are conducted from the statement, the more knowledge the statement contains.

A formal system is set by a system of axioms and deduction rules, which enable obtaining «true» statements from other «true» statements. (Of course, in more strict definition of a formal system it is necessary to define the symbols to be used, the rules for term and statement construction etc., but scrupulous following these rules would make us digress from the subject). A classic example is Euclid geometry with five existing axioms and usual rules of logical deduction, of which the most famous and most widely used by mathematicians is MP (Modus Ponenc) A, A->B)/B, i.e. if implication A -> B is already proved, and if A is proved then B is included in proved statements. In fact this is the only deduction rule, used by mathematicians in their practical work.

In setting a formal system researchers aim at non-redundant system of axioms, i.e. so that none of the axioms was a corollary from the others (as in this case it is redundant and may be excluded). Sometimes it is very difficult to determine. For example, in required almost 60 years to understand whether choice axiom was independent from other axioms of set theory. (The answer is negative: choice axioms does not depend on other set theory axioms, Gödel, 1939; Коэн, 1964 and [3]). Further, a system is called complete if any «correctly constructed» statement can be either proved (i.e. proved on the basis of axioms) or rejected. The latter means that denial of the statement can be proved. Complete systems are rare and poor, i.e. describe very simple fields of science.

Gödel's theorem (1938) states that if a formal system is rather rich (in particular, includes arithmetic), and a system of axioms is not very big, e.g. finite, than the system is incomplete. In other words, there exist (arithmetic) statement that cannot be either proved or denied.

For the purposes of this paper the theorem states that no rather rich finite system of axioms contains the whole knowledge: there will be a statement which does not logically follow from axioms and therefore, contains essentially new knowledge.

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Formal systems, however, are studies not only for their sake. Formal system usually develops from axiomatics of a certain field. Then, if a certain statement can be proved in this given formal system, then it means that this statement contains something new about the field.

3. Quantitative estimations of knowledge in a formal system

Statements have no sense in a formal system, we are interested only in one fact: whether the statements are provable and if they are, what is the proof (is it long, which axioms and deduction rules it uses). Proof is a chain of formulas and statements, which starts from an axiom. Each consequent formula is either axiom or a formula which was obtained from the others in this chain according to deduction rules. Proof is the proof of the last formula in the chain.

Let us examine a formal system. For each proved statement A we will keep its proof $d(A)$. Suppose that each statement is assigned a certain positive number $k(A)$- the amount of knowledge it contains. We will consider the length of proof to be the number of statements in it with exclusion of the last one.

Suppose now that we obtained a new proof $A_1, A_2, ...A_n, E$. In other words, previously it was not known that E was provable. Let $D(E) = \{A, ..., A_n\}, k(E) = n$, and let us increase the amount of knowledge in each statement $A_i, i = 1, ..., n$ by one. So $k(A_i) = k(A_i) + 1$. Now we should provide integrity of the system for knowledge assessment. For each $A_i, i = 1, ..., n$ we take the fixed $d(A_i)$, with its length λ, and increase the amount of knowledge in each statement of this proof by $1/\lambda$. If with time another proof of the statement E is discovered (e.g. a shorter proof), this may lead to overestimation $k(E)$ and memorization of this new proof as $d(E)$.

Dynamic system for accessing knowledge has been constructed.

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4. Comparison of the constructed system with real world

Similar assessment of knowledge exists within actual formal systems. Indeed, a theorem is (to a certain extent) considered the more significant, the more complicated and the longer its proof is, and in the larger number of proofs (this theorem) is employed. Very often a simpler and easier proof is found after the initial proof of the theorem; in this case, the significance of the theorem decreases. In actual systems proofs are kept and are being periodically revised.

The constructed system for accessing knowledge corresponds to the fact that only proved statements contain knowledge. A number of new questions arise in this context. For example, if a statement A contains $k(A)$ knowledge, than how much knowledge contains denial of the statement? And how much knowledge contains conjunction or disjunction of two statements? Obviously, certain constructions dealing with Boolean models of set theory and with fuzzy sets could be useful in this regard.

5. Can a machine create new knowledge?

One of the most important terms in new economy or in knowledge economy is the very term «knowledge». It seems that we know what it is, but giving a precise definition it is very difficult. It is a little easier to explain what is «new knowledge». This is knowledge which did not previously exist or, more precisely, which can be developed or created in the course of analyzing and researching certain facts or information. Now let us consider the question in the title of the paragraph: can a machine create knowledge? This question is interlinked with the question: can a machine think?

The latter question has been the issue for many thinkers and, first of all, mathematicians, starting with Turing. They created many tests to help distinguish

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between an attempting to think machine and a human (see a wonderful popular science book [4], which stimulated writing of (5) and of the final part of this paper).

Let us consider three statements:

A. The sun is seen in the sky.

Б. Stars are seen in the sky.

C. It rains.

Machine is shown many «pictures» of our real world. The machine can determine whether events A, *Б*, C occur at the time of photographing. After looking at «pictures» for a long period of time, the machine confidently makes three conclusions:

1. If *A*, then not *Б* (i.e., if the sun is seen in the sky, stars are not seen), in symbols, A>>$\overline{Б}$;
2. If *Б*, than non *A* (i.e., if stars are seen in the sky, then the sun is not seen). In symbols, Б>>$\overline{\text{A}}$;
3. If A, then C can occur with a very small chance (i.e., it sun is seen, then rain is unlikely.

These conclusions are NEW KNOWLEDGE which was not put in the machine!

Let us study which conclusions computer makes. For analyzing deduction $X >> Y$ computer marks (counts) all «pictures» with X and out of them marks all «pictures» with Y, as well. Dividing the latter number by the former, we obtain the relative frequency of deduction $X >> Y$. If it is equal to 1, then the deduction is considered true, if, for example, 0.2, it is considered unlikely etc.

The above example is not so simple and non-substantial. Let us imagine the mankind at the stage of mass interstellar research. In cosmic expansion the mankind needs new planets for inhabiting. An automatic probe, with the following questions put in its program, is being thrown to other planet: Do earthquakes occur? Do

droughts occur? What is the relation of these events to the average temperature of the planet? What is an average ocean level? Etc. After studying the planet for several years, the probe reports its deductions (see the above).

Let us cite an extract from [6]. It has a direct relation to the purpose of our paper and deals with the work of our intelligence service abroad. This was written about soviet IS of about 1970s, yet, the essence must not have changed significantly.

«We consider invaluable information coming from Soviet truck drivers abroad, from cabin attendants of Soviet trains, from Aeroflot crews, from our sportsmen and, of course, from our agents. The pieces of this information are fragmentary and not related to each other. "Division is waked up on alert", "Rocket battery left in unknown direction", "Massive takeoff of planes". Our electronic machine relates these pieces with activity on air. Regular occurrences, special cases and exceptions are distinguished. Then, in the course of many years of analysis we can say: "If rocket battery РБ-7665-1 is on air, then in 4 days massive takeoff will take place in Ramstein ". This is unchangeable law. And if by any chance the station we call Ц-1000 will start functioning, then even a child will understand that fighting capacity of American forces in Europe will be increased. And if, for example ...». This is exactly, what we have above written!

6.Can a machine think?

Let X,Y be two statements. Let us call the above deduction $X >> Y$ a conditional implication in the course of looking over a certain number of «pictures». This conditional implication will be assigned current frequency $f(X,Y) = k(X,Y)/n$, where n - the number of «pictures» with X. Y is present in $k(Y)$ of these n. When this current frequency stabilizes at the value $t(X,Y)$, then this value is regarded as the value of conditional implication $X >> Y$ (and machine usually stops tracking implementation of this implication, although it might not, if memory and computational resources allow it).

(The name "conditional implication" is justified by its difference from logical implication $X \to Y$, which is equivalent to disjunction $\overline{X} \vee \overline{Y}$. Logical implication is considered true, if either $\overline{X}$ or $\overline{Y}$ are true, and the former case does not satisfy the purposes of our analysis).

Coming back to the question: Can a machine think, let us note that implication $A >> Б$ (see the beginning of the paper) is a cause-effect relationship, and implication $Б >> \overline{A}$ is not a cause-effect one! Indeed, when stars are seen, the Sun is not seen not because of that, but because of the fact that it is not in the sky. However, implications $A >> \overline{Б}$ and $Б >> \overline{\text{A}}$ are logically equivalent! Consequently, a taught machine would not see the difference between cause-effect relationship of events and simultaneous implementation of events.

Ability to create new knowledge must be regarded as the lower form of thinking. Discovering cause-effect relationships is a more important function of thinking. The above described machine may create new knowledge, but as it can not tell the cause from the consequence, it does not possess the latter more important feature of thinking.

Considering these questions in a talk with my colleague Eugene Makarova over a cup of tea with honey, I asked, why she was confident that the Earth rotates over the Sun and not vice versa.

Having thought for a while, she replied that this was not a simple issue and that the right answer demanded much knowledge: scientific picture of Solar system, the fact, that Sun – is a huge nuclear reactor, a possible reason for changes in seasons, certain personal experience is necessary etc.

Summing up, we can say that for revealing cause-effect relationships it is necessary to know not only formal and logical structure of statements, but their essential meaning.

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7. Human mentality

Our mind (in full or at least partly) must be similar to the above described computer. A «picture» of our real world is being sent to our mind at each moment of time. The mind analyses the links between a large number of statements-hypotheses-facts, accumulates frequencies of implication realizations and remembers them. How exactly the mind does it is unclear, however. For example, learning to ride a bicycle is a very distressful process. But certain time passes and a person says. «I learnt. Now I can ride a bicycle». But being asked, how exactly s/he rides a bicycle, the person replies in confusion: «I do not know. My arms and legs make necessary movements by themselves; I am incapable of describing this in detail». Let us add that this "description" would be unlikely to help another person, wishing to learn ride a bicycle.

Everything is interlinked, however, with the volume of memorizing capacities of human mind. We had only three statements in the example in the beginning of our paper. Let the number of statements be one million (10^6). Then, the number of implications, i.e. binary links, is one trillion (10^{12}), the number of cells to keep frequencies should be at least the same, so we obtain the total of $2 \cdot 10^{12}$. By estimations of physiologists human mind contains approximately 10^{15} neural cells. Nobody knows yet how much information may be kept in one cell. Nonetheless, it is obvious that informational resources of our mind considerably exceed our necessities for processing and preserving information.

Now let us imagine a computer similar to the above probe, which was left on another planet for analyzing occurring events. Even at the contemporary level of science development, it is not difficult to teach computer reveal and compare links between different events. Moreover, computer can input and assess relationship of events by itself. If computer has memory and other parameters comparable to those of human mind, than after a certain period of time, we will be unable to understand

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what is kept in which parts of computer. Similarly, only in the course of complicated research, scientists find in spheres of human mind, responsible for certain functions.

In this sense there are no principle differences between our mind (or its considerable part) and computer. The essence is large computational resources. When computer becomes comparable to mind, it will have similar problems.

The following levels of human thinking may be distinguished: 1) lower level, correlation-regression, based on analyzing relative frequencies of conditional implications; 2) the consequent one, based on analyzing conditional implications with the help of instruments, directly proceeding on the work of our sense organs – microscopes, telescopes, meters, watches etc.; 3) searching of cause-effect relationships; 4) higher level, implemented with the help of abstract scientific theories, the major deductions of which may not be achieved by simple analysis of facts. These deductions are unavailable to our sense feeling and may be achieved only with the help of mathematical methods (e.g. Heisenberg uncertainty principle or other results of quantum mechanics).

Levels 3 and 4 are accessible only for humans; animals must have capable of levels 1- 3; machine may be taught levels 1 and 2.

References:

1.Махлуп. Производство и распространение знаний в США.-М.: Прогресс, 1966

2.Клини С. Математическая логика.-М.:Мир,1973

3.Коэн П.Дж.Теория множеств и континуум-гипотеза.-М,:Мир,1969

4.Р. Пенроуз. Новый ум короля-М.: УРСС, 2004.

5.Т.М.Гатауллин. Процесс развития научной теории и количественное измерение знания .-М.:ГУУ;Вестник университета №2(6); 2005.

6. В.Суворов. Аквариум.-М.:Изд. Дом «Новое время», 1993.

Social networks in modern world

© *I.A.Bobkova (Moscow)*

Network approach and social networks are recently being paid a special attention in different fields of science. Social network may incorporate a round of certain agents' relations, informal or socially important relations or services for sustaining social groups or networks. Social networks are used in modeling complex relations between members of a certain community, or between social systems at different levels – from interpersonal to international and from micro to macro levels. Although this term is well-known since 1950s, development of theory and application for social networks gained its particular importance in recent years. Methodology of social networks is used both in behavioral models and in modeling innovations, knowledge, epidemiology, in studying migration, in biotechnical systems, medicine, modeling culture, informational, transportation and many other systems.

A number of dynamically developing areas with social network applications may be systematized in the following way:

1) studies of «small world phenomenon», in particular, experiments in applying small world features to large scale organizations, e.g. mega polis;

2) spread of knowledge, starting from micro level - companies, which are interested in successful exchange of knowledge between their employees. The study of prerequisites for constructing good social network and of factors, influencing formation of trust to the source of information and knowledge carrier, necessary for successful distribution of knowledge within the network;

3) modeling economic interrelation and analysis of small business strategies, merges and redistribution of responsibilities;

4) organization of virtual laboratories, which aim at spreading knowledge on macro level (these networks widely use all possibilities of modern information technologies and may serve a model for cyberspace);

5) modeling of «chaos» (in particular, studying how a system, which functions under given parameters, reaches chaotic condition with change of these parameters).

Recently various fields of science pay more emphasis to network approach and social networks. Scientists were interested in this approach back in the 19th century. Emile Durkheim and Ferdinand Tönnes regarded various social groups as communities of social pairs of individuals, united by formal and informal links. They showed that closeness of links increases when individuals realize that reality may not be described by formal individual characteristics. The reality is not only «mechanical» (i.e. the one where differences between individuals are minimized), but is «organic» as well (i.e. with individuals having different independent characteristics). Gejrg Simmel, J.L. Moreno, W. L. Warner, and E. Mayo were among first economists to get interested in social networks. Yet, it required years and dozens of years to systematize those single papers.

A number of sociologic works in human society development have emerged since 1950s. In particular, the very term «social network» was introduced by J.Barnes (Manchester school) in 1954 in "Class and Committees in a Norwegian Island Parish". Anthropologists made a considerable contribution by their attempts top construct social networks. In 1960s-70s special groups studying social networks appear in American Universities (Harrison White, Ivan Chase, Bonnie Erickson, Harriet Friedman, Joel Levin at Harvard and Linton Freeman, John Boyd, Kathryn Faust, Douglas White in California). Similar groups appear in other Universities – Michigan, Chicago, Toronto. Researchers in game theory also become engaged in social network analysis (e.g. Anatoly Rapoport).

In the last quarter of the 20th century – the period with growing interest to social and psychological aspects of contemporary society development – application of social networks and methods for their analysis becomes widespread.

The analysis of social networks is a whole area of structural approach with the main goals of studying links between social objects and causes and preconditions for

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emergence of these networks. Recently social network analysis becomes a distinct scientific field with its theoretical basis, methods and research tools. A number of theoretical papers (A.L.Barabasi, T.L. Friesz, J. Guare, M.E.J. Newmann etc.) emerged, as well. The study is done from simple to more complicated aspects. It covers the whole structure and separate human relations, behavior and quantitative characteristics. Social network analysis is applied in sociology, linguistics, anthropology, psychology, communications, informatics, biology, economics, and other fields.

4 approaches may be singled out in social network analysis:

1) structural – the analysis of network geometric form (graph theory) and of intensity for interactions within the network (network exchange theory);

2) resourceful – analysis of individual and network resources attracted by individual in order to reach a certain goal in the best way. Knowledge, skills, demographic peculiarities, level of wealth, position in the society etc. may be considered as resources;

3) normative – analysis of trust level between the objects of the networks; rules, norms, and laws influencing the behavior within the network; as well as the processes of their interaction;

4) dynamic – analysis of time changes within the network.

Most popular methods for modeling social networks are graphs, block, stochastic and other models, which allow to visualize quantitative and qualitative features of social subjects, objects and their relations. Agent-based models are often used in modeling social networks. Besides that, social networks are considered complex networks, where methodologies of static and non-linear physics are applicable. This increases the spectrum of social network applicability.

Theoretic and practical study of social networks is accomplished in two directions – an analysis of already existing networks, their special features and properties, and formation of new social networks.

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Since the sphere for social network applicability is already wide, let us concentrate only on certain most characteristic directions in studying and analyzing social networks. One of social network phenomena is «small worls phenomenon» (the term introduced by F. Karinthy and developed by S. Milgram).Иthe idea of this hypothesis lies in the fact that the way (links) between two isolated people in human society is very small. Any two people are believed to be able to be united by a very short link (e.g. I know my boss, my boss knows the President of Russia, and President of Russia knows the President of the USA. Therefore, only 2 people stand in the link between me and the President of the USA). This phenomenon may be viewed in many natural and artificial systems (knowledge of short ways in these systems is described by network model with certain probability).

This term became widely spread after the experiments, conducted in 1967 by Stanley Milgram (his phrase about 6 levels of separation is now a classic one). By sending letters to his acquaintances, he discovered that the average length of a path between 2 people is 5 people. These experiments were continued, and a number of scientists received confirmation of this phenomenon. For example, the experiment of email exchange in Columbia University demonstrated that two people are separated by 5-7 links. Obviously this hypothesis cannot be spread for the whole world due to considerable cultural and language diversities between Earth's population. In particular, this deals with many isolated tribes, which have a chance to see a «white» man once in 10 years, or with the peoples of the Soviet Union, who lived under «iron curtain». Another issue is important in this context. The speed for knowledge and information dissemination in a «small world» is very fast. This is related to modern civilization with information boom. Recently a number of experiments aimed at proving the fact that adding a small number of random links to human or machine networks with «small world» properties decreases network diameter, i.e. the longest way between its nodes to the shortest one (see theoretic works of D.J. Watts and S.H. Strogatz).

Another issue are short links, based only on local information. When two people get acquainted to each other, they usually pay attention to social surrounding of the new acquaintance. They discover common acquaintances very quickly. There are interesting experiments in applying small world properties to large-scale organizations, e.g. mega polis (A.E. Motter, T.Nishikawa,Ying-Cheng Lai – 2003). They demonstrate that short links between network participants are not necessary and sufficient condition for the presence of close friends. Yet, the chance of having common friends is higher for people, who got acquainted to each other, if compared to two randomly selected people. Networks with this property contain both random and regular components and are highly correlated. There exists high correlation between friendly ties of people belonging to the initial social group, as well as correlation between position of people in different social groups.

Social networks play a special role in knowledge disseminating. This is found at micro level – the level of companies, which are interested in successful knowledge exchange between their employees. Recent research (D. Levin, R. Cross, E.L. Lessler, etc, 2000-2002) proves that a number of factors, influencing formation of trust to information source and to knowledge media, are necessary for successful knowledge distribution within the network. They are common language, demographic and social likeness, carefulness, behavior, etc. Consequently, creation of a good social network requires certain conditions – understanding who possessed which knowledge, demanding particular knowledge, excluding network «narrow places» (people in the center) by redistributing their responsibilities, studying behavior and abilities of people, who form the network. Effective knowledge dissemination in such a network requires an analysis of the very knowledge and its accessibility, participation of various specialists, possibilities of their joint work in the project, freedom of study and relations.

Social networks are widely used in modeling economic interactions and in analyzing business strategies, merges, responsibilities' distribution. A commonly used term

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«entrepreneur network» denotes the round of someone's relations: his/her work colleagues, acquaintances who can be of entrepreneurial interest, acquaintances of acquaintances, the level and structure of relations, i.e. informal but important relations.

Creating social networks at macro level is connected to such problems as information dissemination, mutual penetration of different cultures, establishing international workgroups to study a certain problem. These latter groups consist of people divided by language, territorial and time factors.

One of practical directions in developing social networks is organization of virtual laboratories aimed at disseminating knowledge (up to forming «world knowledge»). Virtual laboratory is a group of researchers and specialists of different organizations, united for most productive work on a certain project in order to achieve fast and significant results. These laboratories enable management and control of research in various parts of the world. They also make it possible to achieve high results at both technical and theoretical levels. The laboratories grew out of real traditional laboratories and may not be considered as replacement of the former. Instead they represent a different level of relationship organization and are possible only at a certain level of technical development. This is explained by the fact that with territorial remoteness of laboratory members from one another they must communicate the same language, and have compatible technical and communication equipment.

Technical aspects of virtual laboratories' creation are analyzed by specialists in computer techniques, electro energy, mechanics, special techniques, and IT.

Virtual laboratories function at three major levels:

person – person. Technically this link is supported by telephones, books, conferences, letters and television connection. In computerized analog it is video conference, email, television education.

person – machine (experiment). Virtual laboratories are created to conduct serious experiments, where data collection and processing, parts of experiment, and processing of results are implemented in different organizations. These organizations are often situated in different countries, and the whole experiment and overall control is realized within one of research centers. For example:

Teleoperation. This is a classical case: a scientist passes commands to equipment (e.g. telescope) via controlling equipment. S/he receives information about the development of the process, so there is the link: scientist- operator – Internet – controlling computer (feedback) – equipment.

Teleprogramming –asynchronic approach to teleoperation with equipment in virtual laboratory: a scientist forms tasks (commands), that are later processed and are sent to equipment as a united flow, so that they could be fulfilled in due time.

person – metha machine. This concept was widely studies at communications conference in 1998 (CACM-98). Since many scientific projects may not be implemented due to required huge databases to be processed at gigantic supercomputers, special digital libraries as a part of virtual laboratory information structure may be considered a good solution. In particular, this deals with space and astrophysics programs. A major problem in this case is database and data presentation compatibility in the systems of different organizations.

It is plausible that in the nearer future we will face appearance of a new level: person – robot (humanoid). These networks widely use all possibilities of modern information technology and may serve a model of world cyberspace organization.

17th conference CODATA (Italy, October 2000) gave an impulse for virtual laboratories development. The conference formulated major principles for virtual laboratories creation and functioning; revealed possibilities of virtual laboratories in conducting and monitoring global research; formulated recommendations for developing virtual laboratories at the international level, including active participation of East-European countries, of Russia, Asian, African and South

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American countries, which are currently weakly involved in the process. A special emphasis was paid to unification and standardization in data collection and storing; to creating digital libraries and to accessibility of data in largest libraries – US Library of Congress, National Diet libraries in Great Britain, France and Japan, in the Russian State Library and in university libraries.

Most developed directions in virtual laboratories work are biosecurity, epidemiology, medicine and bioinformatics. Other widely represented areas are physical sciences: physics, biophysics, physical chemistry and geophysics. Recently a UNESCO united laboratory of scientists from different countries, created to study earth cataclysms and geophysical processes of World Ocean, reached considerable results which would be impossible in the framework of one country or one institute. Wide opportunities for virtual laboratories arise in monitoring environment and in non-traditional energy (under European commission and European environmental agency in Copenhagen).

Social networks in modeling «chaos» become a matter of special interest. In particular, this deals with studying how functioning under certain parameters system reaches chaos with changes in these parameters. This is a new and perspective direction in modeling unstable systems.

In the course of knowledge economy research, conducted in CEMI RAS, the studies of using social networks in forming knowledge economy; creation of virtual laboratories for forming «world knowledge», and modeling artificial societies become the issues of a particular interest. In modeling social networks agent-based and computable models are commonly used.

References

Barnes, J. A. "Class and Committees in a Norwegian Island Parish", *Human Relations* 7:39-58

F. Karinthy – Chains: in Everything is Different, - Budapest, 1929

S. Milgram - The Small World Problem, - Psychology Today, 2 (1967), 60-67

S.H. Strogatz – Non-linear Dynamics and Chaos, Addison-Wesley Readings, MA, 1994

D.J. Wattes,S.H. Strogatz – Collective Dynamics of Small-world Networks, - Nature, 393 (1998), 440-442

D.J. Watts - Six Degrees: The Science of a Connected Age, 1998

A.L.Barabasi – Linked: The New Science of Networks, - Cambridge, MA, 2002

S. Lichter, T.L. Friesz – Networks and Dynamics: The Structure of the World We Live In, - в сб. Network Science, Nonlinear Science and Infrastucture Systems под ред. L.Friesz, Hardcover, 2007, 7-52

J. Guare – Six Degree of Separation: A Play, - Vintage, NY, 1990

M.E.J. Newmann – The Structure and Function of Complex Networks: Society for Industrial and Applied Mathematics, 45 (2003), 167-256

A.E. Motter, T.Nishikawa,Y-C. Lai, F.C. Hoppensteadt – Smallest Small-world Network, - Physical Review, 66, 046139 (2002)

A.E. Motter, T.Nishikawa,Y-C. Lai – Large-scale Structural Organization of Social Networks, - Physical Review, 68, 036105 (2003)

K. Froitzheim – Communication Technology for Virtual Laboratories, -

T.Tamisier, F.Feltz – A Data Model for Knowledge Representation in Collaborative Systems, - Data Science Journal, 6 (2007), 225-233

www.arxiv.org

www.pathfinder.net.ru

www.prof.msu.ru

www.insna.org

www.casos.cs.cmu.edu

www.codata.org

http://en.wikipedia.org

www.openacademia.org

www.cs.vu.nl

Second World Congress on Social Simulation

© A.R. Bakhtizin, V.A. Istratov (Moscow)

2 years after successful organization of the first World Congress on Social Simulation, George Mason University (USA, Washington DC) hosted the second Congress on July 14-17, 2008. The Congress was sponsored by three regional associations, specializing in social modeling: North American Association for Computational Social and Organizational Sciences (NAACSOS), European Social Simulation Association (ESSA), Pacific-Asian Association for Agent-based Approach in Social Systems Sciences (PAAA).

A large range of issues on general approaches in model creation, on major model features, and on instruments for computer implementations was studied in the course of conference work.

Bench presentations on WCSS-2

Below is the list of most frequently discussed topics:

• Social networks and their dynamics

• Conflicts and cooperation in social networks.

• Group decision making and collective action.

• Evolution of social institutions.

• Market modeling and description of consumers.

• Resource management in the models of social dynamics.

• Modeling the consequences of political action on society.

• Development of social systems in web2.0.

• Software for conducting simulations in the models of social dynamics.

• Computer games and social modeling.

Each day of Congress work started with plenary speech of famous scientists in agent-based modeling

	The first speaker Joshua Epstein (Brookings Institution, USA), the developer of a widely known "Sugar model" and a recognized authority in agent-based modeling, is currently involved in using agent-based models for researching epidemics spread and consequences of bio terrorism. His speech dealt with certain aspects of big model for USA population, which included 300 million agents reflecting the population of the country. In particular, the model incorporates migration data (due to change of job, residence and traveling), which allows assessing the speed of infection spread.
	The second speaker Hiroshi Deguchi (Tokyo Institute of Technology, Japan) is a well-known scientist, specializing on interdisciplinary research of economics, sociology, management and agent-based modeling. His speech touched upon certain conceptual software implementation aspects of agent-based modeling. The applied package SOARS (Spot Oriented Agent Role Simulator / Social & Organizational ARchitecture Simulator), developed for the above purposes, was demonstrated.

The third speaker Dirk Helbing (ETH Zurich, Switzerland) is Professor of sociology and a developer of many agent-based models, mainly dealing with transportation and pedestrian dynamics. In his speech he shed a light on a number of problems arising in developing transportation models, and on the ways of solving thereof.

The conference included session talks, training sessions and stand presentations. The latter allowed the members of Artificial societies laboratory to present the results of their work to conference participants.

Teaching sessions were mainly devoted to the software for producing agent-based models: Repast, MASON, U-Mart System etc.и др.

As for stand presentations, the Russian researchers prepared the following ones:

1. V.L. Makarov «How Public Goods can generate regional structure: simulations on the agent-based model». Download presentation
2. V.L.Makarov, V.A.Zhitkov, A.R.Bakhtizin «Agent-based model for traffic jams in Moscow». Download posters (3.2 MB).
3. V.A. Istratov «Agent-based model of human behavior: can money buy you happiness?».

Stand presentations at WCSS-2 Travel notes by V.A. Istratov (On the trip to the conference WCSS-08)

Airport is already far behind. The both sides of the road present a view of energetically looking one or two-storey American houses. We are approaching a neat hotel, which is cozily fitted in between two noisy highways. This is the place for conference members' accommodation. The hotel is situated in Fairfax - a half-asleep

town in suburban Washington, a 30-minute distance from the conference hosting University.

In the morning the bus obligingly takes us from the hotel to University campus. Here, in George Mason University the Second World Congress for Social Simulation was held. Campus territory is large; and judging by a great number of construction sites which we passed in the bus promises to be highly populated, as well. Getting inside the territory, one discovers concrete and brick kingdom of a modern American university. Park oases are found here and there. In summer there are only a few students, but University is not empty. The narrow road takes us to a corner-shaped non-inhabited building. This is our destination.

A light fruit breakfast after registration, and we are asked to proceed to a plenary session. Each plenary session is prepared by a representative of one of the three organizing associations: European (ESSA), Pacific Asian (PAAA) and North American (NAACSOS). There is one plenary session a day.

The speakers of North American and Pacific Asian associations devoted their talks to the problem of the spread of infectious diseases in human populations. (North America was presented by the Sugar model author Joshua Epstein).

European association representative dwelt on the model for persons and car movement. The model was aimed at solving the traffic jam issue both for the means of transportation and for pedestrians inside buildings.

After the end of plenary session one can have some more food: fruit, sweat bread and drinks noticeably disappear during the coffee break. Then there is the start of various sessions: lectures, seminars, round tables and workshops. They are conveniently organized in 5-6 neighboring auditoriums, situated on the same floor. Did not like it at one place – you can move to another.

Official attitude is not at all stimulated here. This is reflected in everything: a presenter with long uncombed hair, in an old T-shirt worn outside jeans. A listener in a sundress and open-toe sandals. One of the main organizers stands nearby, smiles

and is ready to help with everything. Everything is easy: the clothes, the manner, the open communication between all the participants, despite their age and status.

A break in an hour and a half allows to rest, think over what has been just heard, get something to eat, and talk with other participants. In the middle of the day there is lunch in student cafeteria. Similarly to the whole building, but for several groups of applicants cafeteria is empty. Therefore, we can comfortably choose the table and do not waste time in lines.

Conference day continues. Another short break in half an hour. If there is no evening reception, the conference ends at 18.00-19.00, and the same morning bus takes participants to the hotel.

According to information in registration materials, the conference hosted about 150 participants. The same number of people could be estimated according to our personal impressions of attending lectures and seminars. If somebody missed day sessions, s/he would be present at evening reception. On the whole, it was an exciting meeting of inquisitive people holding the same views.

At any moment of time one could find an issue of his/her particular interest among a number of simultaneous talks, seminars and round-tables. It is hard to write about general impression of the conference, as while you sit in one auditorium you know that something was going on in the neighboring 3-4 auditoriums as well. If you liked a particular presentation, it does not mean that at the same time there could be a more exciting one between another audience. One could always have a feeling of swiftness and of something being lost, only because there was a variety of issues to be paid attention to.

The topics indeed were mixed and diverse. Yet, they were all united by the fact that all models were computer-based simulations, implemented within agent-based framework. As on any conference, there were works of obviously mysterious purpose along with those, realized within state or commercial projects.

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A number of works were devoted to research of particular issues. Two out of three plenary sessions dealt with the spread of infectious diseases. There were papers on daily life of African tribes and on Asian wanderer migration in medieval time.

The conference saw papers of more general character, too. Some dealt with leadership emerging inside a working community; other studied which network structures inside a society are applicable in environments with certain tasks and conditions.

A noticeable part of presentations and workshops was devoted to the means for developing agent-based models. Several research groups from different scientific centers demonstrated the preliminary results of their work. According to the authors, when completely finished, these results will aim to establish a standard in this software. We do look forward to it!

As for the scientific part of the conference, I personally felt that too many works contained transformation of old borrowed ideas for the purposed of new instrument fo agent-based modeling. Very often it led to the lack of fresh views and conclusions.

It should also be noted that a noticeable part of presenters made an emphasis on the results of the model work, being reluctant to throw light on the model methodology. While the results sometimes looked trivial or even questionable, models often failed to be singled out due to methodological zest.

This, however, is not at all a fault of the conference, as output of original ideas is rather low in any creative process. Maybe, subconsciously, one wanted the level of presentations to highly correspond to high level of organization and hospitality of the organizers.

Organizers do owe special gratitude: everybody could feel that they treated their task both professionally and cordially. All members of organizational committee, including its head, were always available for communication, a very cordial communication.

Giving a farewell look from the bus to the moving away hotel on the day of departure, we could feel pleasant tiredness and gratitude.

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Scientific search for happiness and factors explaining happiness

© *T.A. Konkova (Moscow)*

1. *Introduction*

For centuries philosophers and poets tried to understand what happiness is and how it can be increased. In recent decades researchers started offering the following answers: happiness is electric activity in the left front part of human brain. It increases with marriage, with gaining friends, with receiving wealth, and with departing from communist idea. At least this is the solution of scientists in an increasingly expanding theoretical field. A constantly growing flow of theories and approaches on human welfare and happiness often moves to the politics field.

The British economist Richard Layard is the author of one of the most acknowledged works in this field: "Happiness: Lessons from a New Science" (London, 2005). He concentrates on the fact that since 1950s economic growth in the rich countries did not lead to increase in happiness. This may be explained in a number of ways. As money has decreasing returns, we get used to higher income and have to increase our needs to remain at the present level of happiness. Since we pay more emphasis to our relative position, the fact that some have higher income (which makes them happier), makes the rest less happier. Increase in income has negative effect, which Layard called "pollution". It causes other to work harder and longer in order to keep their relative position. However, with time they get accustomed to it as well, and as a result do not get happier than they used to be. To break this vicious circle we should raise taxes, restrain increase in the amount of work, and decelerate mobility. In this way more time will be left for things that make us happier: time spent with family and friends, and time on reading Layard's books. In the sections below we analyze how these factors influence the level of our happiness.

2. *The results of the research.*

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Researchers state that I would not get happier if I become richer; but do you know how much researchers earn?

Hence, despite unprecedented increase in income, the level of happiness did not rise in the developed countries. Let us try to explain it and make a number of conclusions, which might be particularly useful for politicians.

Let us fist take a look at the illustration: a gulf player says, " Researchers state that I would not get happier if I become richer; but do you know how much researchers earn?" Gulf player is right in a certain sense. There are two key factors that need explanation. In any moment of time rich people are happier than the poor. Yet, with time, although getting richer, developed societies did not become happier.

What has happened is outlined in Table 1. In 1975 the rich (the top group) were happier than the poor (the main group). The same was in 1998, when both groups became richer (the top group in particular). Yet, we should pay attention to people who characterized themselves as "very happy". In 1998 both groups of this category did not become happier than before, even those with high income. This is a paradox.

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Table 1 Happiness in the US, % of total members of an income level

	Top income group		**Main income group**	
	1975	**1998**	**1975**	**1998**
Very happy	39	37	19	16
Rather happy	53	57	51	53
Not very happy	8	6	30	31
Total	100	100	100	100

Source: General Social Survey tapes. People over 16.

This situation is standard for most of the countries. In fact we observe similar phenomenon when instead of taking two time periods in one country, we compare two countries at the same time (one is richer than another). So what is happening? On the one hand, a particular individual in a particular country becomes happier if the individual is richer. This is the reason why most people want to be richer. However, at the same time, when the whole society gets richer, it is found that neither of particular citizens had become happier.

People are obviously comparing their revenues with a certain norm, i.e. a certain expected level. This norm should rise with actual income. It could be seen from the following data gathered by Gallup survey in USA during a large number of years. The interviewers asked a question: “What is the minimum amount of money required to satisfy major needs of a family of four?” As is depicted in Figure 1, the values rose according to the actual income.

There is another fact which also proves that this mechanism works. Since 1972 Americans are being asked if they are satisfied with their financial situation. Although real per capita income rose 50% within the survey time, the percentage of people, who were rather satisfied with their financial situation, decreased.

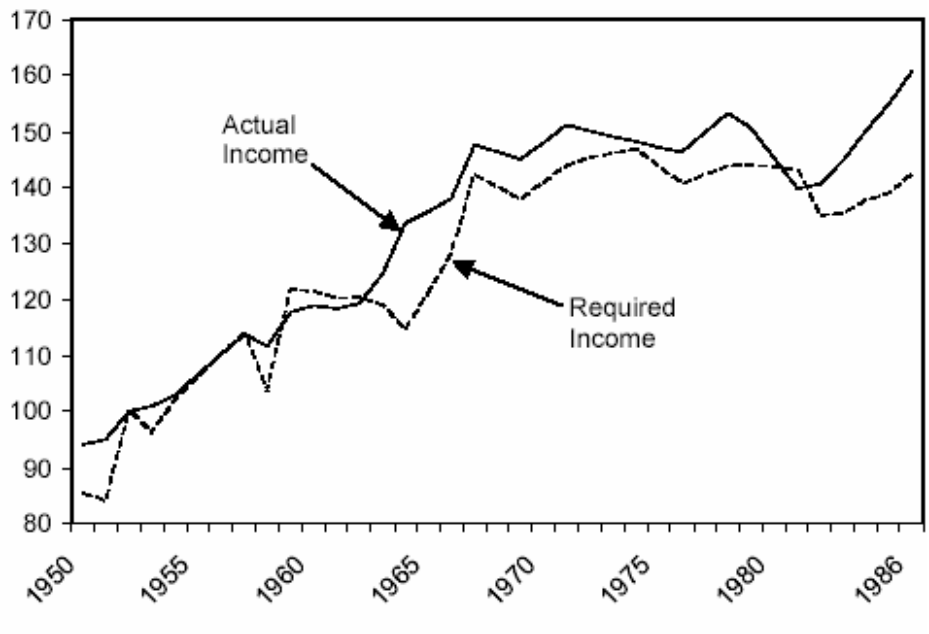

Figure 1
The required income and actual average income (1952 = 100)

At first I compare what I possess with what I might have possessed (through acquaintance process). My increase in the standards causes decrease of satisfaction, which I obtain from any level of life. Secondly, I compare what I have with what other people have (through competition process). If others get more material possessions, then I must have even more in order to feel as well as I used to. Consequently, we have two mechanisms that help explain why all our efforts aimed at getting wealthier to a certain extent have a pernicious effect on the full happiness of the society.

First of all, it is necessary to analyze these effects, and then to discuss the role of politics. Let us begin with acquaintance or adaptation, as physiologists would have called it.

3. *Adaptation*

The key feature of any successful organism is its capability to adapt to the environment. People turn out to be surprisingly adaptive. This is both a strength and a weakness. It saves us from miserable poverty in face of hardships, but at the same it prevents us from obtaining higher experience.

The lower degree of happiness can be assigned to paralyzed people who have just suffered the attack. Yet, after a certain period of time their happiness is just slightly lower than the average for the total population. The same is true about the highest value of happiness, e.g. after marriage.

Therefore, when our level of life increases, at first we like it, but then we get used to it, and it contributes just to a little difference in the feeling of happiness. However, it would be extremely difficult for us to come back to the initial level.

The process of acquaintance is analyzed in a number of studies. One approach deals with comparing individuals with different income. Each individual is asked: "What should be the level of your family so that after taxes you could assess it as: very bad, bad, insufficient, sufficient, good, very good?" An arithmetic mean of sufficient and insufficient level is then determined for each individual. This "required income" changes with actual income: a 10% increase in actual income causes about 5% increase of required income.

Salary level is not studied in group research of work satisfaction in the United Kingdom. The degree of satisfaction depends only on the rate of salary change. It provides for negative adaptation effect, increasing due to previously low salary. For larger samples, in 2002 it was discovered that income lag decreases average happiness by two thirds; and the current income increases average happiness exactly by the same two thirds ratio. Consequently, a steady increase in income increases happiness to a certain extent; yet, in historic perspective this was compensated by negative effect of other changes: high percent of divorces, crime etc.

To sum up, people assess their situation with regard to what they have reached. They try to climb another step of the ladder, but in the next moment they are again at the beginning of their way. This is in fact an inclination problem where previous life style standards have a negative impact on happiness received from current level of life. If we adapted to everything in a similar way, then there would be no need to discuss politics issue in this context. Yet, to certain things we get accustomed

particularly easily and consider them as a matter of things (e.g. in particular this applies to our material possession: personal car, private house). We do have the same experience within our whole life: it becomes harder to get accustomed to time spent with family, to quality and safety of our work.

If we can not foresee, how we get accustomed to our material possessions, we will "invest capital" in acquiring them. This investment will come at the cost of our free time. There is a number of evidence that people underestimate the process of acquaintance. (For example, academicians think that if they devote more time to science they will become happier.) The result is a skew of our life in direction of work and departing from other ways of spending time. This should be noted as a major distortion, the one which is more important than that between income and expenditure. A natural way to establish the balance is to impose tax on revenues (similarly to tax on smoking) in order to make an obstacle to excess work.

4. *Competition*

Now let us consider the second issue in explaining the paradox of income and happiness, i.e. competition. Let us start with a simple question.

Which world would you prefer?
(prices are constant)

A. You receive $50000 a year; the others receive half of it B. You receive $100000 a year; the other receive twice the amount

In the course of recent Harvard questionnaire, graduate students were asked the above question (holding prices constant). The majority preferred the first answer. They would be happier with lower income if their material situation were better than that of the others.

The results of other research suggest that people are interested in income of others in same degree as they are interested in their own income. We get disappointed when others are promoted, and we are not. The only situation when we take the

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decrease of salaries calmly is when the others face it, too. That is the reason for low degree of economic dissatisfaction during the Second World War. As a contrast, big inflation of 1970s caused a lot of dissatisfaction, as within a year salaries of others rose quickly, while somebody else's salary remained unchanged.

When people compare their salary, it is rather a comparison with those of the same circle than with movie stars or beggars. The obvious explanations lays in the fact that it is possible to reach to the standards of the same circle; and impossible to accomplish what David Beckham has done. Consequently, the most intense competition happens within organizations and families. In organizations calmness may be often kept due to the secret of the salary size. In families it was noticed that the more your the spouse earns, the less is your satisfaction with your own job. For women, if a sister's husband earns more than her own, a woman is likely to enter the job market. In other words people are interested in the level of their income relative to that of their neighborhood; and are not particularly worried about its absolute level. People do not want to be behind the others and if possible to surpass them.

If people change the round of their relations, this may have a serious effect on their happiness. Let me provide two examples when people had an objective material gain but subjectively felt worse. The first deals with Eastern Germany, where the life level has been sharply increasing since 1990s. Yet, their level of happiness sharply decreased since they compared themselves with people from Western Europe and not with those from the countries of the Soviet block.

Another example is women whose income and possibilities considerably improved relative to men. Yet, they are unhappy. Indeed women happiness fell in the US relative to men happiness. Maybe this is due to the fact that they compare themselves with men more than is necessary and therefore, know more about inequality which still continues to exist.

The rich are happier than the poor, as they compare themselves with a larger proportion of population, which is more poor than they are. Vice versa, the poor are unhappy comparing their income with that of the rich.

In an extreme case people worry only about their relative income and do not care about their actual income. Then, in economic growth people with increasing well-being do not appear. The only exception would occur if people have changed a circle of contacts on the one in a lower hierarchy. But, if the circle of contacts does not change, and the actual and relative income were invariable, the general happiness would be the same.

Actually everything is not as bad as it seems. If we compare the states in the USA we will see that if other people of your circle achieve more, you feel a material loss. However, this negative feeling is not so strong to completely cross out the increase in your income, if the latter rose on a average size for all. Then a hope emerges. To be exact, if my incomes increase, the loss of happiness for the others is approximately 30 % from increase in my happiness.

This is a form of pollution. To interfere with excessive pollution, "polluting" should pay the cost of damage which is produced. In our example, "polluting" should lose 30 pence from each 100 pence that s/he earns; this is a 30 % tax on all the additional income. The tax payments will be returned to this person through the useful expenses of other society. The person will work less and a fatal element in the work which lowers the sense of happiness by others will be eliminated.

However, for the correctness of this conclusion, the following condition should be further satisfied: although people compare their income with the income of others, they should not compare the leisure. And how do we actually behave? To throw light on it, we should consider answers to the second question which was set to students of Harvard. Two possible worlds, C and D, were offered to them.

Which world do you prefer?

C. You have a 2-week vacation, and the others have a half of it
D. You have a 4-week vacation, and the others have twice it

Only 20 % of students chose the world C. Hence, in case of leisure the majority of people do not compete with each other. The conclusion is the following: we will have little time for leisure while it is not declared by public policy.

In reply to this argument, fighters for freedom often say that since the competing person is guilty himself, s/he should not be protected with public efforts, as the latter will interfere with others' chances to earn money. But this reasoning is erroneous. It is in our forces to change human nature. But we cannot destroy our existing nature.

5. Happiness and taxes

In fact the phenomenon of competition and adaptation are so important that they demand rethinking and total reconsideration of public economics. Here public economics denotes the theory of microeconomic policy, developed in the works of James Meade, Amartya Sen and Tony Atkinson, James Mirrlees.

The starting point in this theory is the following: taxation deforms the choice between leisure and income, and forces people to work too much. Taxation can be justified by the value of public consumption which it finances. But, at comparison of tax cost with benefits from the expenditures, we should consider essential "burden of tax surplus", arriving from the deformed choice which it is supposed to cause. In this sense, the theory of Veenhoven is always against public activity.

Competition and adaptation lead to an absolutely different conclusion. They inform us that in an effective economy there should be levels of "correcting taxation". And while taxation is not above the set "correcting level", the analysis of

public consumption benefits should not be of our concern at any surplus burden which appears from expenses for financing of expenses.

So what should be the corresponding level of taxation? The statistical data are only being accumulated, but we already spoke about 30 percent which arise in connection with competition. The reality testifies that the same deals with adaptation. Thus, 60 percent no longer seem unrealistic. In fact, it is actually a typical level of extreme taxation in Europe, if one considers direct and indirect taxes. I suspect that in certain cases the electorate almost unconscientiously understands that the desire to spend more is somewhat fatal, and it corresponds to the tendency of public consumption. At this point it is necessary to add that this contradiction is one of the central features of Social Democracy and that it is another way of developing the economy.

We should be sure that this taxation finally decreases our estimated Gross National Product, as it decreases work effort. However, we should clearly understand that this does not matter as Gross National Product is a wrong estimate of well-being.

6. Mistake

The mistake lays in the fact that usually consumers and producers are treated as different agents. Yet, each of us is both consumer and producer at the same time. We consume goods and produce them. Of course for the most of what I consume, I assess, whether it is useful for me. But is I also seek for a way of increasing my income and expenditure to reach a certain status, this part of my efforts is malicious.

To understand this, let us compare the happiness function of an i-th individual

$$\text{Happiness}_i = f(\text{Leisure}_i, \text{Valued Consumption}_i) + \alpha\ \text{Rank}_i \qquad (1)$$

I sacrifice leisure and increase consumption, which I assess as my own utility, and increase status. But now if I consider the society as a whole, then

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$$\sum_i \text{Happiness}_i = \sum_i f(\text{Leisure}_i, \text{Valued Consumption}_i) + \text{Constant}$$

Hence, even most of our consumption is assessed as useful, an additional work for increase in status leads to opposite results. Additional work does not lead to anything, as the total amount of α-status is a constant. We obtain the *zero sum effect*! Consequently, when we bring up people, we should try to decrease their α-demands.

According to Veenhoven, the complexity is the fact that we should avoid those actions against others that lead to zero sum effect. There is, however, a positive side: to direct efforts against negative features of character, to develop our talents till maximal possible level, as reaching this level gives us satisfaction.

We should support tests and research aimed at demonstrating what we could have reached. But we should question those tests where a set of table values is public and is intentionally opened for motivating people to raise their status. This causes both success and failure, and is not a good formula to increase human happiness. The function to be introduced in our system is

$$\text{Happiness}_i = f(\text{Leisure}_i, \text{Valued Consumptions}_i) + \alpha\ \text{status}_i + \beta\ \text{production}_i$$

where α should be as low as possible and β – as high as possible. First of all, we want people to enjoy their contribution to social life – a phenomenon, unknown to standard economics but clear to all of us. Advantage of last part in the equation is the fact that when there is summation over all people, the last component can grow without a limit. In the analysis of the above example it does not lead to zero sum.

Now we will consider how the society developed in 1990s: α grew and β decreased. The attention was concentrated on "advancement" and on financial stimulus as a way of motivation. The main objective of modern payment policy consists providing for possibility to closely connect payment and production. In other

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words, payment is connected to performance. If comparative performance is emphasized, it inevitably leads to increase in α.

But there is also another effect. Economists and politicians assumed that when external stimuli for work increase, other stimuli remain same. But it is not so: a number of research offers us chances for rethinking the issue. Edward Desey set tasks for two groups of students. In one group he paid for each correct answer, in another – did not. After the lapse of some time both groups were allowed to continue work. The non-paid group continued to work further because of their interest to exercises. But, for group which was paid, external prompting has reduced internal prompting, which otherwise would have existed if there were no paid motivation.

The second example is a real case from life in Switzerland in 1993. Two communities were selected as potential sites for storage of a radioactive waste. Economist Bruno Frey interviewed the majority of inhabitants. They were asked two questions. The first - "would you like to have storehouse here?" had 51 % of positive answers. The second question sounded as - "If to you were offered certain compensation, would you like to have storehouse here?" Only 25 % replied positively on this question. Thus, the presence of financial award reduced readiness of people to operate happy-go-lucky.

7. The impact of television on the well-being

Veenhoven attempts to explain why happiness did not increase and why depression, alcoholism, and crime are present, in particular during the golden growth period of 1950-73s. He comes to a conclusion that it is not meaningful to accuse economic growth in general, since in earlier periods of economic growth (e.g. 1850-1914) both alcoholism and crime decreased. So, what has changed in the post-war world? The most obvious transformation of our life consists in emergence of TV, which shows us with full intimacy how other people live. So previously people compared themselves to people round the corner, and now they can compare

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themselves to anyone. It would be surprising if such comparisons were not disturbing.

The TV differs from any previous means of communications by two features. The first is instantaneousness. The second is obvious quantitative overweight. An average Englishman watches TV 3.5 hours per day, roughly 25 hours per week. During the whole life, an average Englishman spends more time watching TV, than doing paid work. Although less time is spent on watching TV in the majority of the European countries, this figure is still more than 2 hours per day. So it is logical to assume that TV had and continues to have deep influence on our life and on our well-being. This influence is extremely negative, which is confirmed in the examples below.

The majority of public discussions about TV is concentrated on the problems of violence and sex. It supports the common sense view that repeated violence on TV leads to legalizing violent behavior, similarly to the fact that repeated adultery scenes tend to legalize adultery. For example, in 1950 TV has given the report on the shown programs in various American states for previous years. The research demonstrated that that year when violence and sex display was increased, saw a 5% increase in larceny. We can only assume its subsequent aggregate effect. At the same time, this research somewhat speaks about direct effect of TV on happiness, but here we are compelled to rely on a guess and indirect conclusions.

Here it would be logical to provide the results of the following research. In a number of psychological experiments, women were shown photos of models. Their mood before and after the display was estimated. After viewing photos of models, the mood of women decreased. So should TV influence the mood of women? In a 3-hour everyday watching of TV a woman should see a parade of beautiful women. It hardly will improve her mood. And what is concerning the effect on men? The photos of models have been shown to men, as well. Their feelings towards their wives before

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and after the display were estimated. After viewing the models, the majority of men had fewer good feelings towards their wives.

This research is a key to the general hypothesis. TV creates discontent, filling us up with images of forms of body, of wealth and goods which we do not have. This discontent is incorporated in soap-operas and commercials. The feeling of envy which is deeply rooted in human character is anyhow inevitably increased through TV.

8. Intermediary conclusions

Let's return to the theory of public economics. Supporters of this theory boldly asserted that utility is measurable, as without this assumption is impossible to consider the problem of optimal income distribution. They assumed that additional income was more necessary for the poor than for the rich. But they could not make empirical research to prove it. Now we can. For example, using Euro barometer for comparison of individuals, it is possible to show that marginal utility of the relative income sharply decreases as income increases. Also, using World Review of Values for comparison of the countries, John Halliwell has estimated that an increase in the average income lifts average happiness only in those countries, where per capita income is below $15,000.

But nevertheless, it would be a big simplification to say that growth of well-being does not bring any contribution to happiness. Actually, the only thing on which all agree in this very young field of a science, is the statement that it is possible to buy happiness for money. There is extremely strong correlation between well-being and happiness. Countries with low income have low level of happiness; countries with average income have average level of happiness; and the countries with high income have high level of happiness.

Halliwell's statement (supported by Layard as well) it is put forward by researchers, but nevertheless it is necessary to prove it. That fact that higher level of

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incomes does not lead to higher happiness, yet does not speak about uselessness of growth in incomes.

Let's sum up the above said:

1. If my income grows, I become happier, especially in the short run.

2. But it does others less happy and the effect rendered on me, disappears. This fact I did not expect.

3. Consequently, correcting taxation is necessary for the balance of my labor life to be positive. It should be the key doctrine in a new way of economic development.

4. Due to zero sum, we should not encourage comparison of incomes and struggle for the status.

5. External stimulus can undermine our internal desire to do work well.

6. Advertising should be controlled, especially it concerns children.

7. We should redistribute income in favor of the poor.

9. Conclusion

It is easy to see that all the above is based on works of Western scientists and on results of European researchers. In Russia, as well as on all post-Soviet territory, the question of defining happiness and increasing its level is practically of no concern for economic or political circles. Happiness as a scientific theme is not loved: there are only scientific groups studying stress, depression, and political preferences. It is almost impossible to find out serious articles devoted to the issue of happiness in the Russian language literature.

There are a number of explanations to this phenomenon. The first one is language distinction. In English the word «happy» is used often and on any issue. For example, the employee who got an increase in salary or a child traveling with parents can easily say: «I'm happy». In Russian there is other treatment of the word

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"happiness". To a Russian person, happiness can be felt only a few times in life, e.g. when somebody is deeply in love. Russian "happiness" may be translated with the English word «bliss», while the latter is translated in Russian as "pleasure".

Another specific feature of Russia is climate. Looking out of the window of an average Russian million-population city (especially in winter) one can at once understand, why, for example, in Guatemala according to the survey of Ruut Veenhoven people are much happier than Russians. In the countries of Latin America or of Southern Europe it is possible to bathe all year long, sleep during siesta, and arrange carnivals. However, in Northern Europe the weather is as nasty as in Russia. But these countries have a social system which simply does not allow people to be unhappy.

Another explanation is mentality. Russian mentality implies modesty in expressing emotions, especially positive ones. We may be characterized by underestimating them. It is similar to superstition: if you look too happy, the destiny will necessarily punish you. In each culture there are rules of expressing emotions. We are irritated with Americans having eternal smile. And for them coolness of Japanese seems surprising. Public demonstration of happiness causes mistrust and fear to put an evil eye among the Chinese. It is easy for find proof of the above facts in major religions. In Protestantism increasing wealth is a main objective, and although it is done for the sake of God, private property is inviolable and individualism is developed. An opposite picture is in Confucianism and Buddhism: money is denied, property rights are not stressed, and the basis of a society is not an individual but a group. In Orthodoxy money is considered as the means, collegiality dominates, the basic cell of a society is the family.

Probably, for this reason European countries take the leading positions in the level of happiness of their population in modern consumption society. In these societies rationality and personal interest are considered as norms of life. And a

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Russian person always preferred to live «according to justice», observing general interests.

Happiness at the national level has a difficult formula, and scientists still cannot understand its exact structure. But it is simple to distinguish major factors influencing happiness: mentality, public activity, income, democratic character of a society and so on. The exact proportions of these factors, however, are unknown. Therefore, in the meanwhile, it is necessary to independently search for a way towards personal happiness.

References

1. Charles Murray «In Pursuit of Happiness and Good Government», New York: Simon & Schuster, 1988.
2. Eurobarometer, Report No. 53, Brussels: European Commission, Oct 2000, chap. 1
3. Mihaly Csikszentmihalyi «Flow: The Psychology of Optimal Experience», New York: Harper Perennial, 1991.
4. Michael R. Hagerty, Ruut Veenhoven, «Wealth and Happiness Revisited», Social Indicators Research, 64, 2003.
5. Richard Easterlin «Does Economic Growth Improve the Human Lot? Some Empirical Evidence», P. A. David & M. W. Reder (Eds.), New York: Academic Press, 1974.
6. Richard Layard, Guy Mayraz, Stephen Nickell, «The Marginal Utility of Income», 2007
7. Ruut Veenhoven «Wellbeing in the Welfare State», Journal for Comparative Policy Analysis 2, 2000.
8. Ruut Veenhoven, Micheal Hagerty, «Rising happiness in nations,1946-2004. A reply to Easterlin», 2006.
9. Ruut Veenhoven «Quality of life in individualistic society», 1999.

10. World Database of Happiness, http://worlddatabaseofhappiness.eur.nl/

About the authors

Gataullin Galim Nagimovich	–	The Doctor of Economics, Professor of The state university of management
Bobkova Irina Aleksandrovna	–	Cand.Tech.Sci. Researcher of the Central Economics and Mathematics Institute of the Russian Academy of Sciences
Konkova Tatiana Aleksandrovna	–	Engineer of the Central Economics and Mathematics Institute of the Russian Academy of Sciences
Bakhtizin Albert Raoufovich	–	Candidate of Sciences in Economics Senior researcher of the Central Economics and Mathematics Institute of the Russian Academy of Sciences
Istratov Victor Aleksandrovich	–	Researcher of the Central Economics and Mathematics Institute of the Russian Academy of Sciences