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SOCIAL SCIENCES

UMWELT ANALYSIS AND MONITORING THE DIGITAL ENVIRONMENT OF SOCIETY

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Abstract

The development of society is currently characterized by the expansion of various social practices and digital technologies serving public relations. In the light of solving the problems of digital ecology, the problem of organizing monitoring and umwelt analysis of the co-evolution of society in a digital environment arises. It is proposed to expand the classical monitoring of direct and latent indicator characteristics with a functionality that has predictive capabilities of different lead times. It is noted that it is advisable to use the socio-technical landscape methodology as a platform for the proposed Umwelt analysis of the digital environment. The article describes the structure of the information and analytical model for the analysis of pre-crisis situations and presents the results of modeling the dynamics of the needs of medicine for digital technologies (2000 -2020). Models with harmonic and parabolic components had the best predictive capabilities. The identified models using information from past experience and predicted future also have acceptable predictive properties. The dominant cyclical modulators of medicine needs for basic digital technologies have been identified by three years (3, 6, 9, 18), which corresponds to Kitchin's cycles. The pilot studies carried out allow us to speak about the prospects of organizing predictive environmental monitoring based on landscape ideology, which analyzes the environment (ecology) of individual taxa from the standpoint of a systematic approach and Umwelt analysis. This work was supported by a grant from the Russian Science Foundation No. 19-18-00504 "Socio-technical landscapes of digital reality: ontological matrices, ethical-axiological regulations, road maps and information support for management decisions."

Keywords: socio-technical landscape, digital ecology, functional monitoring, umwelt analysis.

Introduction

The normal development of society presupposes the expansion of various social practices (culture, medicine, education, religion, ecology, etc.), which make it possible to realize the main "target function" (in the terminology of functional systems [1]) - "endless" existence and development in the World , due to the reproduction and/or extension of the life cycle of society, both the system as a whole and its individual elements [17]. Applying the methodology (and terminology) of functional systems [1], strategically the society develops in the umgebung (Ikskul's terminology [26]), and its "receptors and acceptors of action" [1] function in the umwelt. Thus, umwelt analysis is the basic tool for organizing environmental monitoring of society.

In the case of studying the influence of the environment on society and its structural elements in [21], the following conceptual models, for example, are proposed - Figure 1.

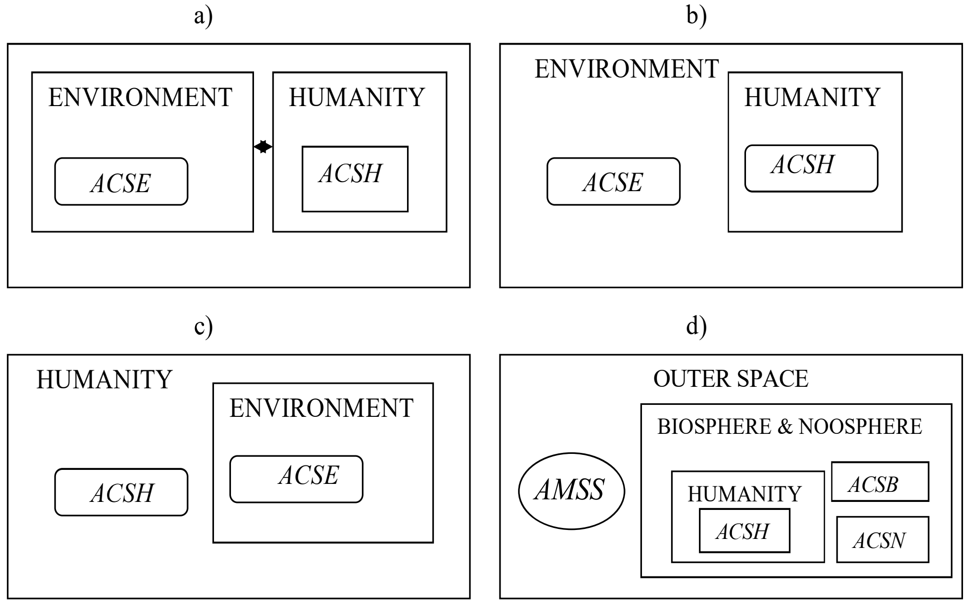


Figure 1. Conceptual models "The Person — the Habitat"

The following designations and terms are used: HUMANITY - “person, society”; ENVIRONMENT - "habitat"; OUTERSPACE - "space sphere"; ACSE - autonomous control system ENVIRONMENT; ACSH - autonomous control system HUMANITY; AMSS - OUTERSPACE autonomous management system; BIOSPHERE & NOOSPHERE - biosphere and noosphere; ACSB autonomous biosphere control system; ACSN is an autonomous control system for the noosphere.

The given conceptual models form various paradigms for conducting research (including the organization of monitoring) of the impact of the environment on both an individual and society. There are four possible situations due to the functioning of ACSE and ACSH: dom (ACSE) & ACSH; ACSE & ACSH; ACSE dom (ACSH); not (ACSE) & not (ACSH). In the first variant, ACSE dominates, in the third - ACSH, in the second - the control systems are equal, in the fourth - they are practically absent (the values of the observed and controlled parameters of the subsystems are chaotic). The paradigm based on the scheme in Figure 1a is the most widespread (including in works [2, 11]) - autonomous control systems ACSH and ACSE are not included in each other, simplifying modeling. In this case, simulation modeling consists in "playing" the occurrence of various states of HUMANITY under the predicted states of the environment and the response of autonomous control systems.

The paradigm based on the model in Figure 1b assumes that the HUMANITY subsystem is part of the ENVIRONMENT, and its states are determined by the operation of the autonomous control system ACSH (according to the set of states of its ENVIRONMENT subsystem).

The modeling paradigm for the situations presented in Figure 1c assumes that ENVIRONMENT is entirely determined by the functioning of the HUMANITY and ACSH subsystems.

The paradigm of modeling (and initial monitoring) of HUMANITY, represented by the diagram in Figure 1d, is an element of the hierarchical management of “human-environment”, providing for “observability and control” from the “outer space”. - OUTERSPACE - which by influencing the biosphere and noosphere [13, 20]. A hypothetical situation of complete controllability of the HUMANITY subsystem from the factors of the biosphere and noosphere (changing under the influence of their own autonomous control systems described by the fundamental laws of Space (for example, outbreaks of viral diseases as a reaction to the passage of comets or "lunar cycles" of mental diseases) is considered.

Thus, the considered models make it possible to systematize research in the field of studying human reaction to changes in the environment of various hierarchical levels. It should be noted that in this case the monitoring of the umwelt (the nearest habitat) is carried out by well-oiled mechanisms for registering, at certain intervals, the values of environmental indicators that affect human health [14, 25]. In [3], it is proposed in the monitoring process to calculate the values of such, for example, latent variables as the ratio of the recorded concentrations of various substances to the area, population size.

To study the behavior of society in the "environment" created by it, it is proposed to use the STL - the socio-technical landscape as a platform [9, 15, 18]. The main idea in this case is that the "platform" is considered in the form of a matrix, each cell of which is a reflection of the dynamics of indicator indicators characterizing the development of certain social practices with the help and under the influence of certain technologies. If it is required to monitor in the field of digital ecology, then, for example, such digital technologies as Internet things, BigData, artificial intelligence systems, the Internet of things, digital communications, virtual and augmented reality, social networks on the Internet, etc. act as such. etc. [9, 23]. Currently, STL monitoring is carried out mainly in the field of sociological research [27], which is not a classical monitoring in the technical sense. The issues of predictive monitoring are also insufficiently worked out. By this we mean not only the fixation (and logging) of indicators and the use of smart expert systems for the analysis and classification of the current states of the environment, but also the implementation of forecasts of various time predictions, the possibility of crisis situations (bifurcations [12], Black Swan [19] etc.).

The purpose of this work is to solve a particular problem: to study the possibilities of using the socio-technical landscape as a platform for organizing predictive environmental monitoring of social practices in the realities digital technologies.

Materials and methods.

To monitor digital (and other) Umwelt in order to analyze the evolution of evolutionary practices, an information-analytical model is proposed, presented in Figure 2.

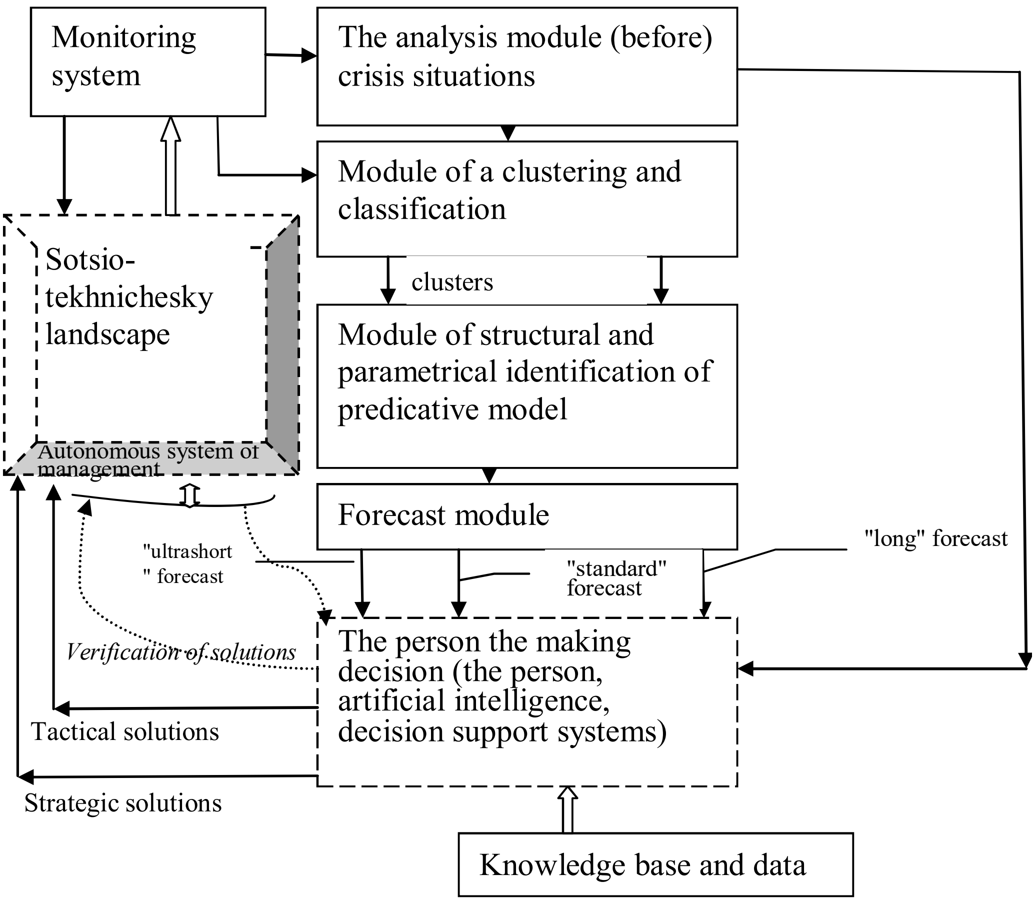


Figure 2 Information-analytical model for the analysis of pre-crisis situations in STL based on monitoring with umwelt analysis.

With the help of the monitoring system, indicator indicators are recorded that characterize the functioning of social practices and, for example, digital technologies in STL. The monitoring results are fed to the (pre)crisis situations analysis module. Since, in fact, the pre-crisis and crisis situations are areas of bifurcations of STL states, they can be predicted by analyzing the correlations between the recorded indicators: the number and modal values of which in this case increase [16]. Note that since the correlation reflects not so much the functional connections between the indicators, but rather the subordination of their close distribution laws (including functioning), the growth of correlations emphasizes the growth of chaos in the recorded values of indicators, which is subject to similar laws. It can be assumed, by virtue of the "law of large numbers", that the normal (Gaussian) law dominates. The onset of a (pre) crisis situation is recorded by the appropriate analysis module and the information is transmitted to the decision maker, which can be either a "Person" or a certain "Group of Persons", or artificial intelligence or other automated (and non-automated) decision support systems. The information is also sent to the "Clustering and Classification Module", in which certain clusters are allocated (or the procedure of correlating to already known ones is carried out). For each cluster, its own procedures for constructing predictive models are applied (in the “Module for structural-parametric identification of a predictive model”). Based on the information received, the “forecast module” generates predictive data, which are three types of forecast: “ultra-short” (for the near future), “typical” (most often used in the situation under consideration) and “long-term” (for a time exceeding the first reaction society (STL) on the control (or corrective) impact on it). Taking into account the data provided, the "decision maker" module forms a set of (usually alternative) decisions of strategic and tactical impact on the STL, after making a "check (of the consequences) of decisions" by short-term. It should be noted that the STL has its own autonomous control system [10], the functioning of which should be taken into account for optimal, adequate adaptive control of the STL (and its components). In the scheme of the informationanalytical model is reflected (Figure 2).

In the case under consideration, the umwelt analysis of digital reality, in the process of co-evolutionary processes, it would seem that it is necessary to analyze the interaction “Man (and / or Society) <=> Computer (digital reality)”. However, a computer is just a piece of hardware (a technical world created by human hands). Therefore, it is more expedient to consider the following structure: “Practicing person (society) <=> Computer (Digital reality) <=>“ Serving person (society) ”.

The latter, with the help of digital and information technology tools, creates certain software and equipment to serve the “Practical person (society)” (or his social practices), to protect and interact with the outside world (primarily the umwelt), to manage this to implement the main target the functions of the entire system and its individual structural elements, reflected in the STL platform, which were mentioned earlier.Both the “Practical person” and “Acting person” have their own “anthropological keys” [7, 8], which define and characterize certain types (and physicalities) of interaction with the “Computer world” (digital reality) and “Society”. developing both in time and space.

In accordance with the components of the anthropological key in the process of predictive monitoring, which predicts both going beyond the reference values of the recorded direct and latent indicators, and changing the clusters of states (which are determined, for example, by the levels tension [22]), it is proposed to register in the monitoring process on the STL platform and analyze the following indicators by which to obtain predictive models:

1) somatic: the type of social organization (hierarchical, distributed, etc. - it is quantitatively characterized by entropy), direct and latent indicators of anthropogenic environmental pollution, including electromagnetic “pollution”;

2) energy (vital): tension, adaptation reserve; intensity of interaction with digital reality, excitement, activity of social networks, information and energy specific components per STL element;

3) reaction: the speed of reaction in STL feedback (determined by analyzing the reaction of the communication means of the third and fourth signal systems - media, Internet, social networks);

4) emotion: intensity in social networks, defined as the number of reposts, responses to initiated discussions;

5) logic: reaction to repetitive information (reflection), the coefficient of stochasticity of the appearance of clusters of messages in communications of social networks (can be quantitatively assessed, for example, as a correlation with the normal distribution law);

6) concentration (the ability to retain information and energy): it is proposed to quantitatively evaluate the coefficient of kurtosis or the number of "returns" and "repetitions" of topics of discussion in the media and social networks for a certain period of time;

7) intuition (the ability to choose adequate new development patterns): the number of correct predictions (forecasts) in relation to the total number of alternative predictions;

8) empathy (the ability to empathize with others - social groups, peoples or cultural communities) - is assessed by: analysis of various media; information sources in the fields of history, culture, religion; conducting sample testing-questioning in certain socio-clusters of the STL platform;

9) will (coherent interaction to achieve a common goal): the number of new communities (in society, including social networks), organized over a certain time, exceeding certain threshold values;

10) communicativeness of true reality (CRC - direct communication to reality (people) or technology, including auto-communication): the number of dialogue-responses in social networks, possible contacts);

11) communicativeness of virtual reality (CWR - communication in the imagination with people, nature, technology): the number of interactions with created images, cultural values (virtual travel and visits to cinemas, theaters, museums, participation in e-sports, libraries, etc.));

12) communicativeness of augmented reality (CRA - communication with people and reality through technical means and information technologies, “distances”, part of telemedicine): the number of visits to various portals per unit of time, multiplied by the number of visitors.

Results and its discussion

The following were analyzed as a pilot study:

- Correlations between social practices and digital technologies in terms of demand, which were calculated according to the methodology [18]: in the information base of publications in open print (Google Scholar), the number of texts is determined in which pairs of terms“ *i* (social practice) are present as keywords - *j* (digital technology) "- $TSD_{i,j}$. Similarly, TSi and TD_j are defined, respectively. As a first approximation, the demand for practices in technology is estimated as:

$$DS_{i,j} = 100\%\ TSD_{i,j} / TS_j. \quad (1)$$

- structural and parametric identification of predicative models reflecting the demand for a part of the STL platform - the “line” of social practice “medicine” to breakthrough digital technologies: “Artificial Intelligence” (AI), “Mobile Technologies” (MBT), “Information Technologies” (IT) , "Internet Things" (IoT), "BigData" (BD).

Table 1 shows the results of the correlation analysis for 2000-2020 of the demand for breakthrough digital technologies of the main social practices ("+" - statistically significant correlation was found (p <0.05), "-" - not found).

Table 1

Correlation of Demand of Social Practices to digital technologies

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1 ИИ медиц.-ой	1																													
2 МбТ медиц.-ой	+	1																												
3 ИТ медиц.-ой	+	+	1																											
4 IoT медиц.-ой	+	+	+	1																										
5 BD медиц.-ой	+	+	+	+	1																									
6 ИИ образ-ем	+	+	+	+	+	1																								
7 МбТ образ-ем	+	+	+	+	+	+	1																							
8 ИТ образ-ем	+	+	+	+	+	+	+	1																						
9 IoT образ-ем.	+	+	+	+	+	+	+	+	1																					
10 BD образ-ем.	+	+	-	+	+	+	+	+	+	1																				
11 ИИ культурой	-	+	+	+	+	+	+	+	+	+	1																			
12 МбТ культурой	+	+	+	+	+	+	+	+	+	+	+	1																		
13 ИТ культурой	+	+	+	+	+	+	+	+	+	-	-	+	1																	
14 IoT культурой	+	+	+	+	+	+	+	+	+	-	+	+	+	1																
15 BD культурой	+	+	+	+	+	+	+	+	+	-	+	+	+	+	1															
16 ИИ экологией	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	1														
17 МбТ экологией	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	1													
18 ИТ экологией	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	1												
19IoT экологией	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	-	1											
20 BD экологией	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	1										
21 ИИ пром-стью	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	-	1									
22 МбТ пром-стью	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	-	+	1								
23 ИТ пром-стью	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	+	-	-	1							
24 IoT пром-стью	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	-	+	+	-	1						
25 BD пром-стью	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	+	-	1					
26 ИИ цифр.экон.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	-	+	+	-	+	-	1				
27 МбТ цифр.экон.	-	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	-	+	-	+	+	-	+	-	+	1			
28 ИТ цифр.экон.	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	1		
29 IoT цифр.экон.	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	-	+	+	-	+	-	+	+	+	1	
30 BD цифр.экон.	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	1

The analysis of the correlation matrix allows us to draw the following conclusions about the digital ecological environment of society, from the point of view of the demand for social practices for them - in fact, these are correlations of Gartner curves [4, 5, 24]. The correlation between the needs of social practices for breakthrough digital technologies is observed in 90%, which suggests that the development of needs in various practices is mainly proceeding according to the same type of laws. The exceptions are: information technologies, which are in demand by environmental research (they correlate only with IT, which are in demand by culture); BD, in demand by culture, industry, digital economy (except for the demand for IoT ecology). Thus, the dynamics of the demand for social practices for breakthrough digital technologies, in general, is subject to the same laws, however, in industry, the digital economy and the environment, there are several distinctive trends associated, first of all, with the fact that the demand for them to digital technologies began on average 5-6 years earlier than in other analyzed social practices, against the background of an increase with IoT ("Internet things"). This suggests that:

- firstly, the observed increase in correlations suggests that the development of society in the field of demand for the digital world by 2019-2020 is in the area of bifurcation (pre or post crisis situations) and in the near future there will be new tactical and strategic ways realization of demands, ultimately, to digital strengthening of society's capabilities for the implementation of its target functions (with integration into a single "information-digital field");

- secondly, since most of the demand correlates with "Internet things", this indicates the domination of interest in "serving tactical decisions" and "everyday issues", applications. Since, possibly, in the field of fundamental research and strategic directions, the issues of demand for breakthrough digital technologies are considered 5-7 years earlier. For example, the numerical values of the correlation coefficients between the technologies under consideration in the social practice of “medicine” are given in Table 2.

Table 2

Correlation of demands to disruptive digital technologies in medicine

	AI	*MbT*	*IT*	*IoT*	*BD*
AI	1				
MbT	0,89	1			
IT	0,74	0,94	1		
IoT	0,87	0,99	0,95	1	
BD	0,84	0,96	0,89	0,92	1

Analysis of Table 2 shows that the demand in the cluster "medicine" is subject to one pattern, and the technologies of "Artificial Intelligence" are less correlated with others than those among themselves. Thus, "Artificial Intelligence", integrating and actively using the main digital technologies, is developing (in terms of the demand for medicine) according to different patterns than the others considered. This fact verifies the presented studies, since it corresponds to the definition "the system has properties that differ from each of its components".

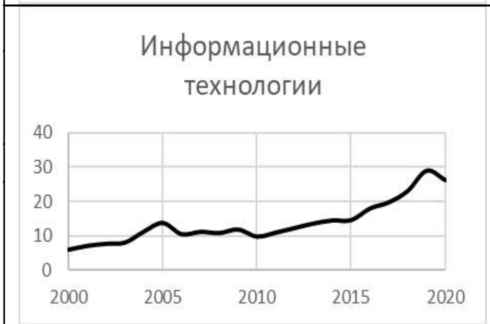
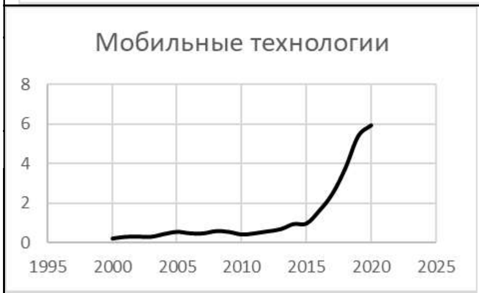
At the stage of predictive monitoring ("Module of structural-parametric identification of a predicative model" - Figure 2), pilot studies of the possibilities of constructing convergent mathematical models obtained by various methods and algorithms were carried out. A fragment of the results obtained is presented in Table 3. Analysis of the results presented in Table 3 leads to the following conclusions.

- For pilot modeling in predictive monitoring for short-term forecasting in the first approximation, you can use polynomial models of 2, 4, 6 orders (note that they are the first members of the Taylor (or Maclaurin) series of harmonic functions);

- The greatest adequacy are predicative models of the type *y(t) = F(y(t-1), y(t+1))*, which in fact reflect the following concept of functioning: the system at each moment of time decides on its further development based on Umwelt analyzes of "past experience" and "predicted future" (depending on the quality of prediction, structural-parametric adaptation of the model is carried out);

Table 3.

Models of predicative monitoring of demand of CT in medicine

<table>
<tr><td rowspan="4">
</td><td>Pol2,4,6</td><td>Exp</td><td>SPR1: y(t)=F(y(t-1), y(t+1))</td></tr>
<tr><td>R^2_2=0,99
R^2_4=0,9998
R^2_6=0,9999</td><td>R^2=0,995
k=0,23</td><td>R^2=0,999</td></tr>
<tr><td colspan="2">F(t,t^2, sin(w_1t+φ_1), sin(w_1t+φ_1)</td><td>EqDim</td></tr>
<tr><td colspan="2">R^2=0.8
5.1-1.2·t+0.08·t^2+2.74·sin(0.45·t+0.081)
P=14 year</td><td>R^2= 0.9 T=3.53
s= -1.224 k=0.08</td></tr>
<tr><td rowspan="4">
</td><td>Pol2,4,6</td><td>Exp</td><td>SPR1: y(t)=F(y(t-1), y(t+1))</td></tr>
<tr><td>R^2_2=0,88
R^2_4=0,95
R^2_6=0,96</td><td>R^2=0,84
k=-0.06</td><td>R^2=0,96</td></tr>
<tr><td colspan="2">F(t,t^2, sin(w_1t+φ_1), sin(w_1t+φ_1)</td><td>EqDim</td></tr>
<tr><td colspan="2">R^2=0.89
9-3.12·t+0.059·t^2+0.332·sin(1.06·t+1.49)
+0.71·sin(2.1·t-1.34)
P_1=6 year P_2=3 year</td><td>R^2= 0.73 T=0.864
s= -0.78 k= -0.902
w=0.73 P=9 year
φ=-0.89</td></tr>
<tr><td rowspan="4">
</td><td>Pol2,4,6</td><td>Exp</td><td>SPR1: y(t)=F(y(t-1), y(t+1))</td></tr>
<tr><td>R^2_2=0,87
R^2_4=0,98
R^2_6=0,99</td><td>R^2=0.83
k=0,14</td><td>R^2=0,96</td></tr>
<tr><td colspan="2">F(t,t^2, sin(w_1t+φ_1), sin(w_1t+φ_1)</td><td>EqDim</td></tr>
<tr><td colspan="2">R^2=0.89
0.87-
0.31·t+0.026·t^2+0.216·sin(0.71·t+0.19)
+0.137·sin(1.8·t-1.76)
P_1=8.8 year P_2=3.5 year</td><td>R^2= 0.76 T=2.24
s= -1.33 k=0.596
w – not</td></tr>
</table>

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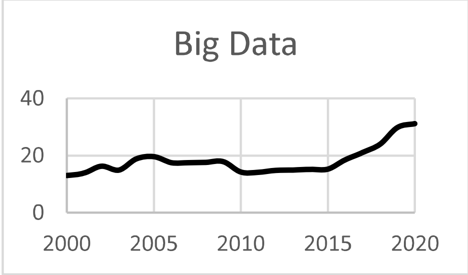
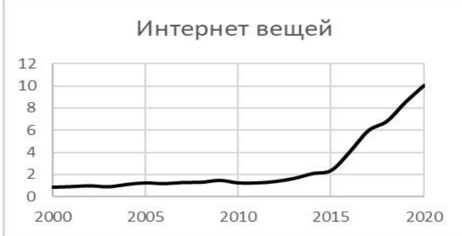
<tr><td rowspan="4">
</td><td>Pol2,4,6</td><td>Exp</td><td colspan="2">SPR1: y(t)=F(y(t-1), y(t+1))</td></tr>
<tr><td>$R^2_2=0,61$
$R^2_4=0,95$
$R^2_6=0,965$</td><td>$R^2=0,37$
k=-0.024</td><td colspan="2">$R^2=0,99$</td></tr>
<tr><td colspan="3">$F(t,t^2, \sin(w_1t+\varphi_1), \sin(w_1t+\varphi_1)$</td><td>EqDim</td></tr>
<tr><td colspan="3">$R^2=0.99$
$1.7-0.542\cdot t+0.0472\cdot t^2+1.2\cdot\sin(0.37\cdot t-0.7)$
$+0.063\cdot\sin(1.82\cdot t-2.83)$
P_1=17year P_2=3.5 year</td><td>R^2= 0.73 T=0.864
s= -0.78 k= -0.902
w=0.73 P=9 year
φ=-0.89</td></tr>
<tr><td rowspan="4">
</td><td>Pol2,4,6</td><td>Exp</td><td colspan="2">SPR1: y(t)=F(y(t-1), y(t+1))</td></tr>
<tr><td>$R^2_2=0,92$
$R^2_4=0,99$
$R^2_6=0,995$</td><td>$R^2=0.81$
k=-0.11</td><td colspan="2">$R^2=0,99$</td></tr>
<tr><td colspan="3">$F(t,t^2, \sin(w_1t+\varphi_1), \sin(w_1t+\varphi_1)$</td><td>EqDim</td></tr>
<tr><td colspan="3">$R^2=0.93$
$2-0.537\cdot t+0.044\cdot t^2+0.194\cdot\sin(1\cdot t+2.76)+$
$+0.278\cdot\sin(2.11\cdot t-2.2)$
P_1=6.3yearP_2=3 year</td><td>R^2= 0.73 T=0.864
s= -0.78 k= -0.902
w=0.73 P=9 year
φ=-0.89</td></tr>
</table>

In the table: R^2– coefficient of determination of the model (calculated on examination samples); w is the frequency; φ - phase shift; k - coefficient of exponential degree; P – period; the types of models are presented: *Pol2,4,6* - polynomials of the *2nd, 4th, 6th* degree, Exp-exponent - $exp(kt)$, $F(t, t_2, \sin(w_1t + \varphi_1), \sin(w_1t + \varphi_1)$ - polynomial harmonic model ; EqDim is the equation of dynamics presented in the operator form $T2p + 2sTp + 1 = 0$.

- The differential equation of second-order dynamics reflects the which behavior of functions similared to the Gartner curves, quite adequately, but it is only a first approximation (possibly, characterizing by its solution the strategic direction of development of the analyzed system, taking into account the initial conditions);

- Taking into account the previous conclusions and conducted studies, it can be assumed that mathematical models combining parabolic and harmonic structures have good adequacy of short-term and medium-term forecasting of the behavior of the quantities recorded during the monitoring process (since the cyclic components are a reflection of the internal self-oscillatory processes of most complex, open, living systems);

- The needs for breakthrough digital technologies on the part of medicine have the following, most likely, cyclical components: artificial intelligence - 14 years old, information technology - 3 and 6 years old, mobile technologies - 3.5 and 9 years old, BigData - 3.5 and 17 years old, Internet -things - 3 and 6 years old. Thus, taking into account the EqDim dynamics models, cycles with components divisible by 3 years dominate (3, 6, 9, 18), which is most consistent with Kitchin's cycles (the mechanism of their generation is associated with time delays in information flows that affect decision-making) ...

Conclusion

Studies in the field of environmental monitoring of the digital environment (external environment) and "metabolism" (internal processes) of society on the example of the sociological practice "medicine" STL (in terms of requests for various information and digital technologies) have shown the promise of organizing predictive environmental monitoring based on landscape ideology, in which individual clusters (taxa) are considered from the standpoint of systemic and umwelt analyzes.

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