

## **Bulgaria ATACD team's report**

### **January – November 2008**

This report describes the activities of team to project ATACD at Plovdiv University. It includes period from the beginning of January 2008 to November 2008. First part of the report comprises the activities carried out under the ATACD Residency program during the period October 3- November 9, 2008. The second part describes the preceding research and communication activities of the team from January to September 2008.

#### ***Part I. The Bulgarian ATACD residency program 2008***

During period October 3 – November 9, 2008 Ivan Tchalakov, Donka Keskinova and Petar Kopanov visited at Centre for Sociology of Innovation (CSI) at MINES ParisTech (Ecole des Mines de Paris), France under the ATACD Residency Program.

Ivan Tchalakov carried out his ATACD residency at CSI during the period October 3 – November 9, 2008. The aim of the stay was deepening of his acquaintance with the latest developments on actor-network theory (ANT) and its relevance to the topology approach in studying social and cultural dynamics, and more precisely to the idea of ‘stacked networks’ as possible approach in bringing together topology and ANT. He has several discussions with leading ANT researches – Bruno Latour (Science Po), Michel Callon, Fabian Muniesa, Frédéric Vergnaud, Ariane Debourdeau, and some others. During his stay he participated also in the Centre's seminars and worked at Centre's library on dynamics of complex systems and computation approaches to agent-based modeling. He also prepared a Power Point Presentation for the ATACD Workshop that took place at CSI at November 30. During the week after the seminar, he edited the discussion at the Workshop (edited transcript attached to the report). He took part (upon an invitation of Bruno Latour) at the seminar of Ulrich Beck on *Risk Society's Cosmopolitan Moment*, November 7, 2008 at Science Po, Paris.

Donka Keskinova and Petar Kopanov spent six days in Paris (October 28 – November 2, 2008) upon the ATACD Residency program. They worked together with Ivan Tchalakov on the research materials, presented and discussed at ATACD Workshop, held at October 30 in CSI. Together with the intensive discussions during the days before and after the workshop, the members of Bulgarian and French ATACD teams developed further the ideas from the two papers distributed in advance, and outlined the perspectives for the research work during the remaining period of ATACD project.

## **Part II. The Bulgarian research under the ATACD Project**

The specific version of topological approach in studying social and cultural dynamics chosen by Bulgarian team is described in two research papers attached to this report. Below it is taken short description about work for preparation and carried out the regular team's meetings. It is a summary about offered theses and organized discussion on them.

### **14.01.2008**

Meeting at Mathematical faculty. University of Plovdiv

Participants: Dr. Ivan Tchalakov, Dr. Petar Kopanov, Donka Keskinova, Dr. George Kostadinov

The way to topology analyses passes through:

1. Building a model of studied field, in which it is examined like pile in networks (stacked networks). These networks have different contents (and corresponding differences between mediators circulating in these networks – money, prestige, texts, artifacts) and different configuration (nodes of heterogeneous type – human, nonhuman, hybrid, abstract entities, plus specific orientation of their relationships – one way or symmetric).

*[Example: Bulgarian economics on the eve of post-communist transition can be describe as composed of network positioning local actors:*

- (1) According to their commitment with actors abroad including well knowing about authors from the West;
  - (2) According to parties hierarchy – network about parties positions;
  - (3) Network based on professional abilities;
  - (4) Network based on the resources inherited from the past generation – material, cultural, behaviour;
  - (5) Network about the access to determinate kind of goods – houses.]
2. It is specifically to these networks, that they share there the same actors yet each network represent different actor-world, i.e. the actors take part in more than one network simultaneously, although in different way (actor networks). In each of these networks circulated different mediators and bind them with different actors, with different configuration.
  3. In principle all networks are heterogeneous (there is not purely „social” networks)
  4. The cultural and social dynamics can be examine like a process of reconfiguration at least of one of actor networks, that conduct to change of the rest worlds (layers) because of changing in position of the general actors. This should not be understand like combination of different roles in respective statutes.
  5. The whole problem is how this pile can be present singly. The fact that determinate actors definite (or are definite) in several networks should have effect upon respective network.
  6. One of the ways that can be described this is, that the change in one of the worlds has

influence on existed exertion, critical links, slight connections in other networks

7. The main problem is methodological, if description of given actor networks suppose empirical expression of “translation” process, of creation allies, mediators, acquired identity (well known ANT- actor network theory), so is each network closed in itself world, in which the other actor networks are at some form (for example “The rose of winds” from Michel Callon & Philippe Laredo paper 1993)

### **10.03.2008**

Meeting in Philosophical- historical faculty

Participants: Ivan Tchalakov, Donka Keskinova, Maria Vasileva

We continue with the work about clarifying the premises of topology analysis, social and culture dynamics. We examine the result from the project TACTICS and their relevance in the new task.

We suppose that we have the base of TACTICS on the five dimensions – finances, R&D and so on . If we examine them like stratified networks (that set an identity for each one of the objects/actors), so can we determinate the models of interaction between the networks. If we investigate after 10 years and we find that the topology stays relatively stable, we can suppose that we have steady configuration (profile, model, structure). *The cultural change (dynamic) is not so much the change in separate (private) sphere, but rather in way of which the separated networks are connected.*

### **21.03.2008**

Meeting in Philosophical- historical faculty

Participants: Ivan Tchalakov, Donka Keskinova

We discuss the problem for the way how to bind sociological model with adequate mathematical apparatus.

*Conclusion:* We should look for mathematical machine, by which we can investigate the behavior in time of empirically established and statistical meaningful relations between the networks, i.e. if the relations between the networks continue to exist over the time, even under some other form (invariant in topology mean)

Example: If we had determinate dependence between relations of IT firms with public government (the network of connections with parliament, municipalitis and so on and so forth) and the financial sphere (the networks of getting credits), i.e. the definite type relationships in the former are connected with definite type relations in the latter *in statically significant way*, we can talk about social and cultural dynamics when the relation is maintained after definite time even when the both networks are changed essential separately.

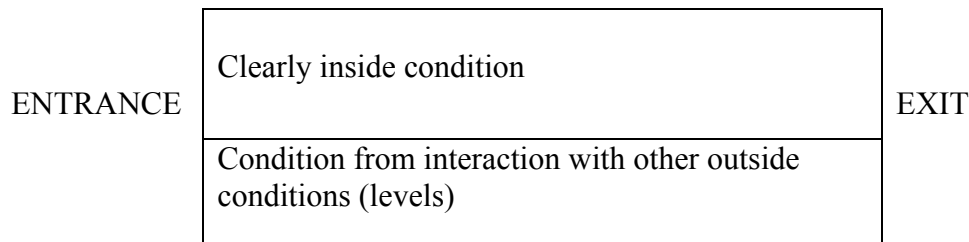
## 24.03.2008

Meeting in Mathematical faculty

Participants: Ivan Tchalakov, Petar Kopanov, Donka Keskinova

Petar Kopanov presents his first ideas about possible modeling of sociological model of network dynamic. Ivan Tchalakov and Donka Keskinova express arguments about the adequacy of offered mathematical machine. The discussion ends with formulating the basic admissions that the matematical model should be answered.

The model of the agent which operate in some connected networks at the same time:



Agent – two inside conditions:

Ab<sub>1</sub> – from his own field (networks)

Ab<sub>2</sub> – from the entrance of other (Ego) in the other networks

Ab<sub>2</sub> – is according its type in current field (network) (canonical correlation of 3 and more groups of variable- letters)

1. The structure of (role) relationships calls networks
2. We measure the type of relations
3. The agent is defined as a set of finite number stochastics machines. Each of them interact with the other agents on respective plane (network)
4. On each level (network) automaton has finite number of conditions, in which it can be
5. Condition – possible configuration of relations of given occasion: credit – 5 sources (banks, firms, funds, .. – generally  $2^5 = 32$ )
6. The object becomes conservative when it is stable (contented) (or in practical situation the agents are stopped on finite, lower from maximal possible number of conditions)
7. We determine some stable conditions in 2000 (inexplicable why). Is there any inside conditions? If not, we will use probably distributions
8. If we determinate some stable relation in moment  $t_0$  and we confirm it for the moment  $t_1$ , so it follows that we have cultural stability, if not we have change: if influence in entrances (the effect of participation in other field) is decreased and is increased inside condition of its own network
9. Total network approach against stratified networks

## **ASSUMPTIONS:**

1. We have detached spheres of life.
2. The detached spheres of life are related between them.
3. The relations between spheres and inside in spheres are by people, things, signs, symbols.
4. The relations can be formalized.
5. Total network approach abstracted from detachment of separate networks (fields).
6. This abstraction (5) ignored cultural dynamics.
7. Cultural dynamic is stable correlation between detached spheres of life (networks).
8. The purpose of the project is not the total network (the relations between different conditions), but the relations between separate detached spheres of life or their configuration.
9. Each detached spheres of life has inside logic, rationality that can be describe like combination of agents' conditions.
10. The hypothesis of examination: measuring of relative weight on  $Ab_1$  – his own inside condition of agent in field toward  $Ab_2, Ab_3, \dots$  i.e. the entrance from the rest networks (as much lower is influence of his own field, what follow? )
11. Culture is presence of stable thresholds beyond that the entrance of other networks -  $Ab_2, Ab_3, \dots$  do not influence upon his own inside condition  $Ab_1$ , definite from detached form of life (network)

## **11.04.2008**

Meeting at Mathematical faculty

Participants: Ivan Tchalakov, Petar Kopanov, Donka Keskinova, Maria Vasileva

We discussed the model of interaction of thus modeling agent with the other agents in stratified (stacked) networks.

1. Building the stochastic model of the conflict. In the growth of given subject there is experience and mistakes. When he had made a mistake once, if he fails in such or similar situation decrease the probability to take the same decision. Conflict spring up when the situation (conditions) is changed and the subject begins to learn again, return steps back.
2. The automaton has entrance, exit and inside conditions. It is received stable relation. The automaton develops with the time.
3. Axiomatics – the basic relations of the avtomaton
4. Inside parameters. Parameters in each field influence on choice – this should be foreseen.
5. *The basic question is how to introduce and entry in register?* In given entry situation we

have different conditions of registers. Condition 1 is less often than condition 0.

6. Empiric examination.
7. We will use topology twofold. The network topology influence contrariwise, it is inert.

## **25.04.2008**

Meeting in Mathematical faculty

Participants: Ivan Tchalakov, Petar Kopanov, Donka Keskinova

We discussed dynamics of modeling network and the way that it is influenced from agents' including in other networks.

1. We will attempt to make model of 'movement' – how one personality, one subject develops and how he learns. Under agent we understand the general subject. This is the most generally presenting of automaton. For example on the business network level the both subject are businessman, but on cultural level they are Bulgarian and American with their prejudices. We will try to outline that the system try to structure itself at some time. Our system is concentrated for business system of procedures and rules. The qualities that the subject (agent) should show they do not depend on him, but they lay from interaction on market, in that he is partial Ego. There is a selection going on in this environment, the system is self-organizing and self-evaluating.
2. Evaluation of the results on the output and their interaction with the actors from other networks. These self-organized systems are modeled with rules.
3. After we have already had data, we can try the model and we will be able to understand how the relations are developed. If we can make connection between relationships between the two networks both in moment T1, then at T2 having data only for one of them we could do the same in the other and we will see the distribution in each fields and we will see what kind is relation between the fields. The aim of whole task is to see whether there is a change in relation between the fields in moment T1 and relation between the fields in moment T2, that is the connection with topology, i.e. individuals who are here. We will examine the Egos like black box, in a sense that they can influence differently. Actually our purpose is if we determine one relation and we see that we have radical change in moment T2 in agent, but dependences are not moved much, we can say that there isn't cultural dynamics, there is topological dynamic in each of the fields. This means that primary system stand and then we can try to determinate where is it the most vulnerable and where – the most stable. The problem is that in moment T1 and in moment T2 in each of the field there can be dynamic from different reasons. We will

be interest from agent that in the given field, exactly from their possibilities, whether they are with inert relation, and in the other field it is described (съдържателно) and abstract.

4. Our model should have prototype and we will lead in dates that we have already had to see what kind of result it will reach.
5. The change in model is reduce in change of registers' conditions, there is no matter from which register are dates in automat, it could not know them. In those automata the registers' levels are shown. Dynamic is in this that distribution of registers of more and more automata begin to jump in different levels or appears new levels. The question is to see what will happen when such one system evaluate. Actually there is following paradox in modeling: if the system optimized linear, the probability to become other is very high.

### **23.06.2008**

Meeting in Philosophical- historical faculty

Participants: Ivan Tchalakov, Petar Kopanov, Donka Keskinova

The discussion is about the way, on which developed model can be use for description of real existed dynamic social phenomena. The problem about including inhuman (material) actors in network's model – interactions in real social networks is not only symbol! We need to present modeling social phenomena like heterogeneous (compound from human and inhuman agents) stratified networks. The description of agents' behavior:

Our idea is to make some model of society, for this aim we should make two things: first to understand in society what kind of networks and interactions there are and the second how the automata work with these networks. Under society we will understand: interactions with material base and those which are clean abstract and in the same time there are things that divided and that united them. The society at abstract level the most generally is one group which interact. The agents (actors) in system determine what is ideal and what not and they alone structure the relations (the edges). Some agents go into interaction like someone and go out like the other, therefore the interaction is the key. The interaction is this which we turn back secondary we can copy to exit of interaction. In the moment when we have action we have edge that show somewhere. The agent should have the least 2 edges. In the model we don't be interest from whether there is material bearer. The network is build from relations and for its modeling we will use the number of layers, symbols. Under symbol we understand and material consequences and we will model it with 0 and 1. We have interactions and we could decide on who to give identity. On each level the problems have decision on the same principle. Empirical we will determinate the different timings, time for reaction. We have different types automata that will operate on different way in the network. In progress of some interactions we should allow a edge that come out and have one end, but it doesn't know where goes. We can register interaction and without

knowing where the edge goes. At these interactions will spring up automation- successor. We should allow that as agents fall apart of automata, a set of finite automata, as in frame of separate (подравнина (поддрезжата) )from interactions can spring up new automation. We will model and finite number “sleeping” automata that will include in definite principle. The automation who is at some network provoker conflicts. There is natural selection i.e. there are automata that are turned out, delayed and etc. We will try to increase to minimum the rules (axioms), that we will use.

Through two network it can spring up a new agent and we named it mediator, thus we have interaction between these two networks.

### **24.06.2008**

Meeting in Philosophical- historical faculty

Participants: Ivan Tchalakov, Donka Keskinova

Let take our database. If we use it in our model we don't know the points, but we register only presence or missing of definite type edges, which means relations. We don't use whole data base, only one type firms and ask them for their business partners (which can be everyone). Our edges are relations with other (щракащи) agents; we can imagine them in one desk. He competes with some by price, with other by specialists, and with the third for national order. By many of these they compete at the same time, but not for all, i.e. we receive different types of relations. We can say with some probability that in this desk of interrelation there are such edges like properties (possibilities), they are enumerated like frequency, very rarely like intensity. Actually our dates are what our studying is shown. We can simulate this temporal with the three sides and when we let it in examination and measure it in the years, we will see in this sea of relations (it is like light of town at night, these lights are demarcated by colors and direction they go). We could see how some of colors are increased, other decreased in one direction there are more in other less and actually it is the society. During the simulation it is possible to turn out some relations like harmful or disappeared. We will measure how far some relations in a sphere influence upon other, and if we have some conditions' relations in first and other in second and if after some time first are changed, but second – not, we will allow that they are independent. Actually those are the coefficients from the model, which should be changed in case of change of frequencies.

### **11.07.2008**

Meeting in Philosophical- historical faculty

Participants: Ivan Tchalakov, Petar Kopanov, Donka Keskinova, Maria Vasileva

We discussed the drafts of the reports of Petar Kopanov and Ivan Tchalakov for the seminar in Centre of Sociology of Innvoation (CSI), Ecole des Mines de Paris, France. The reports are to be sent to French partners and prof. Selia Lury.

**5-9.09.2008**

Ivan Tchalakov took part in DECOS 2008 conference, held in Zadar, Croatia. He made there a joint presentation, based on his and Petar Kopanov's reports.

On the conference Ivan Tchalakov was introduced to Branimir Cace, a young Croatian programmer who developed *ENTORAMA* – environment for modeling the dynamics of interactions between agents. After the conference he has a special meeting with Branimir with aim to investigate the possibilities for possibly using ENTORAMA for purposes of developed from Bulgarian team model. On this meeting Ivan discussed Bulgarian team approach in modeling of social and cultural dynamic using non-determined stochastic automata. It was discussed that for this time *ENTORAMA* models agents like completely determinate automata, but in it, it is set possibilities for possibly development in direction chosen from Bulgarian team. It was stipulated to contact each other and possibly Branimir Cace visits Bulgaria and/or take part in conference in CSI, Paris.

Ivan Tchalakov, Maria Vasileva  
Plovdiv, 20 September 2008