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THE ARTICULATION AND AGGREGATION OF INTERESTS IN THE ANALYSIS OF INFORMATION TECHNOLOGIES COOPERATION

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Abstract: *This work is a part of a more complex project, with the goal of offering decision making factors an efficient and flexible instrument for specific actions of the cyberwarfare, with the help of the theory of international relationships. The developed model extends the concepts of articulation and aggregation of interest between the developmental pluralist political sociology and the collective action in cooperating relations between the states, using four case studies. The articulation and aggregation of interests of industrial cooperation policy in the information's technology of the great powers include dependent variables (actor behavior) but also independent ones (perception and standard identity).*

Keywords: *articulation and aggregation of intrerests, identity theory, information technology, cyberwarfare, foreign policy*

1. INTRODUCTION

The cyberwarfare is defined as a confrontation performed with informational resources by the means of network (internet). As a relatively recent phenomenon (after the year 2000), the cyberwarfare appears between state actors and/or non-state actors in cyberspace. From these reasons, the cyberwarfare has two components: engineering (computer science) and international relations theory [1]. Choucri (2007) considers that the articulation and aggregation of interests are primary forms of typical organizations, specific to any form of political system in any historical period of humanity [2]. The international political arena can be considered an extension of the cyberspace in which articulation and aggregation of interests serve at the outlining the objectives and means of the state and non-state actors. The cyberspace becomes the confrontation field among heterogeneous coalitions, between state actors, but also non state, fact that cannot be determined by classic theories [3] which separate on more levels of analysis the interaction between actors.

By articulation of interests [4] it is described the process by which political actors defines a common interest. Same authors, by aggregation of interests, define the process by which more actors with different interests can identify a form of action than can satisfy their interests. In this study, by articulation of interests it is define the process of negotiation among more actors in order to reach a common goal. The interests of the actors, when talking about the aggregation of interests, might be divergent, but the coherence of the common means, as the participation of the actors at this system of social interaction, asks for a previous process

of articulation of interests. The analysis takes place in the context in which two great emerging powers (Russian federation and China) seek an alteration of the USA hegemony in the semiconductors domain through industrial cooperation in the military and civilian applications.

This study suggests a new approach of the articulation and aggregation of interests in which state and non-state actors can take part in. The classic paradigms of the action's sociology, collective action or the international relations, does not converge for the unitary treatment of a heterogeneous coalition formed by state and non-state actors. In this study, the treatment of coalitions will be realized by the use of *structural symbolic interactionism*.

2. INFORMATION TECHNOLOGY COOPERATION AMONG GREAT POWERS

2.1 Some aspects regarding structural symbolic interactionism. In the *structural symbolic interactionism*, the identity concept is defined by four elements: the input, the standard identity, the comparator and the output [5]. The identity is a characteristic attached to the political actor, be it a person, social group, state or non-state actor. The identity, when speaking of a state actor, is the perception that the steering group has towards the foreign policy of other states, the actions of non-state actors, other international political processes.

For example, in the case of the Russian Federation, the sanctions required by the western world in the Ukrainian are inputs involving conflicts. The Chinese-Russian cooperation to build the pipeline "Power of Siberia" is a cooperative type of input. So, generally, the inputs represent the perceptions of the leaders that are implied in the process of foreign policy have towards the international political processes with various connotations of messages that accompany these perceptions.

The identity is defined by a set of meanings or messages that the actor attributes to perception. If the sanctions of the occident have a hostile character towards the Russian government, this is defined by the standard identity.

The standard identity represents a set of meanings the actor attributes to a certain perception. For this reason, two entries of a conflictual type can have different meanings for two different actions (for one it might not mean an act of hostility and for the other one it might mean a revolting behavior).

The exit represents the actor's behavior at a certain perception towards the environment in which it operates. Its behavior can be a conflictual or a cooperate one with other state or non-state actors. The type of output is dictated by the identity comparator which analyses the perception of the actor towards the exterior environment, or standard identity.

In this research, the analysis unit is the technological cooperation in the domain of semiconductors between Russia and China, as a factor of enrichment for these two states, in relation with the USA's hegemony.

Dependent variables are the articulation or aggregation of interests between Russian and Chinese government, and independent variables are the perception of the Russian government towards Western or Chinese political interests and towards semiconductor technologies from the Western or Chinese industries. Other independent variables are the standard identities resulted from Russian political objectives or the development of the semiconductor industry in the Russian Federation (Fig. 1).

The articulation of Russian-Chinese interests comes as a result of the intergovernmental agreements in domains such as IT, finances, science-technology-education etc. Moreover, the aggregation of Russian-Chinese interests is a consequence of the common projects resulting from the intergovernmental agreements. The cooperation from the IT domain was a result of the development and applications of the microprocessors in the military domain, being performed in three main directions:

- the development of large computing systems for research and simulation of various scientific organizational-managerial processes (e.g. B2 Spirit Bomber and M1A1 Abrams battle tank);

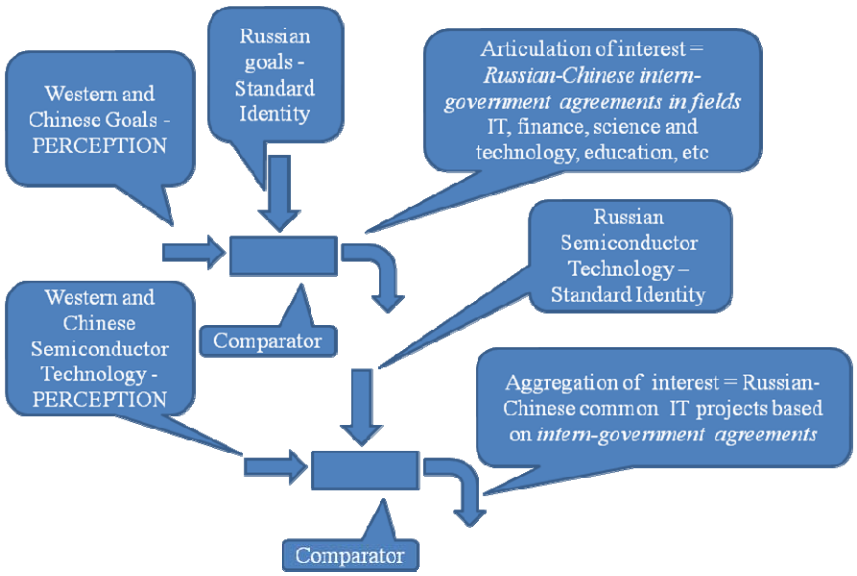

Fig.1. The relationship between independent and dependent variables of Russian-Chinese aggregation and articulation processes

- the organization of computer networks with client-server systems (architecture which originally served the administrative and logistics of a modern army);
- the introduction of equipping the Western armies with new models of weapon systems (e.g.: smart munitions or modern telecommunication platforms) which include systems of information gathering, processing/filtering, data storage and transmission.

2.2 Russian's Perception towards Western Semiconductor Technology. For the first two types of computing systems, there were imposed general use microprocessors (GUM), which are present nowadays in a variety of computing systems (e.g.: tablets, laptops, complex servers, etc.). For the last class of systems, there were used digital signal processors (DSP). These have in their components, besides the architecture of a classic GUM, specialized circuits dedicated to complex mathematic operations, needed in domains like speech processing, image processing or telecommunication processing.

Ever since the beginning, the GUM family had a competition between two families that were different by construction and still competing. The two families were Reduced Instruction Set Computer (RISC), and Complex Instruction Set Computer (CISC) [6]. Between the champions of the two conceptions there were defined, in time, the processors developed by the INTEL/AMG companies in CISC's architecture, and in RISC's one, specific to the products developed by the Sun and Motorola manufacturers. The Sun Company, being at that moment a producer of computers and not semiconductors, created an international consortium of American and Japanese producers of semiconductors which provided circuits for Sun's computers. Thus, SPARC International occurred, and the SPARC processors in RISC's architecture in the mid 80's. These would have a major impact in the development of Russian processors of casual use ELBRUS from the 90s [7].

For the specialized microprocessors type DSP, ever since the beginning there was the Texas Instruments components, which imposed via its product, TMS-320. This is a mathematic processor specialized in complex calculus. Through its specialized architecture, it represented a basic product for aero-spatial and aeronautics military electronics, but for processing television signals, audio, video or telecommunications as well. It was a patent that inspired the DSP manufacturers for the mobile phoning from the 90-2000s.

After 1980, the microelectronic revolution of microprocessors brought, as a military contribution in the military balance East-West during the period of the Cold War, an obvious advantage for NATO and USA regarding conventional weaponry. Because of the new models of semiconducting circuits, the easy

weaponry succeeded for the first time in history to change the balance of forces at the expense of heavy weapons on the battlefield.

The fall of the communist system in the 1989-1991 and the occurrence of the globalization phenomenon led to the spread of semiconductor technologies in the former socialist countries. The great beneficiary was China, Russia remaining a great incubator of patents in the domains of the two concepts (GUM and DSP) (Tab. 1).

2.3 Russian's Perception towards Chinese Semiconductor Technology. Through its profound economic reforms of modernization, China signs into a new internal stage of its internal evolution, but especially international. Via its closeness to USA, initiated in the early 70's, China comes again in contact with the Western world.

The emerge on the Chinese market of the great manufacturers of calculus technology was made after the second half of the 70s, through the big American enterprises that produced main frames (e.g. IBM, DEQ, or CrayCC) [8]. The great step occurs in the 80s, when the first manufactures of semiconductors and modern computer technology appear.

For the market of computers and servers, in China there are several famous producers, including Legend Group/ Lenovo, Founder Group, Great Wall Group, Foxcon, which produce systems based on INTERL technology in CISC architecture.

Likewise, for the market of big computer system, a great contribution was the Chinese academic environment, which began developing its own large computer systems. This paved the People's Liberation Army the opportunity to align with the new trend of the early 80s, "the Army of the third wave" [9].

For the two zones of products remembered, the People's Liberation Army could begin extensive structural reforms: reducing staff, improving logistics and resource management in the Chinese military body; the development, along with the academic and university world, of a wide range of projects locally, through the assimilation of military technology, aviation or naval. Moving the production from the USA and Europe in the Asia-Pacific area made from China the 'floor of the world' [10].

In the twenty-first century, China managed to become the main manufacturer of telecommunication systems, semiconductors, computers, and for the subcontractors of the big American producers of weaponry (Raytheon, Lockheed Martin, Boeing, Northrop Grumman and General Dynamics). An impossible thing to do in the 70-80s – to obtain semiconductor's technology from the USA, was realized by the globalization in the 90-2000s, via American producers which left to China with sensitive technology.

	GUM	DSP
Data center	China dominates technologically and Russia dominates the design experience and patents.	There are no such products.
Computer Networks	China dominates the hardware technology (servers and clients area).	The benefits of Chinese experience in the development of switching and routing, the Russian Federation, because of the experience in design, has great development potential.
Intelligent weapons	Rarely are present in such type of products.	China dominates in the sensor technology, and Russia dominates in its DSP design and telecommunication standards.

Tab. 1 The hardware potential for growth and development

The intake of American semiconductor technology on the Chinese market and the development of their own facilities, both in the printed circuit boards and semiconductors, allowed the occurrence of a public-private consortium to promote a standard Chinese microprocessor for the consumer market, but also for military applications. This *Longson*

processor (initially named *Godsone*), nowadays reached the fourth generation [11]. It presents an RISC architecture with a MIPS set of instructions and the capacity to emulate the set instruction for INTELx86.

It is considered than it will be the standard future for the products on the internal Chinese market, a fact that creates a discomfort to the Western manufacturers for their future products [12].

One of the advantages of the Chinese microprocessors in the future fight with the American ones is the independence of the Chinese industry of the necessary machinery needed for such a semiconductor factory. This was produced in three countries: USA, Japan, and Netherlands. Now China is the fourth producer.

2.4 The Russian Standard Identity – The Russian Semiconductor Technology. The Soviet Union, and later the Russian Federation, represents a strong foundation in the research and design in the electronic industry. The main obstacle was Russia's outdated technological support, compared to the semiconductor industry in the West.

After World War II, the Soviet Union, because of the ideological conflict with the USA, was deprived of access to the new technology – however, this thing was achieved by the use of the secret services. Thus there appeared the city of Zelenograd, a Valley of Silicon in USSR, where were produced the necessary integrate circuits for the industry/Soviet army, programmes of research were run and staff was personally prepared for the manufacturers in the electronic domain [13].

Even though it didn't possess a industrial base such as the American one, in a CIA report it is considered that the Soviet Union, although at 25% of the USA's production in semiconductors, had a promising potential for development and diversification of products [14]. The development of semiconductor industry in the USSR led to the development of an entire computer industry. From independent computer system or PC type to large system of mainframe type (ELBRUS) or onboard computers, aircraft, missiles or complex space techniques.

An original approach was the development of electronics on tubes and their miniaturization so that in the USSR until the late 80s there were build analog computing systems based on electronic tubes. An example of this is the board computers of MiG-23, which could perform combat missions in radioactive environments. Involvement in the large computers area was performed both in the academic and in the industrial one, resulting ELBRUS mainframes family. These were used both on the research and in the Soviet Army's logistic system.

At the end of the 90s, the ELBRUS 2000 architecture was acquired fraudulently by INTEL and integrated in the ITANIUM microprocessor's patent [15]. In the 90-2000s, the ELBRUS 2000 microprocessors work with a double set of instructions. The first set is the original ELBRUS-SPARC one and the possibility of using a written translator in the Linux core. which translates the x86 instructions (alike Transmeta processors). The system's architecture is getting better because of the borrowed elements from the SPARC architecture, but the number of processors is increased as well – two, then four, and this year it is expected a release of the system with 8 cores. Around 2010-2011, the ELBRUS 2C+ systems (which contained two unities GUM and 4 units of DSP ELVEES type – the RISC-EPIC architecture), were executing faster than the INTEL/AMD the matricial and vectorial calculus, because of the four co-unities DSP, but slower the office operations in case of operating with Word and Excel documents. They weren't more efficient than

INTEL/AMD in office processing documents, but much more efficient in the military systems – systems INTEL/AMD [16].

The ELBRUS systems with two cores are embedded in anti-missile system, missile type S-300/400, the plane model aircraft Su-32/32, Su-33, Su-35, Su T-50 PAK FA, and other antiaircraft systems like Tor-M1/2 or Patsir.

The ELBRUS family is a good basis for the development of Russian microelectronic industry in terms of the new embargo caused by the Ukrainian crisis.

Since the 90s, in Russia have appeared private companies that developed systems of DSP (e.g.: Neuromatrix), Global Navigation (GLONASS), revolutionary architectures for market products with high computing power (e.g.: the Multiclet patent); For large systems of mainframe type and data center, in Russia has developed T-Platforms, a large manufacturer company of High Power Computing. T-Platforms, with Rosnano and Roselectronica, taking the ARM Cortx-57 8-core and 64-bit over 2GHz patent processor, have initiated a new Russian processor project called BAIKAL. Along with ELBRUS, BAIKAL is the new line that Russia wants to compete the systems based on x86 technology of American type. The Kremlin wants a reconfiguration of the entire Russian state apparatus by giving up the IT infrastructure of Microsoft-Intel/AMD type and implements an infrastructure of ELBRUS/BAIKAL hardware, with a Debian Linux operating system.

In support of this project, besides „Soviet Silicon Valley" in Zelenograd, a few years ago the building of another „Russian Silicon Valley" began in Skolkovo. Architecture in the new center is not layered as it was in Zelenograd, but cluster. Technology research areas are of the technology of information, energetic technologies, nuclear technologies, biomedical technologies, aerospace and telecommunication technologies.

Analyzing the context of foreign policy of the Russian Federation, President Vladimir Putin, in a speech to parliament in 2013, defines the future lines of foreign policy as follows [17]:

- struggle against capital to evade state control through off shore activities;
- struggle against US hegemony and against Prompt Global Strike doctrine;
- struggle between traditional values and "promoting immorality, destruction of the traditional family and institutionalized dehumanization".

3. THE ANALYSIS OF ARTICULATION AND AGGREGATION OF INTERESTS

In this study it is examined the way Russian Federation understands fighting against the US hegemony and which are the processes of articulation and aggregation of interest promoted in this research.

To promote an offensive foreign policy against USA, the Russian Federation has the Chinese support. As retired Colonel Liu Mingfu wrote in his work on "Chinese Dream", China's goal is to be the exchange for the role of tomorrow's US worldwide hegemony. To do this, China is pursuing a special relationship with Russia through cooperation in the energy sphere, military, technical, scientific and technological [18].

In the nearly four decades ago of modernization, China has reached technological level near Japan, scientists and academics Chinese are attending international scientific conferences or teaching at all prestigious universities around the world. This unprecedented development of China offers Russian Federation an important ally and creates a Russian-Chinese strategic binomial as a counterweight for the Nippon-American binomial in the Pacific Ocean basin. The future confrontation in the Asia-Pacific basin, but also at the global level, depends on two important variables:

1. How will the transition of power happen between US and China? (peacefully through international institutions and political consultations and permanent diplomatic or through military confrontation).

2. How stable will be the Pivotal Global Nuclear Deterrent system? (this is based on mutual nuclear deterrence system between three actors: the Us, China and Russia).

Sutyagin (2014) considers that the reason which prompted the Kremlin to choose the path of fight against US hegemony is the post-

Cold War situation, when the international influence of the Russian Federation and its international voice had not been heard by the United States. The only leverage that Russia may limit US influence is: Russian veto right in the UN Security Council; tools like gas and oil; Russian Nuclear Triad [19].

The articulation of interests of Russian foreign policy for an international joint objective against US hegemony, was building an entire system of formal/informal relationships, bilateral or multilateral format. To challenge the US, Russian-Chinese binomial has several options of tools, not just the military. On financial terms, the two great powers pursue what is called "de-dollarization of the global economy", that the international financial system replaces the US dollar with gold transactions and to prevent a part of the economy of future international economic cataclysm produced by the big US commercial deficit. Another way is to create an alternative financial institution from IMF to World Bank, Asian Bank for Investment and Infrastructure based in Beijing [20].

In the semiconductor technologies field exist agreements of governmental cooperation between the Russian and Chinese parties (nanotechnologies, software development, communications and satellite navigation system, interoperability between GLONASS satellite navigation and the Chinese one, Beidou). Although China possesses advanced microelectronics technology in the US level, it imports from Russia due to lack of experience in certain areas of semiconductor devices, such as telecommunications and radar technique AESA/PESA (Kashin, 2014).

One area in which Chinese experience is particularly rich is that of optoelectronic devices, system cameras or sensors in various electromagnetic with special character. China has rich experience in working with Sagem of Frace. Also, cooperation with the Austrian company Continental Motors, the world's only manufacturer of drones engines with pistons (used to Global Hawks in US and at Heron by the Israelis) which allowed the development of the ambitious program with Chinese drones [21].

Aggregation of interests of the policy in the industrial cooperation in the field of manufacturing semiconductor products and IT can be achieved in three major directions of development of an army of "third wave" type, through joint projects in the area of computer systems and microprocessors.

At the Russian experience (large computer systems, High Power Computing systems), adds the Chinese (data center, software development). Future cooperation in the field of large computing system can be implemented in software through the joint development of software platforms on Linux architectures, starting from the Russian experience of ALT Linux/ Debian Linux, namely the Chinese one in Red Flag Linux. Systems in an open source type of Linux, and the software industries in the two countries can have a huge development potential in the field of office package software, databases or development tools necessary for engineering applications, tools needed for part researches and logistic organization of a modern army in the information age.

The distance between the integration capabilities of semiconductor products that develop in the West or China is relatively small, and the distance between semiconductor industries in Russia and the West can be reduced based on the development of new production capacities, and processing important equipment in China. This will ensure that in the next 10 years the Russian Federation will be independent technologically, both to West and China.

The two great powers cannot develop self-sufficiently in a global world and

interdependent, but must each find niches of cooperation, namely separation, in economic relations in the IT area.

4. CONCLUSIONS

Both the Russian Federation and china, as a standard identity in the sphere of common objectives, have the erosion of the US hegemony (to transfer decision by the US to the world countries in BRICS group). In this area the identity of the articulation of interests standardly requires a set of common objectives, such as de-dollarization of the global economy; creating alternatives to the US institutional instruments; the complementarity of the two economies and their integration.

In terms of the articulation of interests between the two great powers in the area of industrial cooperation in IT and semiconductor industry, we conclude the following:

- the area of software development in both countries is similar or even superior to many western states. Many western companies have branches in Russia and China, and these braches play strategic roles in the many upward trends of these companies.
- the hardware has the potential for growth and development in new standard identities (which the armies of the two countries can acquire) and the national semiconductor industries, are summarized in Table 1.

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