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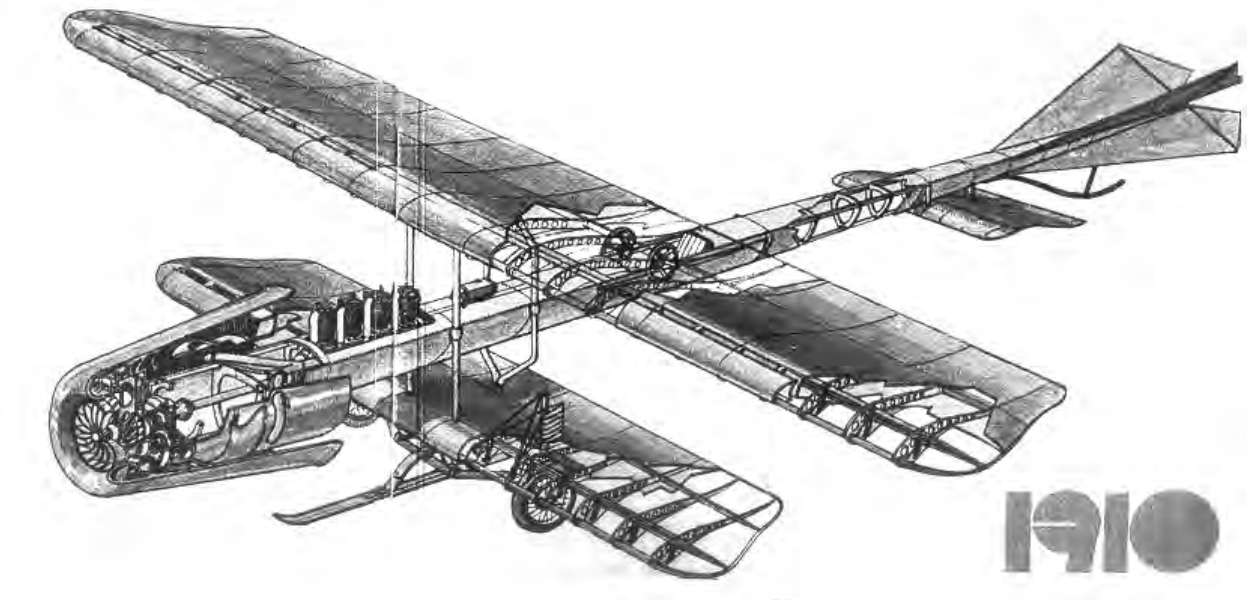

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PROOF OF CONCEPT FOR AN INFRA-CIRCULATION FLUIDIC HIGH LIFT DEVICE

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Abstract: *The paper refers to a new method for augmenting aerodynamic lift trough the use of fluidic jets acting as fluid barriers against the mainstream rather than the conventional boundary layer control jets in the current state of the art. Numerical simulations have been used to compare the proposed infra-circulation fluidic device with some of the most popular flaps configurations. In the matter of the lift to drag ratio and maximum lift coefficient, the proposed variation shows good comparative results especially at low angles of attack. Further development of the concept may yield efficient high lift devices for light aircraft and also for stealthier UAVs.*

Keywords: *super circulation, high lift device, infra circulation, Coandă effect, flaps*

1. INTRODUCTION

State of the art fluidic high lift devices rely on the Coandă effect to either increase the circulation around the airfoil (super circulation) or to prevent or delay boundary layer separation (BLC) . As shown in many experimental Jones et al (2006), T.D. Economu & W.E. Milholen (2008), Buonanno (2009) and numerical studies Rumsey & Nishiro (2011), Guo et al. (2011), Dragan (2012), the fluidic methods are effective for a wide range of applications, including supersonic wings L. Robert & J.Englar (1975).

In theory, lift is linked to the circulation parameter Γ, trough the following relation

$$L=\rho\cdot\Gamma\cdot v \qquad (1)$$

It is therefore sensible to increase the circulation in order to achieve more lift. This, however, is not the only means to higher lift. This paper explores the possibility of using fluidic thin jets to perturb the mainstream in a controlled manner in order to locally decrease the static pressure on the top of the airfoil.

In V. Dragan & V.Stanciu(2012), a fluidic barrier is placed perpendicular to the mainstream, obstructing the flow locally and creating a positive pressure gradient in the underside of the airfoil.

Because the barrier is fluidic, rather than a solid surface, the drag that would be generated on a solid barrier is not transmitted to the airfoil, resulting in a high lift to drag ratio and also an increased maximum lift coefficient.

In this paper, a more radical approach is taken, by placing a cross flow jet near the leading edge on the upper side of the airfoil; a low pressure recirculation bubble is formed on the top of the airfoil leading to higher lift. It is clear that the concept is only applicable to very low angles of attack in order to avoid the increased induced drag (pressure drag) that would arise.

Figure 1 depicts the main differences between a fluidic barrier and a solid barrier placed at the same location on the airfoil.

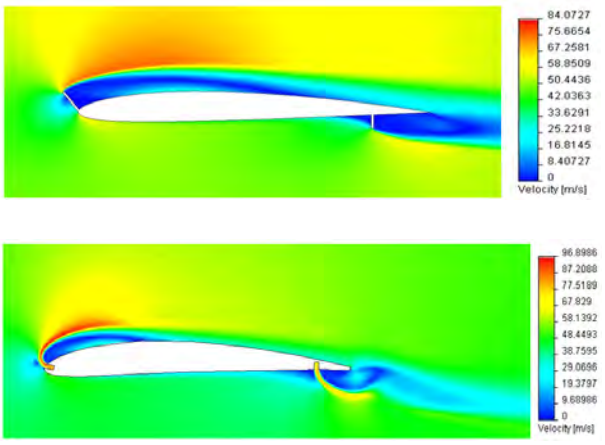


Fig. 1. Comparison between solid and fluidic barriers near the airfoil

Table 1. The forces acting upon the airfoil and the solid barriers

Forces on Ox	[N]
Drag on airfoil	-25,2441
Drag of underside barrier	17,9225
Drag of underside barrier	56,5192
Total Drag	**49,1976**
Forces on Oz	[N]
Lift on airfoil	392,59
Lift of underside barrier	-0,913544
Lift of underside barrier	46,5615
Total Lift	**438,23796**
Lift to Drag ratio	**8,9077101**

The proposed method sets itself apart from current fluidic high lift methods, introduces through his patents by Ion Stroescu (1925, 1927[a] and 1927[b]), synthesized in the lecture H. Dumitrescu (2010), in that it uses the jets not in order to control the boundary layer but to perturb the flow around the airfoil in a controlled manner. In other words, although the jets are thin and located in similar locations across the airfoil, the effect obtained – due to the blowing angle – is completely new.

2. THE COMPUTATIONAL STUDY

2.1 The case setup

For the numerical simulations, a k-epsilon realizable RANS model was used which is known to be more accurate in describing cross flows (Fluent™ User Guide). The mesh is two-dimensional and structured around a common sized airfoil chord of 1 m, which is placed in a stream at 50 m/sec. The test bed for this concept is a NACA 4410 airfoil with and without the fluidic spoiler (near the leading edge) and fluidic flaps (near the trailing edge). Multiple configurations of trailing edge and leading edge flaps have also been tested in order to compare their lift to drag ratio and wing loading with the ones obtained by the fluidic spoiler proposed herein.

By using a fluidic barrier, two effects contribute to the increased lift:

1. The increase of circulation around the airfoil due to the fluidic flaps (super circulation)

2. The decrease of the static pressure on the top of the airfoil due to the fluidic spoiler placed near the leading edge. The proposed term for this effect is infra-circulation, since the circulation near the recirculation bubble is lower than the one encountered under normal conditions.

An important note on the effect of the bubble near the leading edge is that the low pressure zone actually leads to an apparent thrust force (or, more appropriately, a negative drag component). This, however, should not be considered a gain (or erroneous result) since it is more than compensated by the thrust of the jet forming the barrier itself. For the calculation of the global lift to drag ratio, the following equation should be used:

For the fluidic spoiler

$$\frac{F_Z total}{F_X total} = \frac{F_Z + \sin\beta \cdot [A_{fantei} \cdot (P_{static} - P_{atm}) + \dot{m} \cdot u_j]}{F_X + \cos\beta \cdot [A_{fantei} \cdot (P_{static} - P_{atm}) + \dot{m} \cdot u_j]} \quad (2)$$

A_{slot} = blowing slot surface area
F_Z = lift of the airfoil surface
F_X = drag of the airfoil surface
P_{static} = static pressure of the jet
P_{atm} = atmospheric pressure
u_j=blowing jet velocity
m = mass flow

Where β is the sum of the angle of attack α and the angle of installation of the fluidic slot ζ,

$$\beta = \alpha + \zeta \, . \quad (3)$$

and for the fluidic flaps

$$\frac{F_Z total}{F_X total} = \frac{F_Z + \sin\alpha \cdot [A_{fantei} \cdot (P_{static} - P_{atm}) + \dot{m} \cdot u_j]}{F_X + \cos\alpha \cdot [A_{fantei} \cdot (P_{static} - P_{atm}) + \dot{m} \cdot u_j]} \quad (4)$$

In this particular case, we have chosen to use both fluidic systems in conjunction and, therefore, must use both equations to obtain correct interpretations of the results.

2.2 The fluidic jet barrier simulation

Two cases were studied; the first has the boundary conditions described in Table 2, the results in Table 3 and the flow field details illustrated in Fig. 2 and Fig. 3.

Table 2. Boundary conditions and global results for the fluidic barrier setup 1

Boundary conditions	
Front jet velocity	80 m/s
Low jet velocity	75 m/s
Air speed	50 m/s
Results	
Loading [Pa]	1578,12921
Lift to Drag	75,0448675

Table 3. The defalcated force balance acting on the airfoil due to the fluid barrier influence

F_x	[N]
Drag	-18,7338
Negative thrust of frontal fluidic jet	+22,4681
Total	**+3,73**
F_z	
Airfoil Lift	264,259
Negative Lift of frontal fluidic jet	-1,03
Positive Lift of underside fluidic jet	+16,9
Total	**280,2**

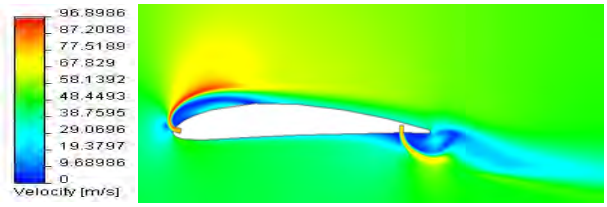


Fig. 2. Velocity flow field influenced by the two fluidic jets blowing against the mainstream

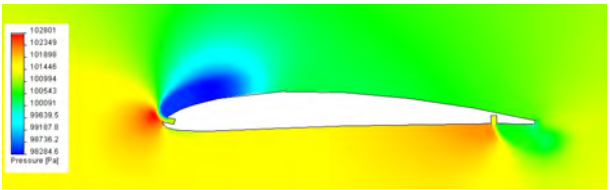


Fig. 3. Static pressure near the airfoil

Table 4. Boundary conditions and global results for the fluidic barrier setup 2

Boundary conditions	
Front jet velocity	100 m/s
Low jet velocity	90 m/s
Air speed	50 m/s
Results	
Loading [Pa]	1885,4784
Lift to Drag	77,660152

Table 5. The defalcated force balance acting on the airfoil due to the fluid barrier influence

F_x	[N]
Drag	-24.45
Negative thrust of frontal fluidic jet	+30,168776
Total	+5,7187759
F_z	
Airfoil Lift	264,259
Negative Lift of frontal fluidic jet	-1,6204436
Positive Lift of underside fluidic jet	+24,40258594
Total	**370,15478**

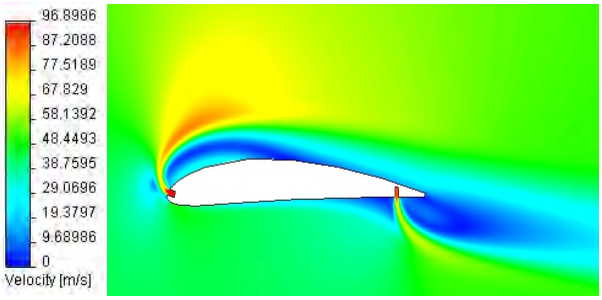
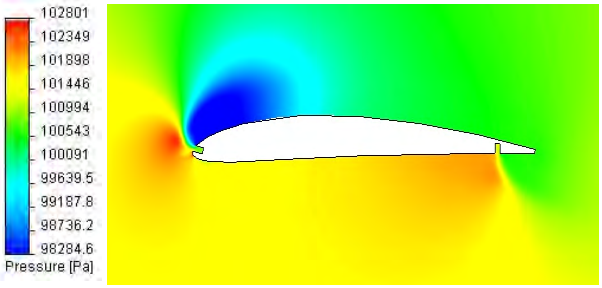


Fig. 4. The velocity flow field surrounding the airfoil.



Note that the air forced to have a curved trajectory is accelerated, reminiscent of the Coandă effect.

Fig. 5. The low pressure bubble forming on the top of the airfoil as a result of the fluidic spoiler interaction with the mainstream

2.3 Comparison with other know high lift devices

In his paper, Smith (1975) presents the basic principles of multiple element airfoil theory. The paper presents the Handly-Page eight-element airfoil which, Smith concludes, is the limit to which multiple element airfoils can be designed efficiently.

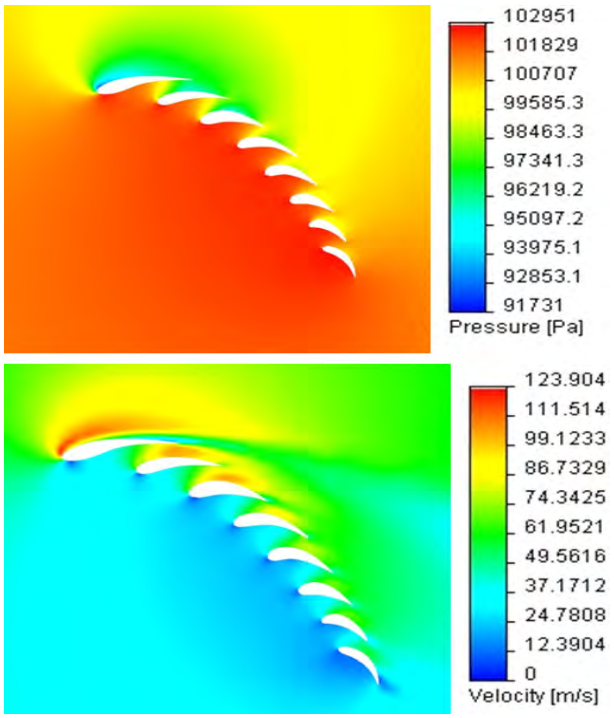


Fig.6. Handley-Page eight element airfoil Velocity and Static Pressure flow fields

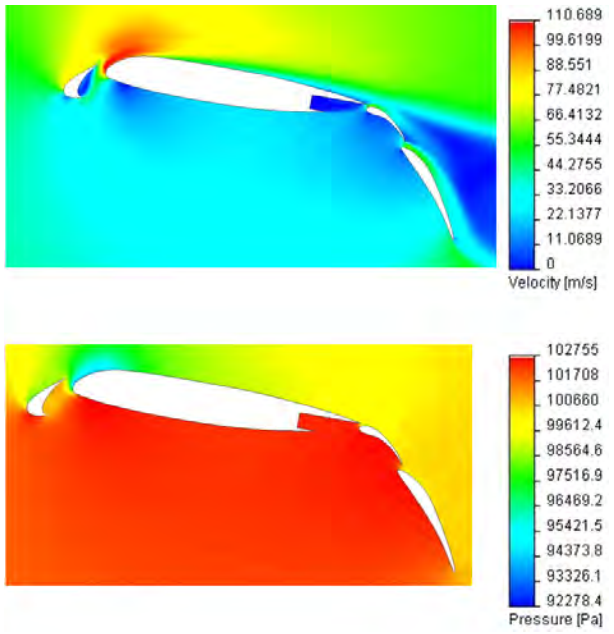


Fig. 7. Velocity and Static Pressure flow fields for 15º angle of attack of a bull-nose L.E. (Kruegger flap) + two slot T.E. flaps

In the User Manual of Zeusnumerix™ (2012), two more flaps configurations are discussed, the geometry was recreated and the same CFD methods applied in order to simulate the flow around them.

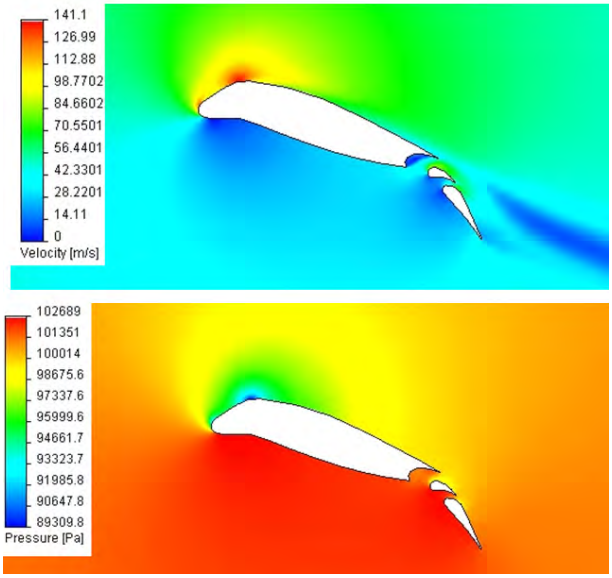


Fig. 8. Velocity and Static Pressure flow fields for the droop-L.E. + 2 slot T.E. configuration (adapted geometry from zeusnumerix).

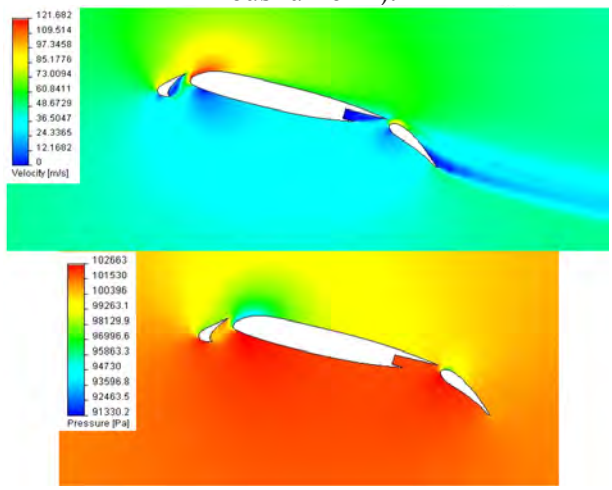


Fig. 9. The velocity magnitude flow field around the airfoil with single slot flaps and slat (adapted geometry from zeusnumerix)

From vanDam (2002), another geometrical configuration has been extracted and tested under the same conditions.

3. CONCLUSIONS

Through the use of a fluid barrier on the inner side and of a fluidic spoiler on the upper side of the test bed airfoil, higher wing loadings and increased lift to drag ratio are obtained. The charts below illustrate the differences between the baseline airfoil while comparing them with other commonly used high lift devices.

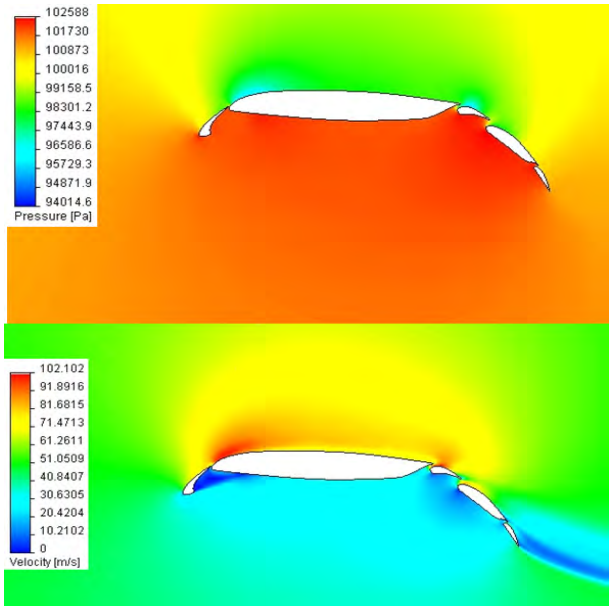


Fig. 10. Velocity and Static Pressure flow fields for the bull-nose L.E. and three slot T.E.

Two fluidic configurations have been used, having the physical parameters described in the tables in section 2. It is apparent that the velocity of the fluidic jets is a relevant factor since the amount of air entrained by them is directly influenced by the velocity magnitude. It has been observed that for a fluid barrier jet velocity of 1.5 times the free stream velocity, downstream of the airfoil there is no periodic vortex shedding. A possible explanation is that, at these values, the jet begins to behave similar to Spence's fluidic flaps which work on a completely different system in which the entrainment of air is more important than the local flow disturbances.

From Fig.1, which illustrates the velocity flow field, it is apparent that, due to the curvature of the streamlines, the fluid is accelerated as it passes the fluidic barrier. This behavior, explainable by the balance between the viscous, pressure and centrifugal forces is manifested both on the fluidic barrier and the fluidic spoiler. As such, a new facet of the Coandă effect may be studied, namely the Coandă effect on fluid surfaces. The two histograms below show that the use of both the fluidic spoiler and the fluidic barrier lead to higher section loadings and lift to drag ratios for the null angle of attack even in the case of an asymmetrical airfoil – such as the NACA 4410.

Possible applications of the principles described in this paper are aircraft which require a higher wing loading – and have a high landing speed – which can be reduced through the use of the fluid barriers. Also, stealthier high lift and/or maneuvering devices with no moving parts are potential applications of both the fluidic barrier and the fluidic spoiler presented here.

Table 6 – Synthesis of the CFD results

Case	Loading [N/m^2]	L/D
NACA 4410	362.92278	17.455465
NACA 4410 fluidic 1 AoA=0	1577.2984	75.044868
NACA 4410 fluidic 2 AoA=0	1885.4784	77.660152
Handley-Page	3072.802	7.668583
Kruegger 3 element flaps AoA=15	2851.662	7.061685

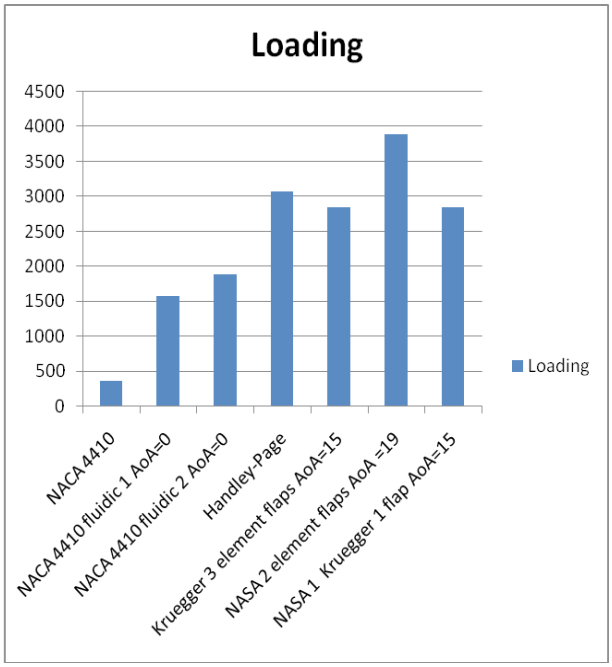


Fig. 11. Section loadings for the simulated high lift device configurations

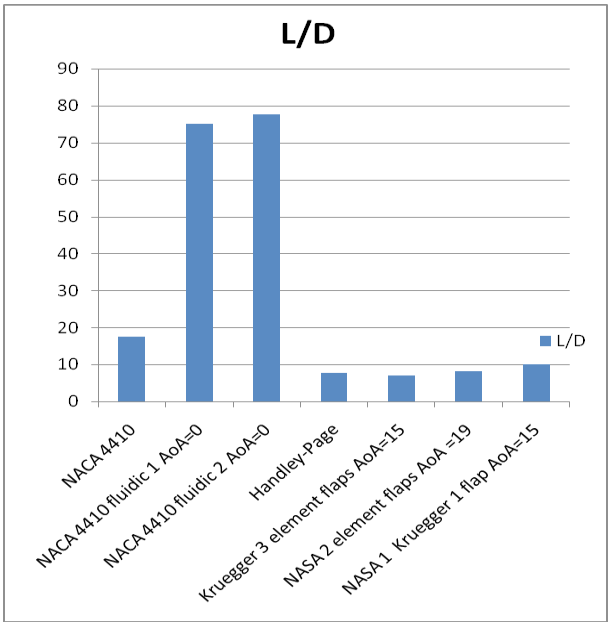


Fig. 12. Lift to Drag ratios for the simulated high lift device configurations

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FRACTAL ANTENNA SYSTEM WITH MIMO CAPABILITIES

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Abstract: *The article presents a fractal stripline antenna system with MIMO capabilities. It was designed for microwave use and it has wideband properties, a wide directivity chart, low emission power and an average gain over 5 dB.*

Keywords: *fractal, antenna, directivity, gain, MIMO*

1. INTRODUCTION

This article presesents a fractal antenna with MIMO capabilities [1][2][3]. This frequency-independent antenna consists of four spiral elements. The paper also presents analytical calculations for tge geometry of the antenna, as well as for the electromagnetic properties. These are accompanied by experimental results.

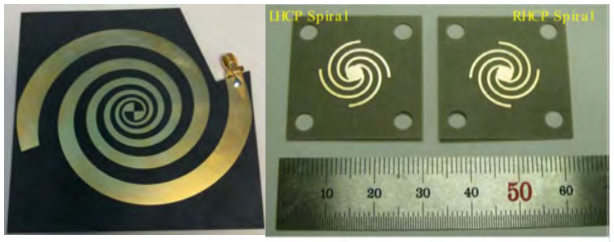


Figure 1 MIMO spiral antenna examples [4],[5]

2. DESIGN AND IMPLEMENTATION

2.1 Circular polarization effect

The design of the antenna is based on four fractal sectors which comprise of Archimedan spiral elements.

The analytical calculation that describes the circular polarisation through a degenerative Archimedan spiral (θ less than 5°) is presented next, starting from the classic spiral relation (1).

$$r=a+b\theta \quad (1)$$

with r and θ – polar coordinates

$$r = a + b\theta \Rightarrow \theta = \frac{r-a}{b} \quad (2)$$

Considering θ':

$$\theta' = \frac{r'-a}{b} \quad (3)$$

where

$$r' = k \cdot r \quad (4)$$

Thus $\theta' = \frac{k \cdot r - a}{b}$.

Rearranging:

$$\theta = \frac{r}{b} - \frac{a}{b} \quad (5)$$

and

$$\theta' = \frac{k \cdot r}{b} - \frac{a}{b} \quad (6)$$

By expressing the difference between θ' si θ, the circular polarization effect is emphasized:

$$\theta' - \theta = \frac{r}{b} \cdot (k-1) \quad (7)$$

where k-1 and k are rotation coefficients.

For a very narrow θ, $r \cong a$, the spiral equation thus becoming a circle equation in polar coordinates. In this case, θ is very narrow (5°) and this means that its coordinates are between those of the circle and those of the Archimedan spiral. Therefore, the antenna can combine the functioning of fractal circular and spiral elements, thus widening the emission-reception bandwidth.

Considering a narrow opening angle of π/n ($n \leq 8$ is acceptable) where the radiant field is constant and Φ an arbitrary reception angle (figure 2), The variation of the reception phase is determined as follows:

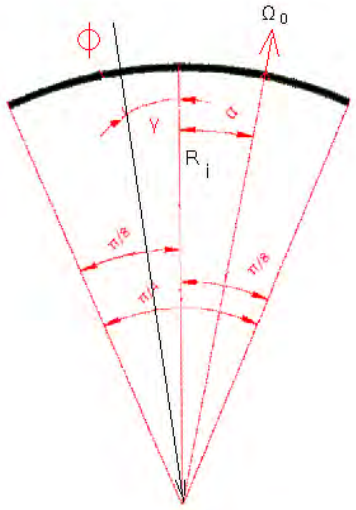


Figure 2 Φ an arbitrary reception angle, Ω_0 the direction of the polar axis and R_i the radius of the i[th] element

$$\alpha \leq \pm\frac{\pi}{8}\ ,\ \beta_i = \frac{2\pi}{\lambda_i} \tag{8}$$

$$|A| \cdot e^{j\phi} = e^{j\beta_i R_i} \cdot \sin\theta \tag{9}$$

$$A = |A| \cdot V_i \tag{10}$$

$$V_i = e^{j\phi} \cdot e^{j\beta_i R_i} \cdot \sin\theta_i \tag{11}$$

$$V_i = e^{j(\phi+\beta i R i)} \cdot \sin\theta_t \tag{12}$$

For the fascicle: $V_0 = \sum_{i=1}^{n} V_i = e^{j\phi} \cdot \sum_{i=1}^{n} e^{\beta_i R_i} \cdot \sin\theta_i$,

where n is the number of radiant elements.

$$V_0(\Omega) = V_0 \cdot \cos\alpha \tag{13}$$

$V_i V_i$ represents the propagation direction for reception. The $\theta\theta$ angle is between V_i and the plane of the antenna surface. V_0 is the total angular phase variation. The expression for reception of E and H waves is:

$$E;H = |E;H\ |V_0|E;H\ |V_0 \tag{14}$$

representing the panoramic reception.

Geometric calculations.

The propagation speed expression is:

$$v = \frac{1}{\sqrt{\varepsilon_r}} \cdot \lambda \cdot f \Rightarrow \lambda_{real} = \frac{\lambda}{\sqrt{\varepsilon_r}} \tag{15}$$

$$\frac{R_i}{R_{i+1}} = \frac{L_i}{L_{i+1}} \tag{16}$$

where $R_i R_i$ is the radius from the centre to the i[th] segment of the antenna [6].

$$L_i = \frac{\pi \cdot R_i}{2} = \frac{\pi}{2} \cdot R_i \Rightarrow \frac{\pi}{2} \cdot R_i = \frac{\lambda_{real}}{4} \Rightarrow$$

$$\lambda_{real,i} = 2 \cdot \pi \cdot R_i \tag{17}$$

$$L_i = \frac{\lambda_{real,i}}{4} \tag{18}$$

$$c = \frac{\varepsilon_s}{d}$$

$$S = \sum_{i=1}^{6} L_i \cdot \Delta l \tag{19}$$

where S is the total radiation surface for a fractal sector.

$$\lambda_{\min} = 2\pi \cdot R_0 \tag{20}$$

$$\lambda_{\max} = \sum_{i=1}^{6} L_i = \frac{S}{\Delta l} \tag{21}$$

2.2 Antenna design.

The antenna comprises of four fractal spiral sectors which are displayed in axial horizontal and vertical symmetry (figure 4). The geometry of a sector is presented in figure 3 and the distance between the centre and the first spiral element is R_0= 24 mm (distanta de la centru pana la primul element fractal spiral). The witdh of the radiant element is 2 mm and the dielectric width between the radiant elements is also 2mm. Thus the distance from an element to another is 3 mm (for example, R_5= 39 mm and R_6= 42 mm). The antenna was made using a dielectric board with $\varepsilon_r = 2.2$, and the thickness h=0.8 mm. AutoCAD 2008 was used for the design.

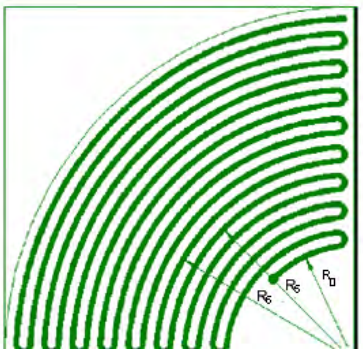


Figure 3 One of the four spiral elements

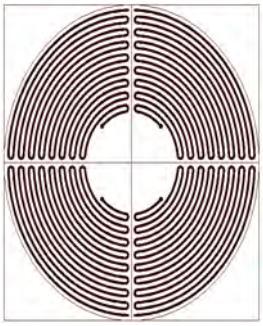
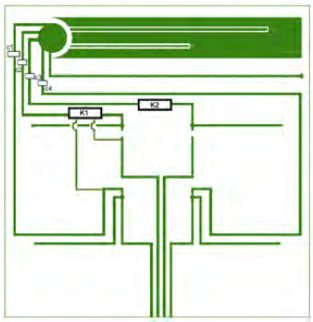


Figure 4 a) the front of the antenna

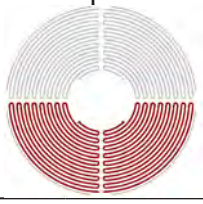
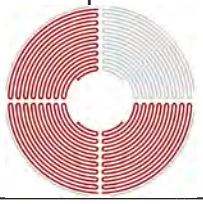


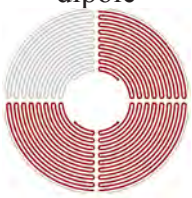
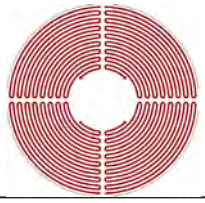
b) the back of the antenna

3. EXPERIMENTAL RESULTS

The MIMO combinations were derived from the structure. The selection of the desired functional combination is made by using the K1 and K2 couplers (figure 5). Table 1 presents the combinations for which the experimental results are provided.

Table 1. Combinations of radiant elements

Mode	K1	K2	Mode	K1	K2
M00	0	0	M01	0	1
Fractal symmetrical dipole 			Fractal asymmetrical dipole 		
M10	1	0	M11	1	1

Fractal asymmetrical dipole	Circular polarization fractal antenna
	

The measurements were made for a characteristic impedance of 50 Ω.

3.1 VSWR

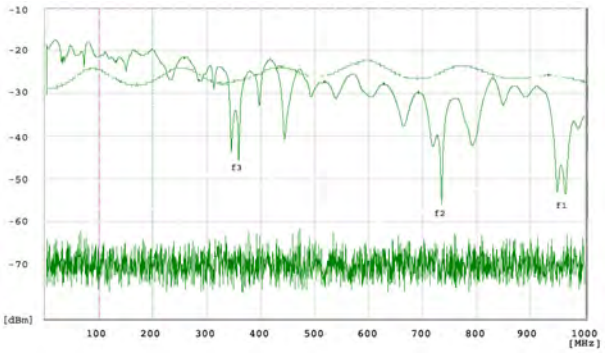


Figure 5 Measured VSWR below 1 GHz

3.2 Simultaneous emission and reception

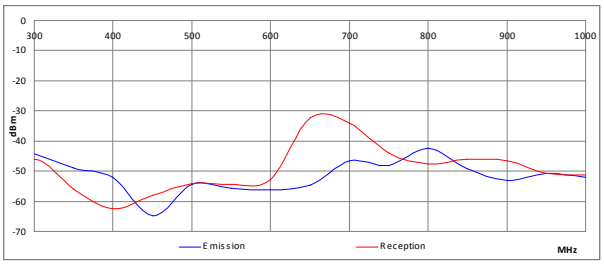


Figure 6 Mode M00 simultaenous emission and reception 300-1000 MHz

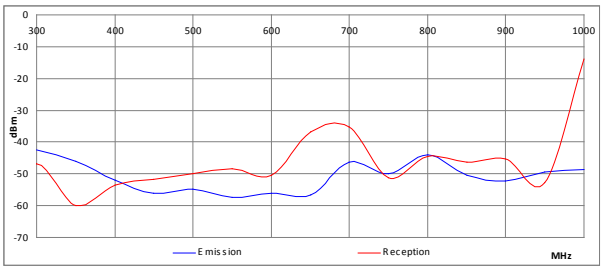


Figure 7 Mode M01 simultaenous emission and reception 300-1000 MHz

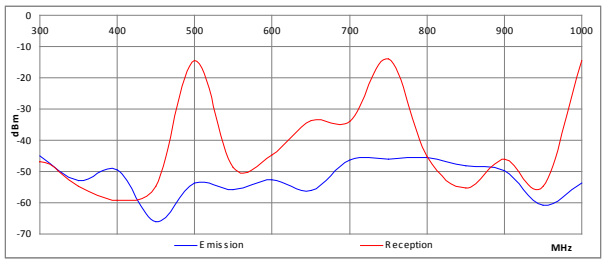


Figure 8 Mode M11 simultaenous emission and reception 300-1000 MHz

3.3 Reception

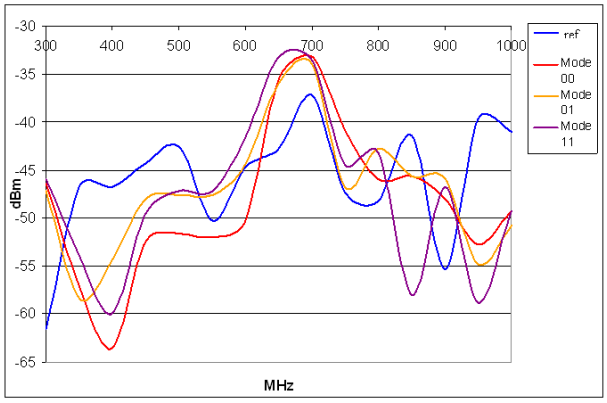
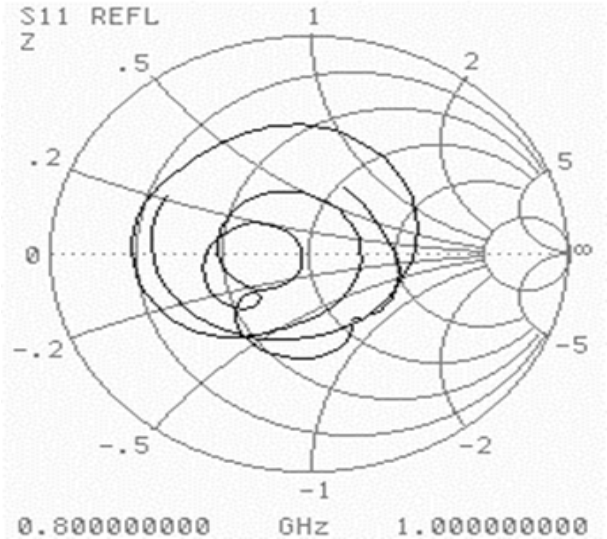


Figure 9 Reception chart 300-1000 MHz for three functional combinations and a reference antenna (blue line, Aaronia HyperLOG 6080)

3.3 Reflection coefficient S11 and the resistance – reactance distribution for the most representative operating bandwidths

Mode 00 as per table 1.



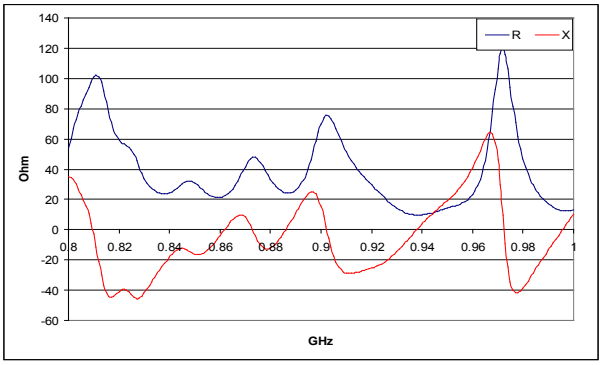
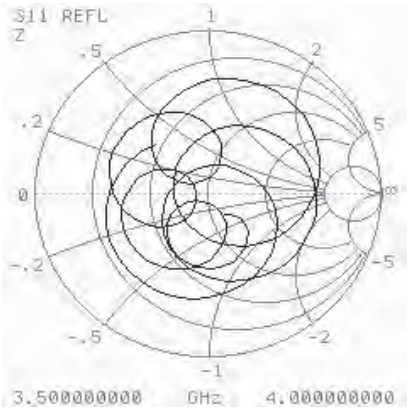


Figure 10 S11 parameter and resistance-reactance distribution for 800-1000 MHz



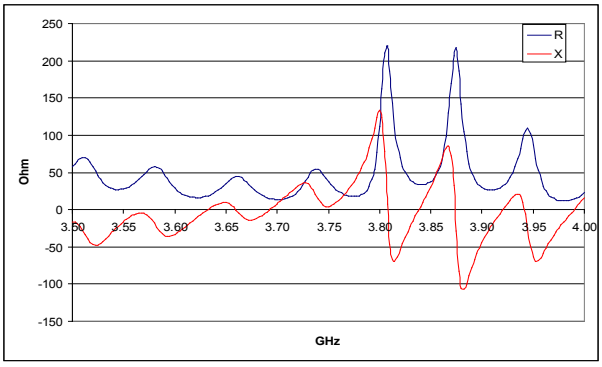
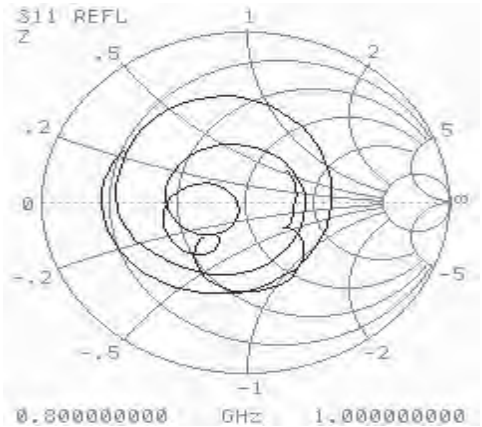


Figure 11 S11 parameter and resistance-reactance distribution for 3.5-4 GHz

Mode 01 as per table 1.



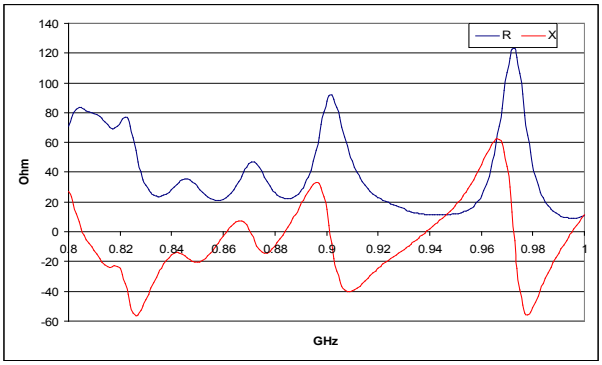
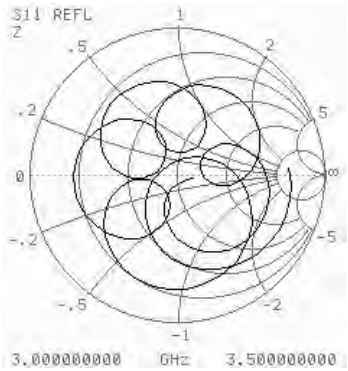


Figure 12 S11 parameter and resistance-reactance distribution for 800-1000 MHz

Mode 11 as per table 1



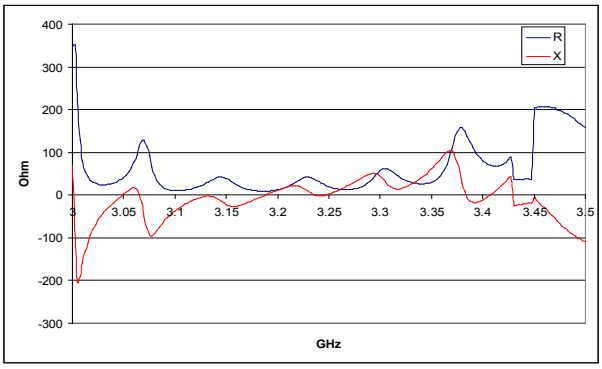
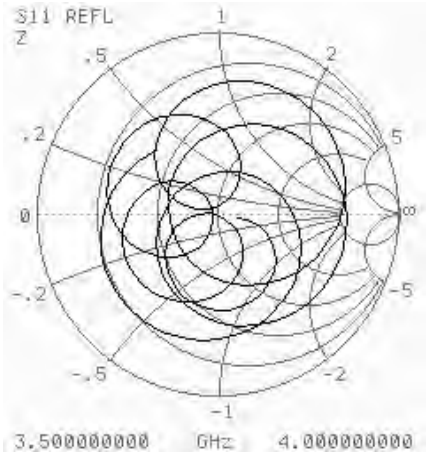


Figure 13 S11 parameter and resistance-reactance distribution for 3 – 3.5 GHz



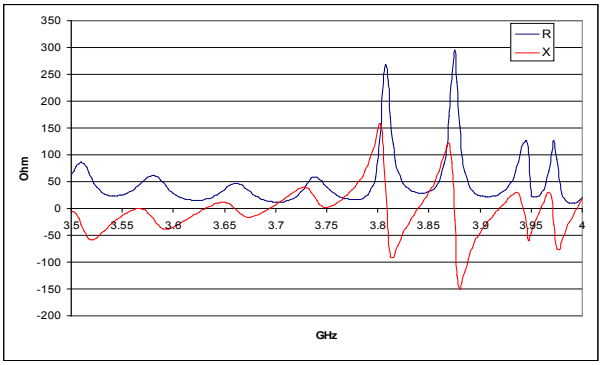
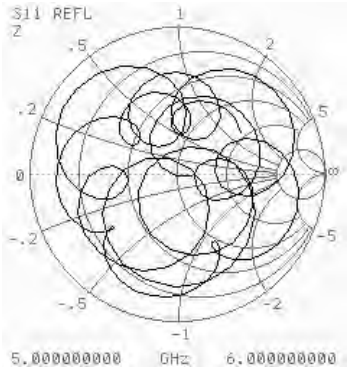


Figure 14 S11 parameter and resistance-reactance distribution for 3.5 – 4 GHz



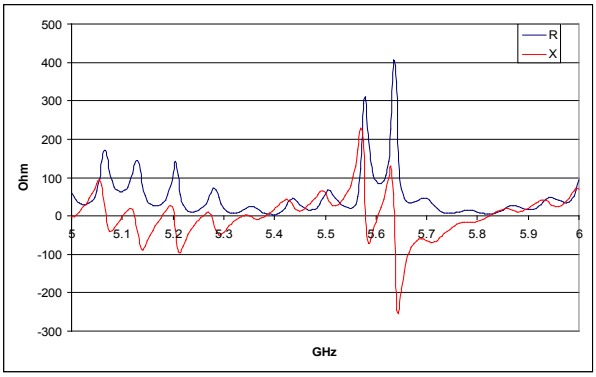
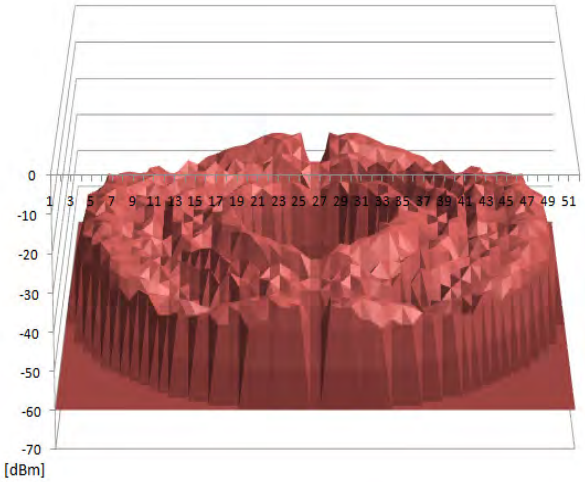
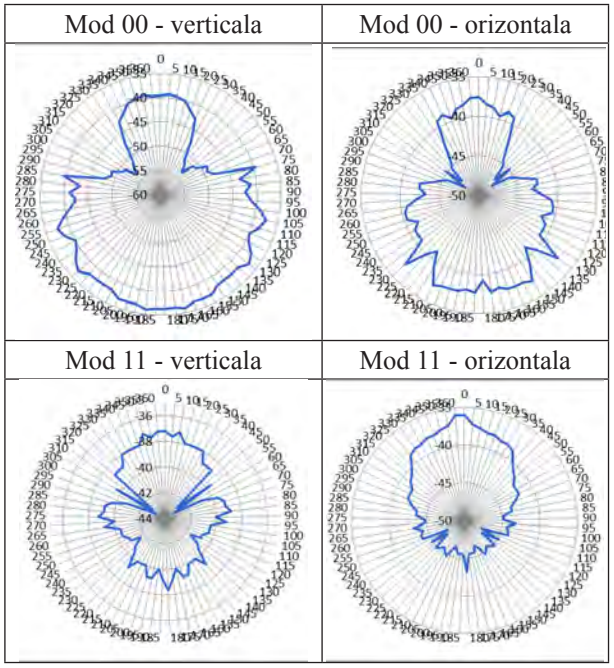


Figure 15 S11 parameter and resistance-reactance distribution for 5 -6 GHz

3.4 Radiant E field distribution



3.5 Directivity diagram



4. CONCLUSIONS

The next conclusions can be derived regarding the antenna. The antenna has quasi-panoramic reception (following the variation of γ angle – figure 2), an average gain of 5 dB (which is relatively constant) and it is independent of the emission-reception directions (circular polarization).

Its uses range from 4G mobile communications (due to panoramic emission-reception in quadrature architecture) to base stations, wideband emission-reception for communication relays, as well as radio-navigation.

Other advantages stem from it being lightweight and employing a simple manufactuing technology.

One of its disadvantages is a limited emission power, due to its geometrical dimensions. Furthermore, it is not recommended for use in directive antenna systems.

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BROWSER-BASED HOME MONITOR USING ZIGBEE SENSORS

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Abstract: *A study of how to implement a web application used to remote monitor parameters read by wireless sensors placed in the rooms of a home is described in this paper. The main goal of our work was the migration of certain features of the MoteView proprietary software package (provided by the manufacturer) in this web application and adding new features or fixing some existing drawbacks. The system created by us displays on a secured web page home specific environmental parameters, and indicates the status of the set values also, sending e-mail alert to the user when various events occur.*

Keywords: *ZigBee,web browser, database, mesh network, MoteView*

1. INTRODUCTION

Many applications have been developed over the years, which aim to transform homes and office spaces into comfortable and safe places. This requires sensors and equipment to gather data read by them (temperature, humidity, pressure, light, etc.). However, these data must be sent remote in some cases, to make decisions and act in the opposite direction, to change the (environmental) parameters.

Browser-based term in the title is the first clue to the fact that we chose to monitor these parameters via a web application. The major advantage of web applications in comparison with a classical application is the facile management of clients. In the case of applications for which there are many clients, there is no need for each client to install software packages that can sometimes reach large dimensions. Another considerable advantage of web applications is the software / hardware platform dependence removing. These can be accessed using almost any existing browser from workstations which can run under Linux, Windows or Mac.

As data acquisition from sensors evolved, specific standards appeared.

One of them, which we use in this paper, is the one designated to low range wireless sensor networks (IEEE 802.15.4).

LR-WPAN (Low Range - Wireless Personal Area Network) is used for information transmission over relatively short distances and transfer rates up to 250 kbps. The IEEE 802.15.4 standard, for these kinds of networks, defines the physical layer and medium access sub-layer for wireless connections having low-speed data transfer between devices with low power consumption. The main objectives of LR-WPAN are ease of installation, the secure transfer of data, and a reasonable battery life, operating on short ranges, at low price while keeping a simple and flexible protocol.

ZigBee, defined for IEEE 802.15.4 is a standard for low power and low-speed wireless networks, designed specifically for remote monitoring and control applications.

While IEEE 802.15.4 can only support 255 nodes in the physical network, The ZigBee network addresses support on 64-bit extended this number to 65,000 nodes. A ZigBee device can be Full Function or Reduced Function. A ZigBee sensor network must contain at least one Full Function device that will act as network coordinator; we used only Full Function equipment.

2. IMPLEMENTATION OF THE MONITORING SYSTEM

2.1 Equipment used. Mesh topology involves a special network of ad-hoc type (in our case), highly scalable, which is self-forming and self-regenerating, reliability and lifetime being maximum. For these reasons we have chosen for our application such topology, using six nodes (MICAz motes) and a gateway

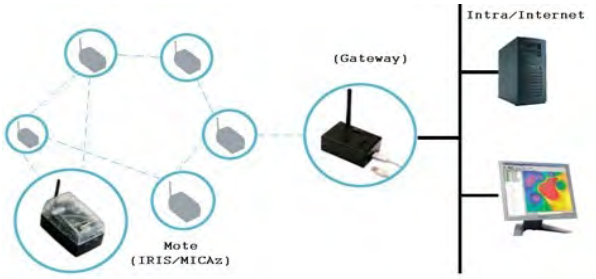

Fig. 1. Mesh network built with the Crossbow development kit

Our web application picks and interprets the measurements performed by the sensor network. The WSN Professional development kit used by us (manufactured by Crossbow Technology, Inc.) includes six preprogrammed MICAz mote sensor, plus a gateway (MIB520 with extension), a data acquisition board (MDA300) and a programming board through USB (MIB520).

A MICAz mote and its block diagram are presented in the Fig. 2. Each MICAz sensor includes a MTS400/420 acquisition board on which various sensors (temperature, humidity, pressure, light, acceleration on OX and OY axis, or even a GPS module) are integrated (Fig. 3).

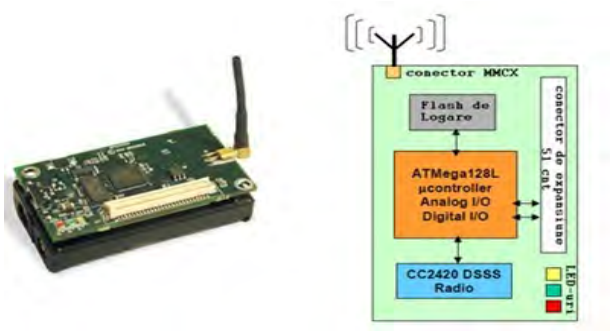

Fig. 2. MICAz and its block diagram

The radio processor (MICAz Processor Radio - MPR2400) uses a transceiver (2400 - 2483.5 MHz) for ZigBee, in accordance with 802.15.4 standard, which it is integrated with a micro-controller ATMEGA128L.

Programming these nodes is performed using the MIB520 (Mote Interface Board) interface, with USB port.

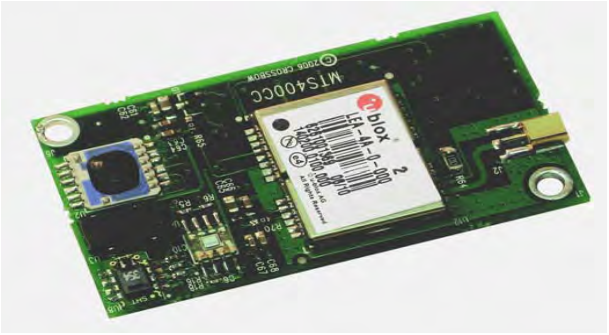

Fig. 3. Sensors board MTS400/MTS420

Features offered by MTS420 boards allow a wide range of applications ranging from a simple weather station to a full network of environmental monitoring nodes, and can be part of more complex systems (HVAC - Heating Ventilating and Air Conditioning).

MDA300 is a versatile acquisition board that is suitable for applications monitoring ambient parameters. This board has two integrated sensors (humidity and temperature) and allows connection of additional sensors on the digital and analogue channels. In order to detect possible break-ins in the home, a magnetic contact door / window was connected to the MDA300 acquisition board, only for demonstration purposes. Instead, other types of sensors may be connected, depending on the application. The magnetic contact was connected to A2 analog channel as shown in the Fig. 5.

Fig. 4. MDA300 acquisition board

As long as the contact is closed, the voltage measured on channel A2 is 0 V, and when the contact is open (door is open) the measured voltage will have values in the range 1.4-1.7V.

The web application reads these values from the database, and when the magnetic contact opening is detected in the specified timeframe, it triggers the intrusion alert, and sends this alert to the user via e-mail.

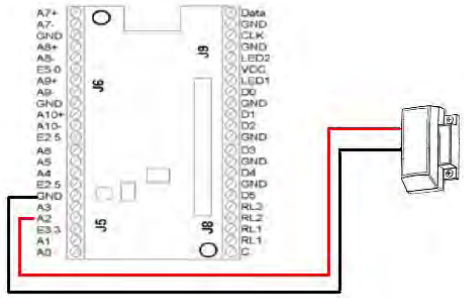

Fig. 5. Connecting magnetic contact to the MDA300 A2 analog channel

2.2 The MoteView Solution

The Crossbow kit contains both the hardware and software required for the installation of a network monitoring ambient parameters such as temperature, lighting, humidity and pressure. The solution provided by Crossbow can be divided into three levels: Sensors, Server and Client. The first level consists of a mesh network (6 nodes + gateway) and is designed to collect data and provide them to the server.

The Server level is represented by the Xserve application. This is a daemon that runs continuously on a PC station and is designed for buffering and translation data provided by the wireless sensor network.

Xserve serves as main gateway between the wireless sensor network and visualization and analysis applications. Essentially, Xserve provides data routing to and from the mesh network, and also superior level services of analysis, transformation and processing of such data. Superior level services are customizable using XML-based configuration files and loaded plug-ins.

To achieve our web application Xserve method was used for insertion into the database. The server can introduce into the results table a new row for each set of values received from a sensor or can update rows, also.

The Client level is represented by the MoteView application which is responsible for the graphical interface. This level provides to the user data collected by sensors using common units such as degrees Celsius, Lux, percentages and Volt.

Moteview can be used to view data acquired from a single type of acquisition board at a time. If there are several MICAz motes within the mesh network, each of them including different acquisition boards (MTS400/MDA300/ MTS420, etc.), the application cannot show to the user data acquired from all boards. This is one of the major drawbacks of the proposed Crossbow solution.

The following are other disadvantages of the Moteview application:

- Requires relatively large space on the hard drive (about 200 MB);
- If it is desired to monitor the wireless sensor network from multiple computer stations, the MoteView application needs to be installed on each of these;
- The port that the application uses is an insecure port (9001);
- Platform dependent. MoteView is only compatible with the following operating systems: Microsoft Windows XP Home Edition, Microsoft Windows XP Professional, Windows 2000 (only ServicePack4);
- Minimum resolution on which can run is 800x600.

2.3 Our solution

Our goal was to develop a web application that takes some of the functionalities offered by MoteView, provides new functionalities and eliminates the disadvantages listed above.

The developed web application has the following advantages:

- Small size (approx. 2 MB);
- Minimum requirements (no special computing power needed to run the web application);
- Platform independence: instead MoteView, the client will be a web browser. Thus, an unlimited number of users can monitor the sensors network;
- The web application can run on any operating system;

- Instead of port 9001, port 80 is used;
- Configurable warning function were included;
- The web application sends by e-mail notifications to the user;
- Security features were implemented (eg. forced entry alert).

2.4 Storing and accessing data

XServe inserts all the data acquired from the sensors to a PostgreSQL database. PostgreSQL is a relational database and is available for free under Open Source license. Data from the sensors are placed in the MTS400_results table; each data acquisition board has a corresponding table in the database. The web application accesses this table through a DAO (Data Access Object); a second DAO is used for the intrusion alerts table. DAO methods are useful for opening the connection, executing the query and closing the connection to the database.

A critical point in the development of the home monitoring web application was the knowledge of the database structure provided by Crossbow. Detailing the structure of the database is not subject of this paper, in which only new items added will be presented.

One of the top features of the developed web application is represented by the configurable alerts. The user can set different alert conditions using the acquired values from the sensors. For example, the application can be configured to trigger an alert if the temperature in one of the rooms in which it was placed a sensor falls below a certain threshold.

To implement this mechanism, storing additional data in the database is imperative. Database used by Xserve cannot be altered. Any changes can make the select or insert operations performed by the server to return errors. In order not to compromise the integrity of the system, we created a supplementary database (Alert), which stores the data used by the alerting function.

The new database contains four tables: Alert, Alert_log, Room and Sensor_user.

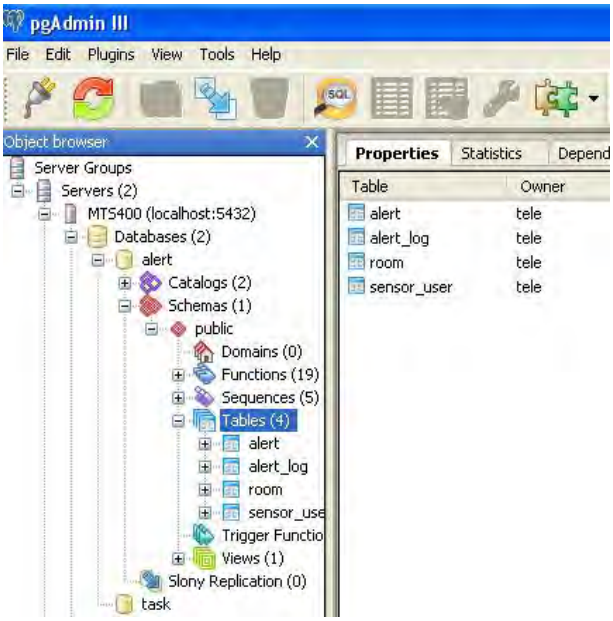

Fig. 6. The Alert database, including 4 tables

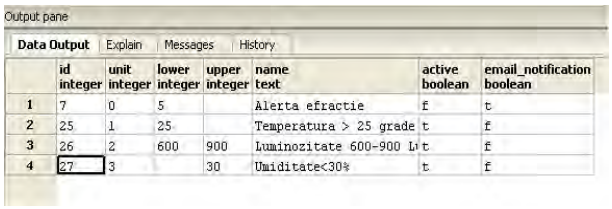

Fig. 7. The Alert table

The significations of the parameters are: *Unit*: is the sensor identifier that triggers the alert; *Lower and Upper*: margins where alerts are triggered; *Name*: the alert title; *Active*: Boolean variable (true/false) indicating whether the alert is active or not; *Email_notification*: flag that determines if the alert will be sent to the user by e-mail.

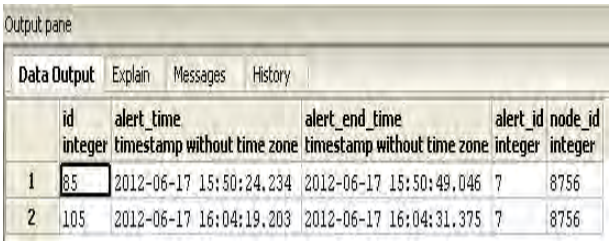

Fig. 8. The Alert_log table

In Fig. 8 the table that stores the alerts displayed on the main page of the web application is presented. The alert_time and alert_end_time fields are used by the application to assess the alerts status. An alert where only alert_time field is set appears as active on the web interface.

The Room table is used only to create a relationship of association between the nodeID and the name of the room where the sensor is placed. User can rename each nodeID accessing the settings page (Fig. 9).

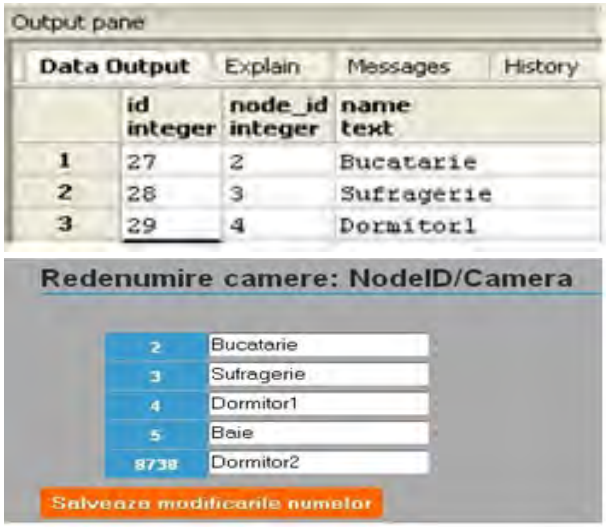

Fig. 9. The Room table and the configuration section from the web application

2.5 Application functionalities

A mandatory element of any web application is the login page.

Fig. 10. The Login page for the web application

User passwords are stored in encrypted form in the database. Encryption mode is based on hash plus jump. A password encrypted in this way is almost impossible to compromise. The Sensor_user table where user data were stored can be seen in the Fig. 11.

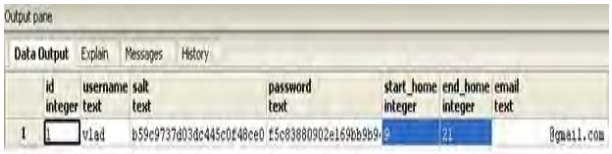

Fig. 11. The Sensor_user table

One of the developed application options is the alerts setup.

The user can create an alert condition using monitored parameters, fields of maximum, minimum and the alert name. In the Fig. 12 the form to add alerts can be seen.

Fig. 12. Form to add alerts

Thus, you can set up alerts such as frost alert (temperature < set threshold), mold alert (humidity of the room > threshold set), etc.

The user can set up alerts so that in a certain time interval, when is opened the door of the room where the ZigBee sensor that was attached to the MDA300 board is placed, it will trigger the intrusion alarm.

The last 8 alerts are constantly displayed on the main page of the web application. If the user has chosen not to receive e-mail notifications, in the registry it can be viewed active / completed alerts, the rooms where the alerts were triggered, and time of enter / exit the alert state. The application home page is shown in Fig. 13.

Users can configure the alerts for which they want to receive e-mail notifications. The e-mail generated by the application includes: the time the alert was triggered; the sensor for which the alert has been configured (temperature, humidity or light); the room where the alert has been triggered. Through a Java class (MailSender) the web application is configured to send e-mail notifications both into alertness and exit from this state.

On the main page of the application, in addition to the measured values of each node, RSSI (Received Signal Strength Intensity) is displayed in a graphical mode. In this way, any sensor failure can be immediately observed. RSSI is extracted from the node_health table and converted to dBm. This indicator will constantly inform the user about the quality of the wireless link between the node and gateway.

In Fig. 13, lines marked with green color symbolize the normal parameters, the ones marked with pink indicate the values that are out of the set ranges, and the red lines indicate that there was an intrusion alarm.

Fig. 13. The web monitoring application homepage

3. CONCLUSIONS & FUTURE WORK

This paper presents the steps that we followed and equipment used to set up a remote house monitoring system. Due to the fact that it is very scalable, this system can be extended to a wide range of applications. Information about the developed application source code can be obtained from the authors, who considered that it is not subject of this paper.

Considering the application description above, we believe that our work has immediate practical applications and offers a wide range of benefits. The future work will consist of:

- Changing the application so that it will be transformed from a house monitor into an automation application, using ZigBee sensors + actuators;

- Installing the application on a dedicated server and configuring the remote access to it;

- Building a complex domotic system around our application.

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CLOUD PERSPECTIVE ON RECONFIGURABLE HARDWARE

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Abstract: *This paper focuses on the potential applications of reconfigurable hardware in cloud computing architectures, proposing a specific approach, identifying the sensitive areas that can benefit from hardware-favored implementations and also the challenges that reconfigurable computing brings along.*

Keywords: *Cloud computing, reconfigurable hardware, FPGA, services, virtual networks*

1. INTRODUCTION

Cloud computing, the next stage in the Internet evolution, is an architecture of computing concepts that aims to deliver all types of distributed resources (from computing power to computing infrastructure, applications, and business processes) to the customers as services. Cloud services include the delivery of software, infrastructure and storage over the Internet in a scalable way (according to the user demand), either as components or integrated platforms.

This new and revolutionary type of computing is changing the way companies use technology, re-shaping the consumer-provider relationship by reducing spending on technology infrastructure ("CapEx – Capital Expenditure"), streamlining processes, improving accessibility, minimizing the need for licensing new software and improving flexibility (including restructuring of the "OpEx – Operational Expenditure"). Basically, the cloud aims to eliminate many of the sensitive constraints that the traditional computing environment suffers from: space, time, power and cost.

The various types of cloud services are forming three distinct models or layers:

Infrastructure as a Service (IaaS) offers compute, storage and switching resources in a rather unstructured way (so, the OS – Operating Systems – are also "in the clouds").

Platform as a Service (PaaS) offers development configurations and environments, (more structured than IaaS, usually with local OS).

Software as a Service (SaaS) offers purpose-built business applications (assembled on a "canvas" from stand-alone consolidated software modules, remotely accessible, for instance, via APIs – Application Programming Interfaces).

As cloud computing is showing a rapid development, the attention turns to the hardware resources needed for providing cloud services.

Shifting more and more local applications to the cloud requires massive volumes of data on the servers to be delivered to users, while guaranteeing the security and availability of the data. However the growth of the datacenters brings on a new limitation: energy consumption, which needs to be surpassed by an efficient scaling of the resource use.

Due to these issues that need to be overcome, portable and embedded computing devices have been developed and are being integrated in the cloud systems [Romanca, Ogrutan, 2011].

Thus, hardware designers are facing new challenges with regard to the area and power requirements, but also design constraints like the time-to-market. In this context, a reconfigurable hardware, closer to the physical layer, is a promising asset that has the potential to help overcome many of the challenges mentioned above.

However, there are also a series of particularities specific to reconfigurable hardware that need to be addressed before a possible mainstream adoption of this technology in cloud systems.

2. RECONFIGURABLE HARDWARE AND THE CLOUD INFRASTRUCTURE

Reconfigurable hardware refers to devices that can change their physical circuitry on the fly. This offers a great deal of flexibility when implementing circuits, since the reconfigurable hardware resources are configurable (and usually re-configurable) after fabrication, making it possible for a single hardware device to implement various circuits.

Reconfigurable hardware is the building block for the newly emerged discipline of reconfigurable computing, which uses reconfigurable devices (like FPGAs – Field Programmable Gate Arrays) for computing purposes. These systems have impressive performances, with a series of strong points like:

-High speed;

-Reduced energy and power con-sumption (the circuitry being optimized for the application);

-Reduced size and component count.

These reconfigurable devices have a great potential due to their high adaptability and scalability reducing the need for dedicated circuitry, optimizing energy consumption and minimizing the hardware resources needed for a specific application.

Cloud computing, being new and evolving, provides some interest areas where reconfigurable hardware could help due to strong-points mentioned above.

The growths in the cloud computing market lead to the moving of more and more data from local storage to datacenters in the cloud for computation. This huge workload raises issues regarding efficiency that need to be addressed at the hardware level.

Energy consumption is one of the main concerns when dealing with growing data centers.

Reconfigurable hardware like FPGAs have the potential to offer a better scalability than one can obtain using traditional hardware resources.

Dynamic hardware resources are the latest step in the evolution of computing. Reconfigurable computing devices can be used as datacenter components that can easily scale and adapt to the fluctuations in load and demand that are a characteristic of cloud systems.

Another asset that reconfigurable computing brings is the potential of System-on-Chip (SoC) integrated structures with application-customized topology. This high configurability enables Network-on-Chip (NoC) architectures to be implemented with reconfigurable network topology and embedded protocols. Such architectures combine packet-switching with circuit-switching resources, thus gaining in flexibility while maintaining high energy-efficiency rates. These applications aim to ease the increased stress on network components (servers, routers) that the growth of cloud systems causes. [Stensgaard, Sparsø, 2008]

2.1 Content distribution networks

One of the applications where reconfigurable hardware could play an important role is in the implementation of dynamic content distribution networks (CDNs). These networks are a crucial part of today's Internet. A CDN is a distributed network of servers and file storage devices deployed to place content and applications in geographic proximity to users, that is reducing the load on the origin site infrastructure and the bandwidth.

Cloud and CDNs work together in a holistic system that meets the demands from content delivery as well as economical computing power [Internap, 2013]. While cloud platforms are responsible for computing dynamic content, the large amounts of static content are being delivered by CDNs, with only the dynamic portion needing to come from the origin.

CDNs have the potential to act like catalysts for cloud acceptance by addressing several concerns regarding: security, availability of service, scalability and performance.

In order to cope with the increasing volumes of data that need to be delivered, considerable efforts are underway for improving CDN structure and web caching.

Research in this area has shown that besides different optimization strategies, an effective approach is the use of reconfigurable hardware in implementing the CDN servers [Cheng et al., 2012]. In this proposed implementation, most of the scheduling and downloading tasks are implemented in hardware, instead of the traditional software implementation. This highly customized approach makes the CDN web server reconfigurable, and with a higher throughput and lower power consumption [Cheng et al., 2012].

2.2 Service protocols

Another area in which reconfigurable hardware is showing great potential in assisting cloud computing is the hardware implementation of the web service protocol stack. These protocols are used in the definition, localization and implementation of web services, and also in the service interaction. Basically, the stack consists of the following four protocols:

-Service Transport Protocol;
-XML Messaging Protocol;
-Service Description Protocol;
-Service Discovery Protocol.

The hardware-based (FPGA) web servers that implement this protocol stack are proven to show an accelerated web processing rate, shortened web processing time and enhanced throughput. This is due to the pipelined hardware implementation of the protocol stack that is more efficient than the traditional software based implementations, and also the direct hardware execution – without an OS [Yu et al., 2011].

2.3 Virtual networking

Cloud computing's main motor is virtualization, which makes the rigid physical component available as a service, easy to use and software-managed. One of the benefits of virtualization is the sharing of network and storage devices, which increases the degree of utilization and makes application migration between hardware resources an easy task.

Network virtualization overcomes a series of challenges of the growing cloud, making it possible for multiple logical networks to be implemented over a single physical infrastructure, thus sharing network resources over multiple virtual networks. The traditional approach, software network virtualization, beside its known strong-points (high flexibility and support), suffers from the nature of the general purpose microprocessors which limit the potential performance. Configurable hardware solutions include ASIC (Application-Specific Integrated Circuits) and FPGA. With flexibility being a key asset when talking about virtual networks, FPGA emerges as a better choice, since it overcomes ASICs with regard to service customization, due to its re-configurability. The FPGA-based network virtualization model uses the chip to implement virtual routers that benefit from the platform's scalability, and can be easily customized thanks to reconfiguration.

Despite limitation in resources when having to cope to a large amount of virtual networks, integration of FPGA-based virtual routers with software- based virtual routers is a potential solution that overcomes all the above issues [Unnikrishnan et al., 2010].

3. APPLICATIONS IN CLOUD SECURITY

Along with the many advantages that cloud computing has, there are also some important problems that need to be addressed. Most of them are related to existing vulnerabilities in the cloud model of openness, which lead to an urgent need for data security and privacy protection issues to be solved as soon as possible. In a cloud system data is being shared between client and provider, and this raises challenges in the privacy protection of sensitive data. There are concerns about controlling what information can be revealed and who has access rights over the Internet to that piece of information. Our perspective has to go beyond traditional models of data-security and channel-security.

Securing the cloud infrastructure is a process relying on trusted computing and cryptography, and it needs the strict separation of sensitive data from non-sensitive data.

In cloud systems, the client does not have exclusive administrative control over the system where the data is placed. This could lead to a potential lack of trust, since data can protected by encryption only in transit to/ from the datacenter and while in storage, but while in use, the data can be accessed by a malicious system administrator or other parties. Clients expect strong security guarantees to be provided as part of the Service Level Agreement (SLA) by the cloud operator. The traditional software-based systems offer some security, but are vulnerable to attacks from the inside. Conventional systems use a unified memory space for program and data, an architecture that offers little memory protection to attacks that can alter the program memory at runtime.

In our perspective, shifting the trust from software to hardware is a key improvement that reconfigurable FPGAs can bring to cloud data processing. By running sensitive applications or algorithms on the FPGA, the data is protected from malicious intruders that can affect the PC or the OS.

Research in this area has shown that reconfigurable hardware can solve most of the traditional system's flaws, due to its built-in bitstream protection, isolated memory spaces and computing parallelism.

The FPGA implementation of a cloud security mechanism provides a protected area within the untrusted environment for securely performing sensitive operations. Since data can be transferred safely to the device, here it can be manipulated without possible interference from outside factors (other system components or an administrator). Thus, the FPGA can play the role of a trusted computing device that decrypts the input cipher-text, performs the computational operations and re-encrypts the results. This potential implementation acts like an emulation of a homo-morphic encryption, which is a technique under development that allows computations to be carried out on the encrypted data, with the decrypted result matching the same result of operations performed on the original data [Eguro et al., 2012].

This type of encryption, if implemented efficiently, would have great applications in the outsourcing of private computations, which is the case with cloud computing.

Although an effective and fully operational homo-morphic encryption algorithm has not been developed to this date, in our perspective the use of reconfigurable hardware like FPGA should enable the behavior of such an encryption to be emulated due to the computational closed environment that this device offers.

Using FPGAs for cryptography in the cloud also has important social implications since it could lower the cost of these services, this way contributing to a more widespread adoption of anonymity [Madhavapeddy et al., 2011].

4. RECONFIGURABLE HARDWARE AS SERVICES

Access to the reconfigurable resources through web services makes it possible to integrate reconfigurable computing and distributed applications in a synergy that brings a series of benefits for both technologies.

This could be the chance for reconfigurable computing to make the jump from a niche activity with low accessibility to a mainstream computing technology used together with other heterogeneous elements like GPU (Graphical Processing Units) and DSP (Digital Signal Processors) in cloud systems.

In our perspective, by applying SOA – Service-Oriented Architecture concepts to reconfigurable computing platforms, a minimizing complexity of the redesign and improved flexibility in IP (Intellectual Property) Core extensions support can be achieved.

This could potentially solve the problems that FPGA researchers still have with regard to issues like high design complexity and limited programmability. Providing IP Cores and hardware processors as function units available through web services, with a high degree of parallelism, this interaction can ease achieving high levels of performance with improved energy consumption management [Wang et al., 2012].

The major side-step in integrating reconfigurable platforms like FPGAs in cloud computing systems is the engineering effort of developing hardware applications that cloud customers have to deal with.

HDL – Hardware Description Languages might prove to be unattractive for cloud customers to use in their application development. In our perspective, the engineering of "hardware description services" is needed as new programming models in order to offer a development environment with high-level language compilers. Integrating such an environment in the cloud could make reconfigurable hardware more attractive for application deployment [Sergiyenko et al., 2013].

4. CONCLUSIONS

Cloud computing presents unique benefits for the IT industry but brings along also specific challenges. Given the complexity and rapid growth of the cloud computing infrastructure, and also the issues regarding the integrity and security of the data, the focus is turning more and more towards the underlying hardware resources.

In this paper we have identified the areas where implementations using reconfigurable hardware like FPGAs have the potential of bringing important benefits to cloud computing and we suggested specific approaches in a service-oriented perspective.

Reconfigurable computing implementations have great adaptability and scalability potential, which are important assets in cloud systems due to the permanent variations in load and demand. Another area where this approach represents an asset is the cloud security, where shifting from software to hardware is a major improvement to the traditional security models, the computational closed environment that devices like FPGAs could unlock encryption possibilities that are unachievable with traditional software implementations.

To fully benefit from the huge potential of reconfigurable hardware, and also to make "hardware description services" widely available for developers, this paper proposes focusing on the development of integrated development environments with high-level language compilers. Nevertheless, in our perspective, methods of cloud configurability could transcend from macro- to micro-structures, being „scalability-independant".

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SOLUTIONS FOR ROAMING AND INTEROPERABILITY PROBLEMS BETWEEN LTE AND 2G OR 3G NETWORKS

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Abstract: *Roaming is a fundamental requirement of any mobile network, since this is one of the main purposes why communications are "mobile". Voice, SMS and data have to be available flawlessly to subscribers who are roaming between networks. Having currently evolved from 2G and 3G to LTE, interoperability issues arose. LTE's modus operandi is fundamentally different (routing is done by Home Routing and Local Breakout, charging processes have differences) so it is not only a problem of linking the core protocols of LTE and 2G or 3G. It would be best to synchronize the two technologies' principles. This paper seeks to find solutions for interoperability between LTE and legacy 2G or 3G networks.*

Keywords: *LTE, 3G, roaming, interoperability, MAP, DIAMETER, policy and charging*

1. INTRODUCTION

In the mobile telecommunications world processes such as Mobility, Roaming , Real Time Charging must run flawlessly between different networks [Balan, Sandu, 2010]. Roaming intra-LTE networks has its own structure, but roaming between LTE and 2G or 3G networks and vice-versa encounters incompatibility issues. Since nowadays most of the mobile networks have only just begun to implement LTE, the roaming issue is of actual importance [Kreher , Gaenger, 2010]. This paper aims to find implementable solutions that should facilitate roaming, mobility and interoperability between different networks.

2. VIEWS ABOUT ROAMING FROM LTE TO 2G OR 3G

2.1 LTE networks which evolve from 2G or 3G

In this case, the most approachable solution is CS (Circuit Switching) fallback when interworking and roaming functions are required. Another solution is Single Radio Voice Call Continuity (SRVCC) which can bring a voice call from the VoIP/IMS packet domain to the 2G or 3G network circuit domain.

2.2 LTE-only networks with roaming to 2G or 3G

Since LTE has no intrinsic voice support, roaming to 2G or 3G networks is essential. This paper discusses solutions for roaming and interworking.

2.3 CDMA/TDMA networks which evolve to LTE - whose interoperability solutions are also approached below

3. PROBLEMS IN NOWADAYS' MOBILITY MANAGEMENT

Regarding mobility and location management and authentication, the Mobile Application Part (MAP) [ETSI] which deals in mobility management messages, is used to communicate between the Home Network and the Visited Network. MAP is based on SS7. On traditional TDM with E1/T1 links, SIGTRAN or SS7 over IP is used.

LTE does not use SS7, but DIAMETER which acts as a replacement for MAP, and supports all its functions [Rumney, 2013].

The architecture for LTE to LTE roaming (red) is shown in Figure 1.

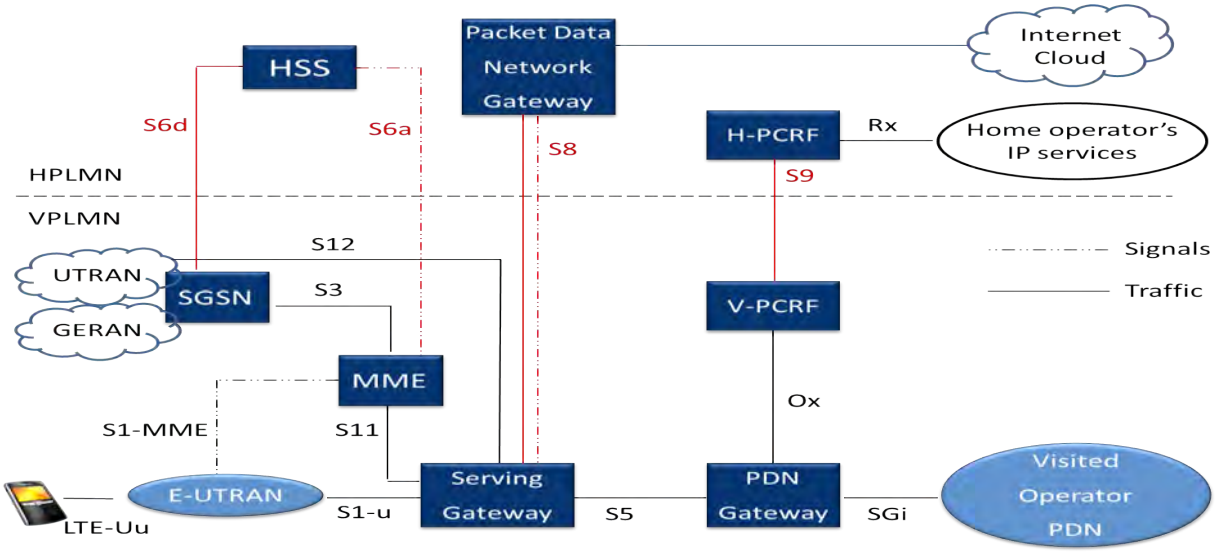

Fig. 1. LTE Architecture. Roaming relevant interfaces are in red

3.1 Mobility Management

Interface S6a enables transfer of authenticating and subscription data between MME and HSS (over DIAMETER) for authorizing user access to the LTE network. Generally, the AAA interface is used for authenticating and authorizing. Interface S6d enables AAA related information exchange between SGSN and HSS over DIAMETER protocol.

3.2 Policy Control and Charging

Interface S9 transfers QoS policy control and charging information between the Home Policy and Charging Rules Functionality (HPCRF) and Visitor PCRF, based on the DIAMETER protocol. The PCRF is responsible for supporting the detection of service data flow, the charging system based on this data flow and policy enforcement. It is, in short, the policy manager of the LTE technology.

3.3 GTP Traffic

Interface S8 carries GTP V2 traffic between the Serving Gateway and the PDN Gateway, which are similar to the SGSN and GGSN,respectively, in the 2G or 3G network.

3.4 The DIAMETER protocol – adapted for LTE [3GPP], supports mobility management for LTE – LTE interworking (DIAMETER-to-DIAMETER) and for LTE – 2G or 3G interworking (DIAMETER to MAP).

DIAMETER uses Attribute Variable Pairs (AVPs) for exchanging data. AVPs encapsulate data depending on the application type. The AVPs are different from vendor to application, and the ones defined in [3GPP] are translated into DIAMETER commands and can be seen in Table 1. For network implementation, mapping DIAMETER to MAP messages, as seen in Table 2 below, is not sufficient. The network processes and parameters have to be synchronized too.

3.5 Authentication

There are different types of authentication methods depending on the network. A 2G network uses the Comp 128 algorithm. There are the SRES, RAND and Kc triplets.

Table 1. DIAMETER commands for LTE

AVP Code	Message	Command
316	Update – Location-Request / Answer	ULR / ULA
317	Cancel – Location-Request / Answer	CLR / CLA
318	Authentication – Information-Request / Answer	AIR / AIA
319	Insert Subscriber Data – Request / Answer	IDR / IDA
320	Delete Subscriber Data-Request / Answer	DSR / DSA
321	Purge – UE-Request / Answer	PUR / PUA
322	Reset – Request / Answer	RSR / RSA
323	Notify – Request / Answer	NOR / NOA

Table 2. MAP to DIAMETER mapping

MAP Message	DIAMETER Commands
Send Authentication Info	AIR / AIA
Update GPRS Location	ULR / ULA
Cancel Location	CLR / CLA
Purge MS	PUR / PUA
Insert Subscriber Data	IDR / IDA
Delete Subscriber Data	DSR / DSA
Reset	RSR / RSA
Update GPRS Location Info	NOR / NOA
Activate Trace Mode	IDR / IDA
Deactivate Trace Mode	DSR / DSA

These triplets are computed by the User Terminal or the visited network, encapsulated in the MAP message and sent to the home network.

A 3G network uses the Milenage algorithm. Here are the XRES, RAND, CK, IK, AUTN quintuplets which follow the same path as those from the 2G network.

A 4G network uses the AKA (EPS authentication and key agreement) procedure for authentication. AKA is used to agree on a KASME key. The EPS AKA procedure is always controlled by the network but the UE can refuse the EPS authentication message. First, CK and IK are computed by the Universal Subscriber Identity Module, and then used by the UE in order to compute a new key known as KASME. Afterwards, KASME is saved in the network security module and in the UE memory, while it is attached to the network. The problem resides in the fact that MAP does not support the parameters described previously. Therefore, roaming between a LTE-only network and a 2G or 3G network and vice-versa is not possible because in the first case the 2G or 3G network is not able to supply the 4G authentication parameters, and in the vice-versa case DIAMETER does not support 2G or 3G's authentication parameters.

3.6 Location Update

The first message seen in a core network is the Location Update message, regardless of the protocol used, be it MAP or DIAMETER. There are important differences between the 2 networks' location update procedures.

In GSM MAP (see Figure 2), the Insert Subscriber Data message usually transports the full subscriber profile, or, if the subscriber profile does not fit into a single message, the Visitor PLMN requests other ISD messages.

In DIAMETER, the Location Update Answer transports the subscriber profile. The DIAMETER ISD is not used unless the Home PLMN requests a change in the subscriber profile.

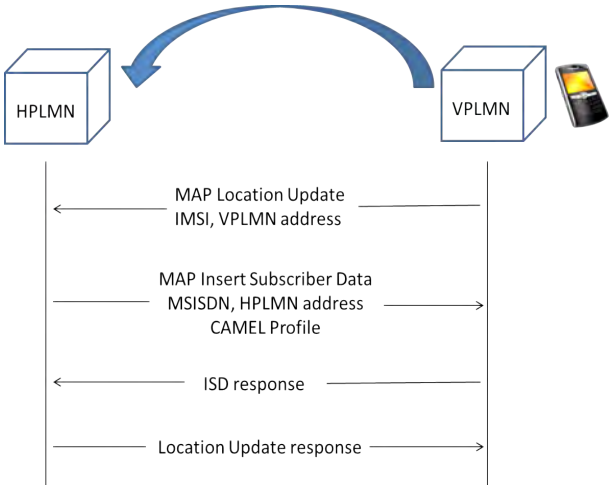

Fig. 2. Location Update procedure for a 2G or 3G network (using SS7 MAP)

In 2G or 3G, INAP-CAMEL is used whenever a subscriber is roaming between networks. LTE does not support CAMEL, so they cannot be mapped with similar DIAMETER parameters – Figure 3.

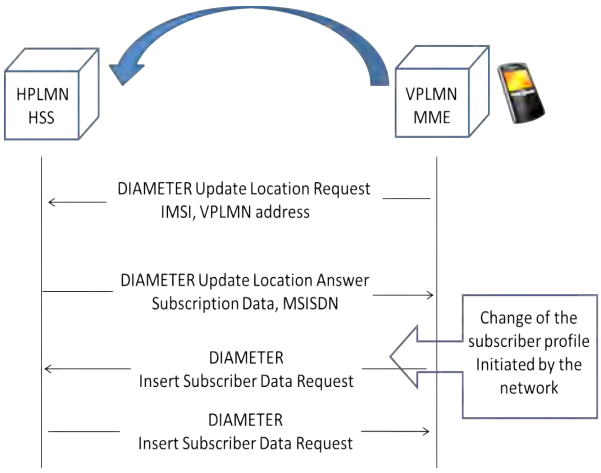

Fig. 3. Location Update procedure for a LTE network

4. MESSAGE ROUTING CHALLENGES

In 2G or 3G networks, which use SS7, the MTP / SCCP layers deal with routing. MTP takes care of point code based routing, and SCCP, which is only a transport protocol, deals with the Global title based routing. DIAMETER is also based on SCTP and does not have an algorithm for message routing and analysis.

It only analyzes parameters which deal in transferring the message to the right destination IP address.

A new element will be defined, "DIAMETER Proxy", which will enable interoperability, will interpret the routing parameters and will decide on the best way to route towards the destination.

4.1 Local Breakout

The breakout occurs at the Visitor PLMN, so the traffic does not reach anymore the home network.

Hence, there should be an agreement between the home and visited network in order to exchange call control information on the Gy interface. Therefore the PDN at the visited network interact directly with the Charging System at the Home PLMN. As a result of that, Real Time charging is triggered.

5. CHALLENGES IN POLICY CONTROL AND REAL TIME CHARGING

GSMA [GSM 09.02] has proposed a model for Online Charging and Policy Control whose issues will be discussed in separate cases depending on the options of LTE to LTE and LTE to 2G or 3G roaming scenarios.

5.1 Home Routing

As seen in Figure 4, the Home Policy and Charging Rules Functionality (H-PCRF) is communicating through interface S9 with the Visited PCRF, but this interface does not carry information regarding data for triggering Real Time Charging. Instead, the Gy interface is doing that, and is also transmitting charging information and call control data which is based on DIAMETER RFC 3588.

There are two problems in roaming from LTE to 2G or 3G networks, regardless of Home Routing or Local Breakout.

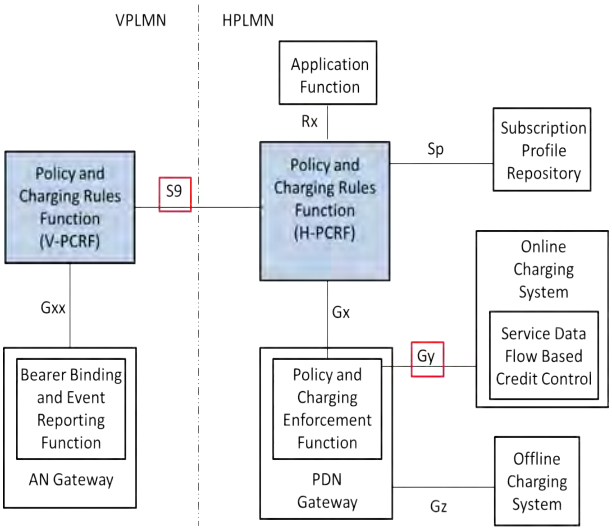

Fig. 4. Home Routing
with S9 and Gy Interface outlined

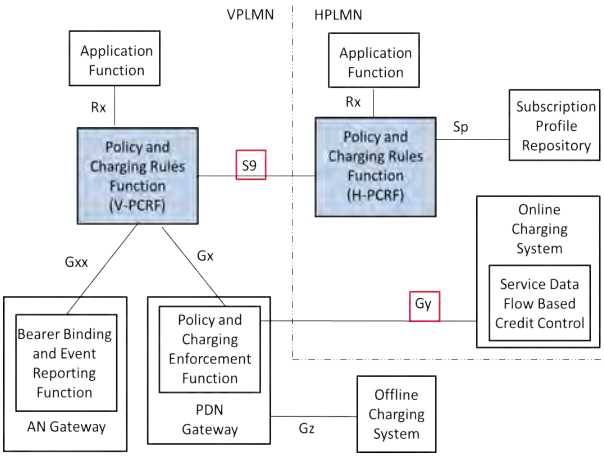

Fig. 5.Local Breakout
with S9 and Gy interfaces outlined

2G or 3G networks have no support for policy control functionality, and, therefore, there is no QoS and charging related policy enforcement.

From the charging point of view, the LTE network has its charging (be it voice, data or SMS traffic) handled by the Gy interface (between the PDN Gateway and the Online Charging System), while the 2G or 3G network has different types of charging depending on the type of traffic.

The GGSN (Gateway GPRS Support Node) handles the data charging, the SMSC handles the SMS charging, and the MSCs handle the voice charging, using CAMEL. Hence, the charging differs a lot between the LTE and 2,3G networks.

6. PROPOSED SOLUTIONS

6.1 Roaming scenario LTE (HPLMN) to 2G or 3G (VPLMN)

In this scenario, the user roams to the 2G or 3G network so the authentication algorithms have to be supported (Comp128 and Milenage). Also, for GPRS, the Gp interface towards the 2G or 3G network has to be implemented in the HPLMN.

A conversion of DIAMETER to MAP is required, and the DIAMETER AIA command must understand the 2G or 3G authentication triplets or quintuplets, respectively. After the successful authentication, location updating follows. We used a new element, DIAMETER to MAP/CAMEL (D2M/C) converter, between the Home and the Visited network (Figure 6).

This D2M/C generates the ISD messages based on the subscription data provided by the 2G or 3G network.

The D2M/C also understands the Real Time charging profile of the subscriber and populates the CAMEL information consequently.

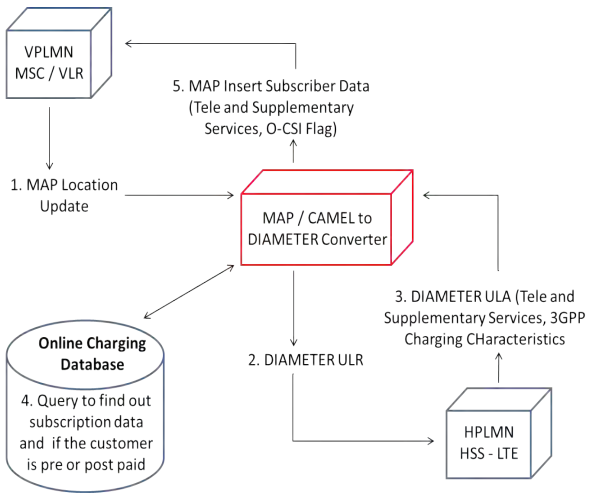

Fig. 6. Proposed solution for Location Update process between LTE and 2G or 3G networks

6.2 Roaming scenario 2G or 3G (HPLMN) to LTE (VPLMN)

We suggest Local Breakout as the best solution for this scenario.

In this case, for mobility management, there should be a conversion from S6a to MAP. Also the HLR must support the LTE authentication parameters (KASME).

The MME has to handle the mapping of the of the subscriber data. The VPLMN PDN Gateway has to have a DIAMETER interface towards the Online Charging System at the HPLMN, in order to handle real time charging (see Figure 7).

We considered 2 options when SMS Roaming comes into play. As seen in Figure 8, one is to transfer the SMS by the SG interface between a MSC and a MME.

Another option we suggest is to use a SIP client and send the SMS on it, using a SIP to SS7 converter and forward it to the SMSC, as seen in figure 9.

6.3 DIAMETER Proxy

Since DIAMETER does not have the capability for intelligent routing, it will analyze the parameters and the numbering plans which exist in the incoming message from the 2G or 3G network, and it will route the message accordingly. The DIAMETER Proxy proposed in Figure 10 serves for all the routing requirements, be them LTE to LTE or LTE to different networks.

Each Mobile Network Operator (MNO) has to set up S6a/S6d/S9 connectivity for policy control. The DIAMETER Proxy eases up this connectivity because, using it, there is no need for point to point connectivity between the partner networks.

It can act as a roaming hub and only a single one time connection to the roaming hub is required. Hence, the DIAMETER Proxy can be placed between LTE capable networks in order to enable international roaming between all the networks connected to the roaming hub, and between those belonging to another LTE roaming hub.

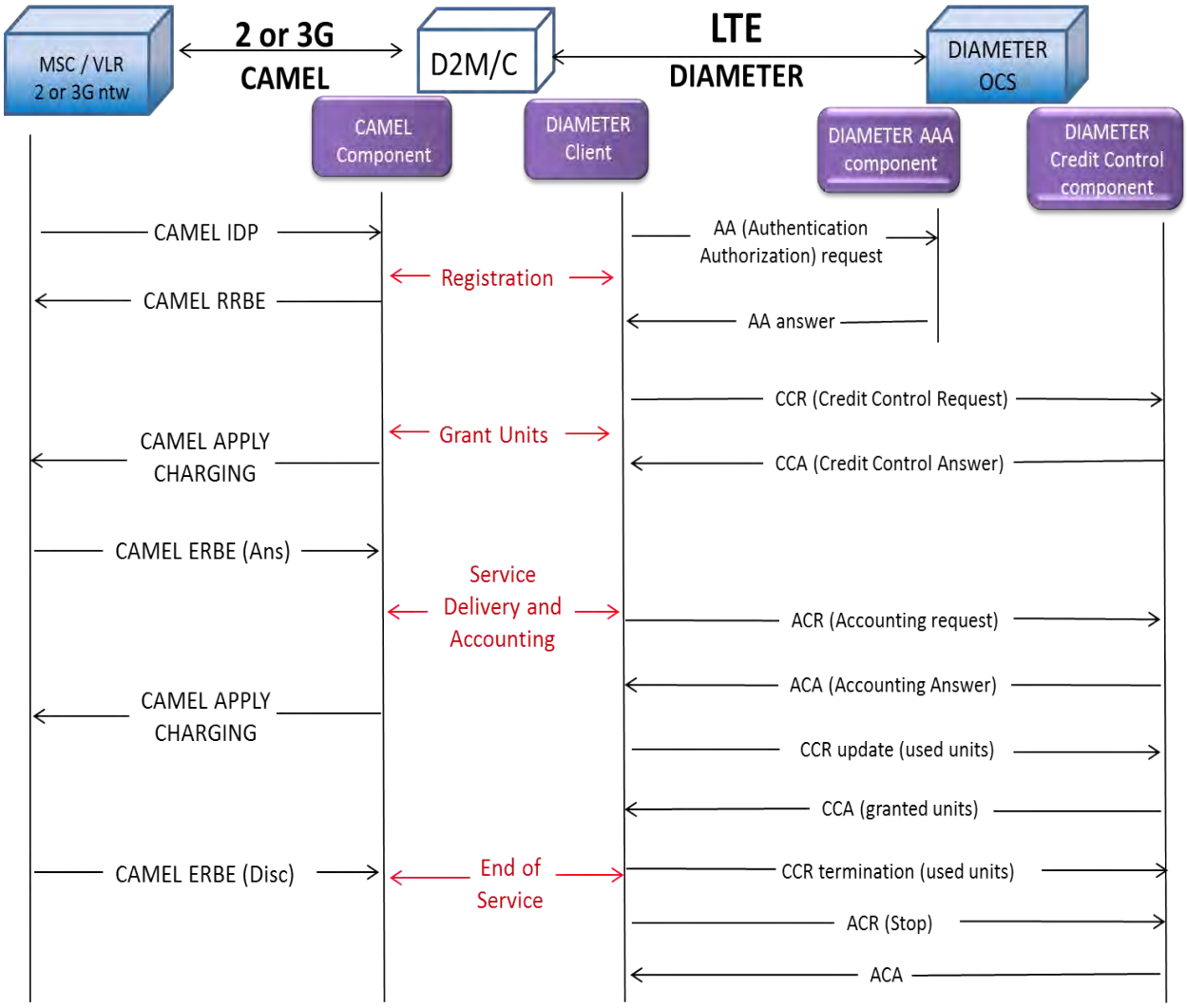

Fig. 7. CAMEL to DIAMETER changeover for Online Charging

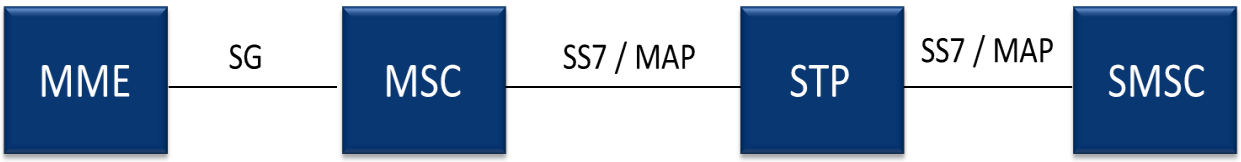

Fig. 8. SMS transfer from LTE to 2G or 3G using the SG interface

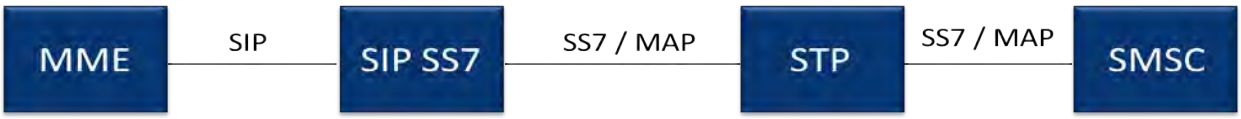

Fig. 9. SMS transfer from LTE to 2G or 3G using IMS client for SMS

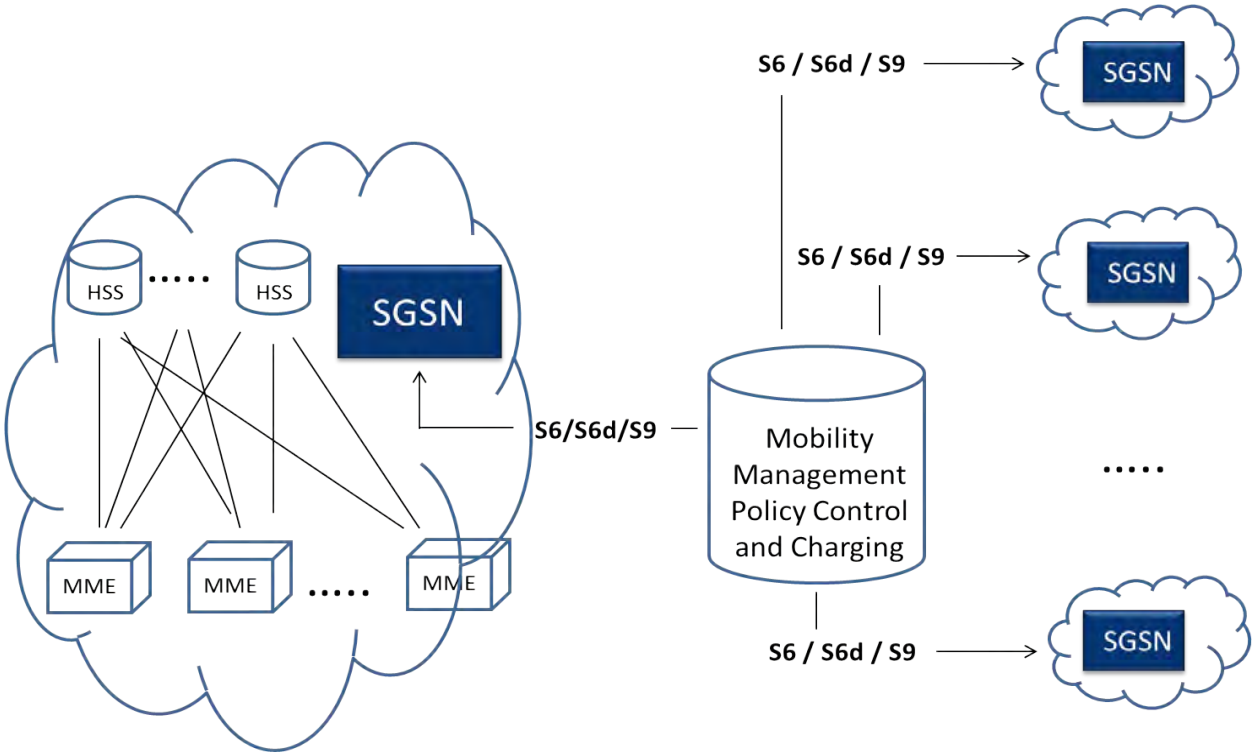

Fig. 10. DIAMETER Routing using DIAMETER Proxy
for Roaming and Interworking purposes

7. CONCLUSIONS

As with seamless voice over LTE, SRVCC and CS fallback are not the only choices addressing the issues of roaming.
Different operators may choose different solutions depending on the profile of their LTE network.

There is still a way to go before implementing a full roaming architecture between all the networks, be them LTE or 2G or 3G.

In this paper, after pinpointing the core problems; the authors suggested specific solutions:

-the use of a DIAMETER to MAP/CAMEL converter,

-the use of the Local Breakout (with dedicated SIP client and a SIP to SS7 converter), the use of a DIAMETER proxy.

Guidelines were given as well, towards implementing these proposed solutions.

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10. 3GPP – *Evolved Packet System (EPS); Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on DIAMETER protocol* – Technical Standard – TS 29.272

SOLID PARTICLE EROSION MODELS FOR TITANIUM AND ALUMINUM METAL MATRIX COMPOSITES

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Abstract: *Solid particle erosion behavior in composite materials is difficult to estimate due to the complex structure and interactions between the continuous and discontinuous phases. This paper refers to the semi-empirical mathematical correlation between the solid particle erosion rates of metal matrix composites and the erosion rates of the matrix alloys. Two well known examples were used to create correlation functions for aluminum and titanium matrix composites. Both correlation functions are in good accordance with the experimental datasets from the literature. Also, the functions are non-dimensional which means they can be used for volumetric as well as mass erosion rate measurements. A final benefit of the proposed models is that they can be used in conjunction with conventional erosion models such as the models of Hutchings, Sundararajan or Wallace, to provide semi-analytical erosion estimations. Further work will have to integrate new experimental data in order to extend the models database.*

Keywords: *metal matrix composite, solid particle erosion, semi-empirical mode, curve fitting*

1. INTRODUCTION

Because of the mechanical and thermal loadings to which the aeronautical propulsion systems are subjected, composite materials make up a small percentage of the turbine engine components. Although phenolic and epoxidic matrix composites have been used, in conjunction with metal alloys, for fan blade fabrication Matheny A.P. (2009), in the hotter parts of the turbine engine, only metal matrix composites (MMCs) can be used as alternatives to conventional metal alloys D.R. Pank & J, Jackson(1993).

In order to reinforce metals, particularly aluminum alloys, with carbon fibers, the fibers must be coated with a thin layer of nickel or titanium boride. The process is complex and provides the fibers with a microscopic layer of nickel or titanium boride which helps the bonding of the fibers to the metal matrix. A patent describing MMC fabrication for aerospace applications was obtained by Bell et al. (2003).

Other fabrication technologies may be found in Evans et al (2003). Wiest (1992) makes a good synthesis for the mechanical properties of aluminum based MMCs, more properties of MMCs are found in Kainer (2003).

The usefulness of MMCs in aerospace applications is derived from their mechanical advantages over conventional materials as shown by Stuart (1992) and Singerman & Jackson (1996) .

More recent studies regarding the application of MMCs in the aeronautical field are described in Vaidya et al (2006) and, for more general purposes in Rawal (2001) .

2. THE MMC EROSION MODELS

As stated in the introduction, metal matrix composites are more commonly found in the fabrication of turbo-machineries than other types of composite materials. This is due to their thermo-mechanical properties which are superior to both the base alloy and phenolic or esteric matrix composites.

In the following sections, we interpret some of the most relevant experimental data found in the literature in order to obtain a mathematical model for estimating the erosion rate for airborne solid particles on titanium and aluminum matrix composites.

The interpretation of the experimental data in the literature is based on the observation that MMCs display a slightly higher erosion rate than the matrix alloy. Therefore a correlation function was derived in both cases below, linking the MMC erosion with that of the matrix alloy – which can be estimated through conventional erosion models such as Hutchings (1981), Sundararajan (1991) or Wallace et al (2000).

In order to obtain the mathematical correlation equation, a non-linear regression method was used, similar to the ones described in Baker (2008), Bethea et al. (1985) or Geaghan (2012).

2.1 The titanium matrix composite with aluminum fibers

As seen in Wilson & Ball (1990) and Tua et al(1998) , by reinforcing composite materials with various fibers, the solid particle erosion rate increases.

In their paper, Tua et al.(1998) presents a series of experiments in which he describes the erosion of an AC4C titanium matrix composite reinforced with un-oriented Al18B4O33 aluminum fibers. Figure 1 presents a comparison between the erosion rate for the composite and for the base alloy (which makes up the matrix). It can be observed that, although similar in shape, the maxima of erosion rate for the composite is obtained at approximately 30º angle of impact. This tendency diminishes at low impact velocities.

Due to their similarities, the two graphs may be correlated through a mathematical function. This will permit the estimation of erosion rate of a MMC based on the known erosion rate of the alloy which makes up the matrix. Since, at this point, the theoretical know-how of calculating erosion rates for metals is superior to that of composites, this correlation function could be considered a step forward.

In the current case, the existing experimental data were synthesized in Table 1. Based on this, the data was then subjected to an iterative non-linear regression algorithm in order to produce the correlation function:

$$E_{r(MMC)}/E_{r(Alloy)} = -1\cdot10^{-7}\,\alpha^4 + 3\cdot10^{-5}\,\alpha^3 - 2\cdot10^{-3}\,\alpha^2 + 6\cdot10^{-2}\,\alpha + 0.670 \quad (1)$$

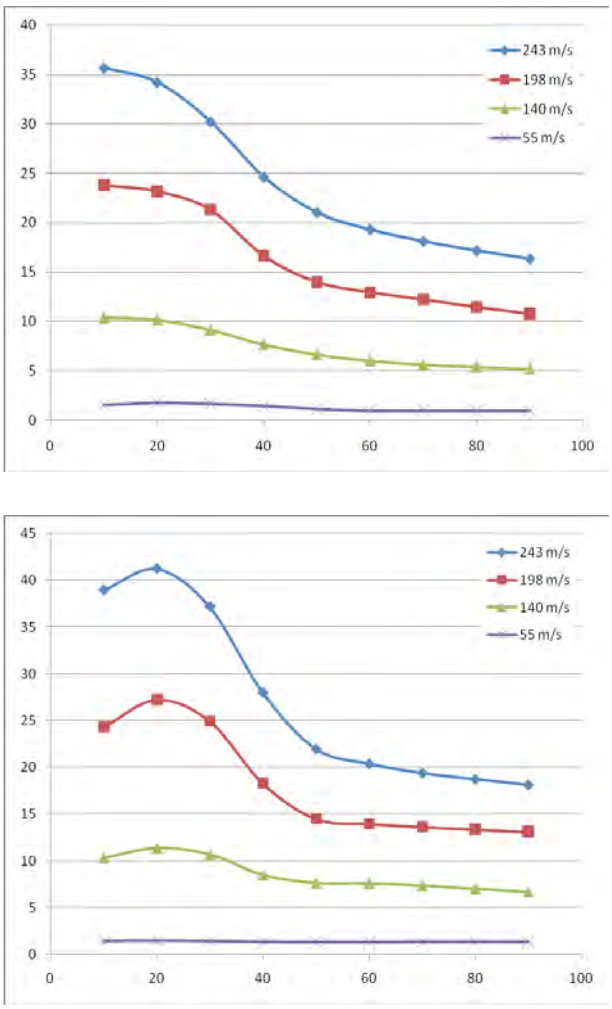

Fig.1. The erosion behavior of the Titanium alloy (top) and the Titanium alloy matrix composite (bottom)

A significant advantage of the proposed equation is that it is no longer confined to the dataset that generated it. This means that it does not refer to a volumetric erosion rate (such as the one described in the experimental paper), instead it is non-dimensional. Therefore it can be used, independently, with any available erosion rate pre-existing or acquired, without any other transformations or corrections.

Table 1. Sample data set used for correlating the solid particle erosion behavior of the Ti alloy and the Ti alloy matrix composite

	243 m/s		198 m/s	
Alfa	MMC	Ti	MMC	Ti
10	38.95	35.68	24.29	23.8
20	41.24	34.21	27.24	23.18
30	37.19	30.24	24.94	21.32
40	28	24.65	18.29	16.65
50	21.98	21.04	14.49	14
60	20.39	19.32	13.95	12.97
70	19.4	18.12	13.63	12.24
80	18.75	17.18	13.36	11.46
90	18.14	16.34	13.1	10.79

2.2 Aluminum matrix composite reinforced with particles

Wilson and Ball (1990) present in their paper, various studies regarding the mechanical properties of a MMC with aluminum 6061 alloy matrix (1%Mg, 0.6%Si, 0.2%Cu, 0.2%Cr) reinforced with 20μm silicon carbide particles. The experimental data provided was also interpreted in a similar manner. The same tendency was observed, in that the MMC eroded more than the base alloy.

After a new iterative process of non-linear regression, a curve fit was obtained for correlating the alloy in question with its MMC.

The following equation links the erosion rate of the MMC to that of the base alloy as a function of the angle of impact of the erodent particles.

$$E_{r(MMC)}/E_{r(Al)} = 2.26 \cdot \alpha/(10.9 + \alpha) \quad (2)$$

By comparison, the aluminum alloy composite tends to have a relative erosion rate higher than the titanium MMC relative erosion rate. This is a clear indication that the nature and geometry of the reinforcing structure plays a key role in the erosion rate of MMCs.

In Fig. 2, the experimental and mathematical equation are superimposed in order to show the accuracy of the model.

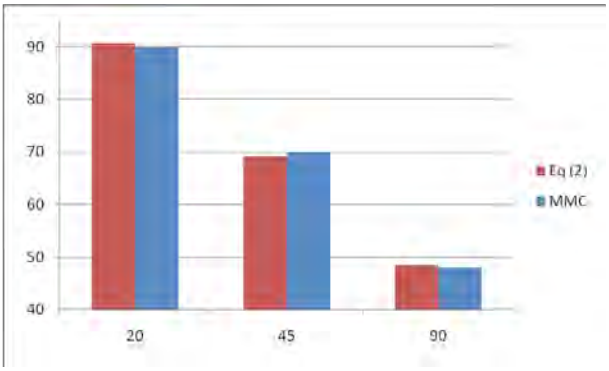

Fig.2. Sample experimental data and analytical correlation function for the Al 6061 MMC

3. CONCLUSIONS

The work described in this paper refers to the mathematical interpretation of existing experimental data, found in the specialized literature, in the field of solid particle erosion of metal matrix composites.

Estimating composite material erosion is a difficult technical problem, most recent studies being focused mainly on experimental data rather than theoretical models. The difficulty of developing a purely theoretical model lies in the complex fiber-matrix interaction.

The proposed model presumes that the matrix alloy has a solid particle behavior which can be predicted by the classical existing erosion models. Furthermore, by comparing the experimental results found in the literature, correlation functions have been developed – through non-linear regression. In this way, the theoretical predictions of classical erosion models may be linked to the erosion rate estimation for a metal matrix composite. The mathematical equations proposed are simple enough to be integrated in CFD solvers in order to estimate erosion rates for various mechanical components such as MMC blades of turbo machineries.

Further work should incorporate more experimental data as well as the accumulated know-how resulted from the application of the proposed methods.

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ON THE LIMIT THEOREMS FOR CONVOLUTIONS OF POWER SERIES TYPE

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Abstract: *The lifetime represented as the random sum of the random variables (r.v.) is found in many issues related to Reliability, Actuarial, Queuing Theory, Renewal Theory and so one. In our work we intend to research the lifetime distribution when the random number of r.v. has a power series distribution, abbreviated as PSD, the components of the sum being nonnegative, independent and identically distributed random variables (i.i.d.r.v.), of (absolutely) continuous type. Results are expressed through Laplace transform. These results are used, as an illustration, for the demonstration / validation of limit theorems for power series type's convolution.*

Keywords: *convolution, Laplace transform, limit theorems, PSD.*

1. INTRODUCTION

By convolutions of power series (PSD = "power series distribution") we understand the lifetime distribution represented by means of sum of non negative i.i.d. r.v., considered in a random number with distribution of PSD type. They generates , in particular, geometric or Pascal convolutins, which appear in some limit theorems in Reliability Theory ([1], [2], [8] and [10]). Such convolutions also appear in problems related to the Queueing Theory, Acturial Mathematics , Risc Theory or Renewal Processes. Distributions of PSD type which enclose a whole class of discrete distributions it was introduced in the papper [5].

The notion of "the power series distribution " class is due to Noack [11] and Kosambi [6]; Noack gives a particular importance to the discrete distributions which belong to this class (for example: binomial, Poisson, logarithmic, geometric, negative binomial [5]).

In the following we reproduce the definition of the class of power series distributions.

Let's consider r.v. Z such that $P(Z \in \{1,2,...\}) = 1$.

Definition 1.1. We say that v.a. Z has a power series distribution (PSD), if:

$$P(Z = z) = \frac{a_z \theta^z}{A(\theta)}, \; z = 1,2,... \qquad (1)$$

where $\theta \in (0,\tau)$, $\tau > 0$, $a_1, a_2, ...$ are positive real numbers and τ is a positive number meaning the convergence radius of power series (*series function*),

$$A(\theta) = \sum_{z \geq 1} a_z \theta^z, \; \forall \theta \in (0,\tau),$$

and θ is *the power parameter* of the distribution.

Consequence 1.1. To the PSD class belong, in particular, the following zero truncated distributions: binomial, Poisson, logarithmic, geometric, Pascal and negative binomial. Their representation is shown in the Table 1.1.

Consequently, we present for each distribution, the representative elements of the PSD class: sequence $(a_z)_{z \geq 1}$, series function $A(\theta)$, as well as the connection between the paramether θ of the power series and the distribution parameters which belong to this class;

all these results are centralized in Table 1.1.

Table 1. The representative elements of PSD class

Distribution	a_z	θ	$A(\theta)$	τ
$Binom^*(n,p)$	$\binom{n}{z}$	$\frac{p}{1-p}$	$(1+\theta)^n-1$	∞
$Poisson^*(\lambda)$	$\frac{1}{z!}$	λ	$e^{\theta}-1$	∞
Log(p)	$\frac{1}{z}$	p	$-\ln(1-\theta)$	1
$Geom^*(p)$	1	$1-p$	$\frac{\theta}{1-\theta}$	1
Pascal(k,p)	$\binom{z-1}{k-1}$	$1-p$	$\left(\frac{\theta}{1-\theta}\right)^k$	1
$BN^*(k,p)$	$\binom{z+k-1}{z}$	p	$(1-\theta)^{-k}-1$	1

2. LIMIT THEOREMS ABOUT CONVOLUTIONS OF POWER SERIES TYPE

Given the geometric convolution of the exponential distribution and considering the elements characteristic to the PSD class for the geometric distribution, we obtain a new variant of Brown's limit theorem ([1], [2]):

Theorem 2.1. ([9]) If $X_i, i \geq 1$ are a non negative i.i.d.r.v., with the Laplace transform of p.d.f. $\varphi_{X_i}(s) \equiv \varphi(s)$, such that exists mean value $EX_i = -\varphi'(s)\Big|_{s=0} = \frac{1}{\lambda}$, $\lambda > 0$ and $N \sim Geom^*(p)$, $0 < p < 1$, being independent of r.v. X_i, $i \geq 1$, then $\lambda p Y_N \underset{p\to 0}{\Rightarrow} Exp(1)$ for $Y_N = X_1 + X_2 + ... + X_N$.

Proof. Assume that $N \sim Geom^*(p)$, $p \in (0,1)$, i.e., N belong to the PSD, with $A(\theta) = \frac{\theta}{1-\theta}$, $\theta \in (0,1)$, $\theta = 1-p$. Then the Laplace transform of p.d.f. for r.v. Y_N is given by,

$$\varphi_{Y_N}(s) = \frac{A(\theta\varphi(s))}{A(\theta)} = \frac{p\varphi(s)}{1-(1-p)\varphi(s)}$$

$p \in (0,1)$.

Consequently the Laplace transform of v.a. $\lambda p Y_N$, is characterised by the following relation:

$$\varphi_{\lambda p Y_N}(s) = \varphi_{Y_N}(\lambda p s) = \frac{p\varphi(\lambda p s)}{1-(1-p)\varphi(\lambda p s)},$$

$p \in (0,1)$, $\lambda > 0$.

Applying the rule of l 'Hospital and taking into account the properties of Laplace transform, we find that:

$$\lim_{p\to 0}\varphi_{\lambda p Y_N}(s) = \lim_{p\to 0}\frac{\varphi(\lambda p s) + \lambda p s\varphi'(\lambda p s)}{\varphi(\lambda p s) - (1-p)\lambda s\varphi'(\lambda p s)} = \frac{1}{1+s},$$

i.e., $\lambda p Y_N \underset{p\to 0}{\Rightarrow} Exp(1)$, that's complet the proof.

The following result presents a new variant of the limit theorem (generalization of Brown's limit theorem in [8] and [10]).

Theorem 2.2. ([9]) If $X_i, i \geq 1$ are a non negative i.i.d.r.v., with Laplace transform of p.d.f. $\varphi_{X_i}(s) \equiv \varphi(s)$, such that exists mean value $EX_i = -\varphi'(s)\Big|_{s=0} = \frac{1}{\lambda}$, $\lambda > 0$ and $N \sim Pascal(k,p)$, $p \in (0,1)$, being independent of r.v. X_i, $i \geq 1$, then $\lambda p Y_N \underset{p\to 0}{\Rightarrow} Erlang(k,1)$

for $Y_N = X_1 + X_2 + ... + X_N$.

Proof. Assume that $N \sim Pascal(k,p)$, $p \in (0,1)$, i.e., N belong to the PSD, with $k \in N^*$ and

$$A(\theta) = \left(\frac{\theta}{1-\theta}\right)^k, \ \theta \in (0,1), \ \theta = 1-p.$$

The Laplace transform of p.d.f of r.v. Y_N is :

$$\varphi_{Y_N}(s) = \frac{p^k \varphi^k(s)}{\left[1-(1-p)\varphi(s)\right]^k}.$$

Consequently, ,

$$\varphi_{\lambda p Y_N}(s) = \varphi_{Y_N}(\lambda p s) = \frac{p^k \varphi^k(\lambda p s)}{\left[1-(1-p)\varphi(\lambda p s)\right]^k}$$

$p \in (0,1)$, $\lambda > 0$.

Applying the l'Hospital's rule, we obtain that: $\lim_{p\to 0} \varphi_{\lambda p Y_N}(s) = \frac{1}{(1+s)^k}$, $k \in N^*$, i.e., the limits is exactly the Laplace transform of p.d.f.

$$f_{Y_N}(t) = \frac{t^{k-1}}{(k-1)!} e^{-t}$$

for Erlang distribution with k degrees of freedom and parameter 1. So, $\lambda p Y_N \underset{p\to 0}{\Rightarrow} Erlang(k,1)$ that's complet the proof.

Remark 2.1. We observe that for non negative r.v. X_i, $i \geq 1$ the condition to be governed by the strong law of large numbers (according to theorems in [1] and [10]) becomes unnecesary in the both Theorem 2.1 and Theorem 2.2.

Now we need some auxiliar results, where by $Geom^*(p)$ we understand the geometric distribution truncated to zero.

Lemma 2.1. ([4]) If $N \sim Geom(p)$, $p \in (0,1)$, then $pN \Rightarrow Exp(1)$ for $p \to 0$.

Proposition 2.1 ([7,8]) If $N \sim Pascal(k,p)$, $k \in N^*, p \in (0,1)$, then $pN \underset{p\to 0}{\Rightarrow} Z \sim Erlang(k,1)$

Proposition 2.2. If r.v. $N \sim Geom^*(p)$, $p \in (0,1)$, r.v X_i, $i \geq 1$ are i.i.d. $Geom^*(p^*)$, $p^* \in (0,1)$, N and $(X_i)_{i\geq 1}$ being independent, then r.v. $Y_N \sim Geom^*(p^*)$.

Proposition 2.3. If r.v. $N \sim Pascal(k,p)$, $p \in (0,1)$, $k \in N^*$, r.v. X_i, $i \geq 1$ are i.i.d. $Geom^*(p^*)$, $p^* \in (0,1)$, N and $(X_i)_{i\geq 1}$ being independent, then r.v. $Y_N \sim Pascal(k,p^*)$.

As a consequense of Lema 2.1. we have the following proposition:

Proposition 2.4. In the conditions of Proposition 2.2. we have that

$$p\,{}^*Y_N \underset{p\to 0}{\Rightarrow} Exp(1)$$

Similarly, we have

Proposition 2.5. In the conditions of Proposition 2.3. we have that

$$p\,{}^*Y_N \underset{p\to 0}{\Rightarrow} Erlang(k,1)$$

In terms of the behaviour of parameter which define distribution r.v. $N \in PSD$, we can also formulate the following limit theorem:

Theorem 2.3. If v.a. $N \in PSD$, X_i, $i \geq 1$ are i.i.d.r.v., N and $(X_i)_{i\geq 1}$ being independent, then r.v. $Y_N = X_1 + X_2 + ... + X_N$ converges in distribution towards r.v. X_1, as well as:

(a) $N \sim Binom^*(n,p)$, $n = 1$ or $p \to 0$;

(b) $N \sim Poisson^*(\lambda)$, $\lambda > 0$, $\lambda \to 0$;

(c) $N \sim Log(p)$, $p \in (0,1)$, $p \to 1$;

(d) $N \sim Pascal(k,p)$, $p \in (0,1)$, $k \in N^*$, $p \to 1$.

Proof. The theorem results immediately, observing the that in each conditions (a)-(d) the probability $P(N = 1) \to 1$, and $P(N > 1) \to 0$.

The following two limit theorems are directly concerned with the connection among different distributions of r.v. $N \in PSD$.

Theorem 2.4. Binomial convolution with parameters $n \in N^*$, $p \in (0,1)$ converges in distribution towards Poisson convolution with parameter $\lambda > 0$, as wel as $n \to \infty$, $p \to 0$ such that $np \to \lambda$.

Proof. According to the clasical Poisson theorem [3], r.v. $N \sim Binom(n,p)$ converges in distribution towards Poisson distribution (λ), $\lambda > 0$ if $n \to \infty$, $p \to 0$ such that $np \to \lambda$. This imply our theorem.

Theorem 2.5. Negative binomial convolution with parameters $p \in (0,1)$ and $k \in N^*$ converges in distribution to the Poisson convolution parameter $\lambda > 0$ as well as $k \to \infty$, $p \to 1$ such that $k(1-p) \to \lambda$.

Proof. On the base of Feller's well known result [3], binomial negative distribution (non truncated) converges slightly towards Poisson distribution (non truncated). Since this property is also preserved when the corresponding distributions are truncated to zero, we obtain our statement of our theorem.

3. CONCLUSIONS

Because lifetime often occurs not only in Reliability, but also in Queueing Theory, Actuary, etc., a whole class of convolutions has been investigated, namely, those of power series type (in absolutely continuous). As a consequence of this approach a variant of the Limit Theorem has been obtained. This generalizes Brown's Theorem in which the restrictive condition that the sum of the r.v. be governed by the Strong Law of Large Numbers, is not necessary. New limits theorems in terms of convolution, are presented too.

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ASPECTS REGARDING BY THE NETWORK ENABLED LOGISTICS OF MILITARY STRUCTURES

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Abstract: *Network Centric Warfare it is a new concept developed by the USA and adopted by other countries in the same way or under other name, like as: Network Enabled Capabilities, Network Based Operations, Network Enabled Operations and others. Network Centric Warfare concept considered as a compulsory requirement, aimed to realize a network supported and integrated logistic system, that would ensure the flexibility, agility and supporting required by the combat forces. Increasing the rate of operations execution during the late global conflicts, where it have been engaged small units (which have became more and more versatile) on wide areas, will have a major impact on future logistics, we believe, and those units must be supported in a various range of solutions. Logistic units might be heavily dispersed in wide areas, all along extended and integrated LOCs; that will boost and increase the Logistic Network process. In the near future, the efficiency of the logistic support management will increase in importance through the development of the command and control systems in the decision-making process, at the operational forces management level, which has to be effectively related and integrated with the informational, command and control systems of the combat forces, in order to accomplish the objectives of the military action.*

Keywords: *logistics support, network centric warfare, network enabled logistics*

1. INTRODUCTION

The concept of NCW (Network Centric Warfare - NCW) appeared publicly for the first time in 1998, at the same time with the work "Network Centric War": its Origin and its Future" written by the vice-admiral Arthur K. Cebrowski and John J. Garstka, director for conceptions and operations within the secretary of USA defense` s office for the force change [1]. Once published, the following main characteristics appeared:

- going from emplacement to network,
- going from an individual to a part of a system,
- going from information to knowledge.

Furthermore, there are two additional extremely important aspects that would subsequently prove essentially in other professional works [2]: Speed of Command and Self– Synchronization.

The concept of Network Centric Warfare, being a general and flexible concept could be adapted to an international level in the following way:

- The Canadian army considers that NCW does not fairly approach the issues that are connected with the military operations other than the war and at this moment, it excessively focuses on technologies of the COTS (Commercial of the self) type and it highly points out a larger space, Global Informational Grid.
- Great Britain developed the concept of Network Enabled Capability.

- In Sweden, the concept was approached under the name of Network Based Defense, and it notably focuses especially on the opportunities of being inter-cooperative within a future coalition in order to attend defensive military operations or within other operations except for the war.

- NATO adopted the term Network Enabled Capability –NNEC and initiated a program of grounding and development of the concept.

In developing of the Network Centric Warfare (NCW), the precision of the force is given by both the techniques and achievements of the fighter and the technological advantages of the new type of war. The new informational technology covers the infrastructure and network in progress, offering an increasing viability, which implicitly means a greater ability for spreading action, not only in the physical area but also in the communication field.

The essential tendency regarding the revolution in the military area is that the future war should be carried out with less lethal forces, having the ability to fire intensely and precisely by fitting the launching and effective detection systems, and the ability to share information.

More specific, the new operational concepts included in the defense strategy are closely connected with the development of the new technological dimension of the revolution in the military area by means of the superiority of information and technological innovation. Everything will be found within the inter-arms capabilities and the joint force. Having probed the nature of the future conflicts through the project Army After Next initiated by the US land forces (US Army), we have the general view of what this would be after three decades, around 2025.

Among the most significant vulnerabilities, we could mention those generated by:

- Relationship in cases of major conflicts.

- Instability in the process of the turning data (physical values, objects, people) into information (concepts with logical meanings) by means of analysis.

- Inaction in performing self – synchronization.

- Imbalances between relative high expenses of performing the Network Centric Warfare and the lowest expenses necessary to counteract it [1, 2].

2. THE REQUIREMENTS OF THE LOGISTIC SUPPORT COORDINATION IN NETWORK CENTRIC WARFARE CONDITIONS

Logistics and especially the structures in charge for logistics support of the armed forces in war seriously need to create the most capable system of communication. The leaders have to make sure before planning their military operations that logistic support is integrated within the network. There are taken into account many requirements for securing/ assertion of the logistic structures with mobile means that allow them to keep in touch with army on the move, in order to secure an effective logistics support in time. These have already meant something else than the logistic support based on the requirement or automatic detachment hereupon of the planned expenditures.

- **The general unique image of the situation**. This aspect can become crucial for securing the command of the operational objectives within the integrate range of the performed military operations that took place in a continually changing area.

For a further improvement of the Network Enabled Logistics (NEL), the general unique image has to be kept and should have access to the historical data of the situation and of the whole context of the past operations.

- **Management capability force**. The outlook of the future logistics specialist as manager of the capabilities of the future military structures will be that of integrating the objectives of change the modes in which they will operate in the future. He will also appreciate the parameter of the force capability as the sum of all modular components of effects devices, missions, tasks that are actively organized in order to accomplish the superior` s intention.

- **Logistics precisely dimensioned.** The unique image allows a global perspective of the battlefield including the non-combat military operation related to the CO` s intention. Furthermore, this can lead to the development of the local optimization of the logistic support by means of rules and flexible dynamic relations, implemented by the Network Enabled Logistics operators as logistics precisely dimensioned.

- **The command and control adjustment in the dynamic of Network Centric Warfare.** This allows the whole activity of the command structure and control to be fitted in with the operation activities, information and logistics. This makes the dynamic adjustment of the evolution of the superior` s intention to the tactical, operational, strategic situation, to the medium and also to the dynamics state of the army, the logistic capability and resources. When they are applied in military operations, these flexible, dynamic activities can be suitably coordinated, work together and communicate among themselves, and can also significantly arise the capability of the army. Thus, they can answer to the events and changes in: status; environment, the state of the army, the CO` s intention.

- **Speed and effectiveness versus quantity and effectiveness.**

- **The full visibility over the whole logistics patrimony.** NEL will create, maintain and make use of information/ standard records regarding materials, and the interrelationships among them in order to gain a development of the logistics resources database.. The NEL extensions towards a full visibility and through transit of the patrimony determine the logistics information level for the development of their own spectrum of potential resources.

- **The cognitive support of the decision.** NEL covers the cognitive support of the decision belonging to both: logistics operators and its operators through the system capacity to turn data and logistics information into relevant and comprehensible knowledge.

- **The proactive anticipatory logistics.** It covers the demand and the logistics support detachment towards the users. It is directed by the events, data, information analysis, accumulation and procession of knowledge.

- **Kinetic and potential logistics: the capability to support the whole range of military operations.** NEL must support the current operations, as well as those that are unpredictable. This proactive logistics support, adjustable for the whole range of military operations, whether in time of peace, war or crises, for all the forces that are involved, fully or in transit, is indicated as kinetic logistics- in transit, otherwise said as linking logistics [3].

3. CONCEPTS OF THE NETWORK ENABLED LOGISTICS

A recent review elaborated by the Office of Force Transformation-OFT of the US armed forces marks the fact that nowadays, there is an actual debate among military experts to determine the possibilities of the logistics of sensing and responding (the Sense and Respond Logistics Capability SRLC).

These concepts, that support SRLC, try to focus on what is expected from the logistics, namely, the replacement of the linear delivery chain with one in the network that should easily solve the communication difficulties from the area.

- **Solid and reliable logistical support.** In this respect, one considers that there is an imperative need of taking into account of certain innovative solutions for dealing effectively with the logistics support necessary for the fighting troops. The decision factors of the logistics area must identify and minimize all the risks of commercial failure, as a consequence:

- of high centralized distribution,

- reliability of some considerable delivery sources,

- the overestimated trust in a major supplier.

In this respect, when the dependence on the date distribution and the information appeared there, it must be developed a technique for protecting them in order to secure trust in the operational structures of command.

- **Logistics support management.** During preparing and performing the military operations, the role of the logistics support management consists of stocking according to types of materials for securing logistic support of the army forces. The necessity of logistics support derives from the need of maximizing the efforts in certain directions that are considered essential in the economy of fighting actions.

- **Logistics support command.** The early getting into action will determine intended forces for this purpose to be made up only military personnel. This requirement focuses on the level of proficiency is able to integrate within the Defense Supply Chain.

But the adopted solution must keep the armed forces in action, having the abilities in this regard, to be quick and to be gradually efficient and to be operational and make up of modular elements.

- **The support capability of the challenges due to the planning suppositions.** The need of logistic support of the operations undertaken simultaneously by the forces dislocated in the same Joint Operational Area performed in competition with the logistics support requirement necessary for the forces that are dislocated in other Joint Operational Area will become private challenges for logistics.

Representing a minimum, this fact will impose the storage of a certain stock of capabilities that will be able to assure the need of logistical support in this particular situation. This feature is relevant for logistic support of many forces which develop operations in JOA, separated at the same time for keeping an integrity of the defense supply chain in more Joint Operational Area simultaneously.

- **Network –enabled capability (NEC).** The foundation of NEC is represented by the unit marked within the process of command and control, using sensors in order to gather, communicate and use information to allow the system of attack to work fast and “to deliver” the appropriate effects.

NEC shares the doctrine opinions of the American concept about NCW that is ready to translate the superiority of information into power force. At the same time, NEC does not try to place the network into the core of the capabilities through doctrinal plan that involves it.

NEC is more concerned with the development of the capabilities through the achievement of a coherent structure of interconnection of the sensors with the decision makers and the battle systems. NEC is going to maximize the military capacity by the means given by the superiority of the information. In this respect, NEL represents the logistics community contribution of logistics community to NEC.

The attributes and the strong points of the logistics network focus on the following aspects [4]:

-The logistic support within the network should be dynamic

-Relations should be permanently negotiated

-The network is hard and it is difficult to attack

-NEL supports the reconfigurable operations.

4. THE EVOLUTION OF THE LOGISTIC SYSTEM IN THE ROMANIAN ARMY

Lately, especially after our country has been accepted in the North Atlantic Alliance, the Romanian army, in its whole and especially the logistic structures have been crossed a period marked by deep changes and transformations, in which the outstanding features given by the process of the adaptation of its own structures to the NATO requirements. In the logistics area, the purpose of harmonizing the relationship between the management structure and the execution one (joint logistics commandment, logistics structures belonging to the army forces and the military teaching institution) was to debate on the conceptual level and to make a military logistics system operational, rigorous in functioning, that is going to become a modular one, capable of offering to the armed forces all that is necessary for fighting, when the Romanian army became more and more part of the military operations of the North Atlantic Alliance [3, 4].

5. CONCLUSION

The essential aspects, for the logistic integration of the Romanian army in the future architecture of the network that would be achieved are:

- The necessity of achieving fighting structures by offering logistics and fighting support of modular type, adjustable and flexible and maneuvering, with a great capacity of reaction, as well as, keeping the units operational during peace and providing the necessary resources for the state of the war.

- A continuous development process of the military logistic system so that it becomes integrated itself, flexible, functional, and able to provide the logistic support at the appropriate place, in required timeframe, as easy as possible and the lowest cost, as well as the requirement to ensure inter-operability with logistics system of other NATO members.

- Making external activities that are defined by the functional field of the military campaign.

- Making progress in co-operation and co-optation in technical modern programs and military equipments of some companies from industry which have remarkable performances in this area.

- Achievement of a strong, effective and fine management in the logistics area.

According to the tasks assumed by our country, as a member of the North Atlantic Alliance, it is possible that the future would impose attending military operations at significant distances. Thus, it would be necessary for the forces that will act in the Joint Operational Areas, where they should reply to many asymmetrical challenges, provided by the operative and tactical areas, different from those of typical war known up to now and to distribute the logistics support within the network.

In this context, it is obvious that it should take into account the evolution of the Defense Supply Chain, if this can demonstrate enough flexibility and swiftness to the troops` requirements, if such complex operations can be supported, and if it is fair to reanalyze the structure of the logistics support.

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NEW TECHNOLOGICAL OPTIONS IN PREVENTING AND OPPOSING INTERNATIONAL TERRORISM

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Abstract: *The performance of today's computing environment has been transferred to the competition state and non-state actors in the field of military power to an broader coverage area, meaning the civilian sectors, exposed to risks and threats posed by international terrorism expansion. This article highlights the magnitude and consequences of terrorist actions in the civilized world and detailing some aspects of novelty in the field of computer technology in identifying terrorists, preventing and combating terrorist acts.*

Keywords: *terrorism, counter-terrorism policy, information technology, biometrics, special operations*

1. TERRORISM – THE UNPREDICTABLE ENEMY OF THE CIVILIZED WORLD

The civilized world has a new treacherous opponent, unpredictable and extremely dangerous - terrorism. Faced with the evolvement of this subject, the effects and consequences of it, threatening the very existence of universal human values, the international community more united than ever, triggered a battle without equal "evil forces" with germs and its vectors. The worsening of terrorism in general, and the manifestation, in particular, have been possible under the contemporary security environment. Given its coordinates, we appreciate that terrorism has become, at present, a transnational public problem.

More and more obvious is that significant actors on the contemporary world scene are not only state actors but also some multinational companies, humanitarian organizations, agencies, groups and even individuals, all of them enrolling in the ubiquitous process of globalization. Among other things, globalization has allowed unrestricted access to information. The imformation, used and targeted in a particular way, it becomes a generator of instability and insecurity involving various forces and means whose sizing can sometimes be considerable.

Thus, under these conditions, with relatively low costs, it is quite easy for those interested to pose a threat. Therefore it is possible that the movements (of any kind), including terrorism, to have access to high-performance technology, weapons and modern weapon systems.

Therefor, the use in specific terrorist actions of a very wide range of mediums, techniques, tactics and procedures is no longer a burden. Because of that, the organizations and terrorist groups widened and diversified their purposes, making the risk even greater. In essence, they can vary depending on the objectives that the terrorist groups may pursue and may relate to:

-alerting public opinion and political power of terrorist groups and detailed explanation of its requirements;

-demonstrate the power and paralel operating mode regarding the government vulnerabilities targeted by an terrorist group;

-forcing reactions from those affected, justifying terrorist actions;

-destruction of targets and producing considerable human and material damage;

-the psychological influence of some decision structures and the corruption of public opinion.

Unprecedented increase in available resources to terrorist organizations, almost unlimited access to the technological, bio-engineering and applied chemistry information hold key positions, offering the possibility to improve the system of management and execution of attacks, while diversifying the means used to achieve objectives.

The asymmetrical way of action of terrorist organizations over the civilized world, failure of law rules or norms of armed conflict, international law or at least ethical rules dictated by the assumption of general human values accepted by the civilized world reduces the predictability of their actions and therefore increases the hazard of terrorist actions, increasing their effectiveness.

2. LATEST SCIENCE AND TECHNOLOGY ACHIEVEMENTS IN PREVENTING TERRORIST ACTS

The international dimension of counter-terrorism policy has become of great importance both in terms of cooperative political support efforts and, above all, the harmonization and joint efforts of all elements responsible for combating terrorism. In this context, we are witnessing an impressive group force capabilitie, backed by political consensus, unimaginable some time ago.

Armies, no matter how prepared, can not manage with the means they have to carry virtually the fight against international terrorism. Apart from special forces and informational sensors, they have structures capable to act symmetrically against networks and terrorist groups. It remains to be seen whether, in the future, they will create such structures involved in fighting terrorism, or will act according to their specificity, because it is unlikely that states will waive the armies and structured for a war against armys and create armed military forces modeled exclusively for the war against terrorism.

However, it is possible to broaden the special forces army structures able to act against all types of terrorism, in close collaboration with other forces and intelligence services in particular. We believe that the tasks that the armies (with the current structure) can preform generally in the following area:

-detection by informational sensors and special forces training centers regarding international terrorist organizations and networks ;

-hitting, by military means, especially aviation, missiles of all types and special forces, vital centers, training bases, warehouses and terrorist infrastructure in home zones (as they are discovered and identified and obtained approval of the country or countries in which they are located), most often in cooperation with the armed forces of these countries and/or other forces in the area;

-the war against terrorism (armed struggle) by the anti-terrorist coalition, with or without UN mandate, against countries and political regimes that practice or harbor terrorist groups and support/fund the terrorist or criminal actions;

-participation in search and destroy missions of bases and terrorist networks in fault zones;

-participation in conducting special operations against international terrorism. (Mureşan, M., Văduva,G., 2004: 471 – 474)

The performance of these tasks involve, of course, action force, aimed at destroying targets, force structures and technical elements of networks and terrorist organizations. Therefore, they are action over effects. They must act on causes. A substantial contemporary method of combating terrorism, which gives, in essence, as a fault terrorism, can not be achieved only through a series of anti-fault programs and strategies, long-term and very complex. These programs should aim, in particular the following:

-reducing the technology gap between the participating countries and harmonization of their interests;

-reactivation / awareness of international democratic organizations ;

-waiver of influence policy, irreconcilable and pressure power centers ;

-promoting sustainable procedures for the crisis management and conflict ;

-creation of flexible structures to detect networks and terrorist organizations and to address them through appropriate means (which is not in the power of armies structured prepared to take arms, nor wars with other governments that have clear strategies against non- actors);

-social harmonization, involving all countries, international bodies and organizations, wherever terrorist threats may come from; the need for a global response.

In the contemporary operational environment, the effective management of terrorist crisis use new science and technology achievements in both preventive and combatant actions. Thus, in recent years, one of the technological options in the fight against terrorism is represented by the biometric branch of science that deals with the measurement of the biological characteristics of a person. This category includes fingerprints, hand geometry, iris scanning and facial recognition. Since biometric parameters can not be lost, forgotten or transferred from one person to another, they are already widely used as specific security measures.

Biometric systems aimed at two main goals. One is identification (who is the person?) by which the identity of a subject is determined by comparing a biometric parameter measured with existing databases. The second is to check (is this person who he claims to be?) within which a biometric parameter measured is compared with that of a particular person. All biometric parameters can be used for verification, but only the unique (especially fingerprints, iris scans and facial recognition) can be used for identification. Biometric parameters are mainly used for access control, to ensure that a particular building or premises shall only be accessed by a authorized persons.

Hand geometry-based systems are ment to measure the shape, size and other characteristics of palms witch are used to control access and check the identity of people in airports, offices, factories, schools, hospitals, government institutions etc. Since hand geometry is a technique of verification, not of identification, users are asked to indicate who they are (inserting a card before scanning). Biometric parameters are then compared with those of the persons.

Extending access control technology is now fully justified. In the security tests achieved in 2001 by America's Federal Aviation Authority, attempts to enter the security zones have been successful in 31% of cases, and the inspectors were able to verify ("boarded") about 80 aircraft.

Another biometric technique witch began to be used successfully in airports is iris scanning. This has already yielded good results in dozens of U.S. prisons to identify inmates, staff and visitors. Also iris scans have been tested by banks to identify the users of ATMs. With their aid, customers do not have to introduce a note card or personal identification number.

Face recognition is the only biometric technique that can be used passively, by comparing the image of a figure with a database of suspects. Such systems connected to a network of closed-circuit television, are already used in the UK stadiums to identify the famous "hooligans".

The director of American companie specialized in this field said that the verification of fingerprints and iris scan would not have paid off with the hijackers of 11 September 2001, but facial recognition would have been effective. "What you need to do is to constitute a database of international terrorism, with photographs and fingerprints of all persons suspected of such acts." Then all passengers would be required at the time of entry into the airport, to undergo a facial scan, "just like your credit card is verified when you buy something with a credit card." Many of the air pirates are not known members of a terrorist organizations, and therefore their data does not appear in such databases.

Another technology that enjoys growing interest is the three-dimensional scanners or scanners "threat image projection" (threat image projection - TIP). The TIP scanner principle is to project the image of a randomly threat on the luggage (knife, gun, bomb component). When the scanner identifies a similar object, illuminates a warning light and the luggage can be retained for a thorough check. The terrorists of September 11, 2001 used as weapons objects that such scanners would not report them as threats.

In the face of terrorists who do not carry weapons and who are traveling under their own identity, a new efficient technology could be computer-assisted verification of passengers (computer - assisted Passengers screning) experimented in 1998 by some U.S. airlines.

It uses information from the system reservation program and the history of previous trips by a person to identify potential suspects to be subjected to additional security procedures.

If identifying the terrorists at ground level is so difficult, what might be done for planes to be harder to hijack in the air? Former president of the British Airlines, Robert Ayling, suggested that the passenger planes could be fitted with a system for controlling them from the ground in case the plane is hijacked. Such a system of remote distance control can be penetrated and used by hackers employed by terrorists. Another suggestion is to modify the existing automatic collision avoiding system so that an deliberately impact can be prevented.

3. CONCLUSIONS

In the days following the attacks of 11 September 2001 politicians and the authorities have realized how little they know about the promoters of the attack and their motivations. Books on the subject were present, most been available in bookstores or on the Internet. The war in Afghanistan, U.S. support for the mujahideen and the Taliban regime are detailed in the works Taliban (MJ Gohar, Oxford University Press) and Unholy Wars (John Cooley, Pluto Press, London). The second, written by an American television reporter accuses U.S. of the results of what some call the CIA Jihad in the 80s. However, no matter how advanced the technology used might be, it should be handled by trained personnel, the human factor being impossible to control. The reality is that the terrorist threat can not be removed with the help of technology.

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TRANSATLANTIC COOPERATION, IN THE CONTEXT OF THE NEW INTERNATIONAL SECURITY ENVIRONMENT TRANSFORMATIONS AND RECENT NATO AND EU DOCUMENTS

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Abstract: *Euro-Atlantic security is endangered by various risks and threats specific to the XXI century. NATO has developed cooperation relationships and partnerships with the majority of the global security actors, but NATO will still have a special relationship with the EU, which currently shares the same values and strategic interests as the North Atlantic organization. NATO – EU cooperation and common strategic objectives are visible also in the approach to the problems of defense in the context of budgetary constraints. Thus two parallel concepts involving procurement (and sharing) of machinery and modern military capabilities, as well as cost sharing between member countries have developed. NATO's action capability remains unmatched worldwide in terms of possibilities to deploy and sustain the military power in order to protect the safety of the Alliance members and to contribute to global peace and security.*

Keywords*: Euro-Atlantic security, cooperation, "Pooling and Sharing", "Smart Defence", defense budgets, military capabilities, sustainability, efficiency.*

1. INTRODUCTION

The documents of the Chicago Summit (2012) and NATO's Strategic Concept developed at Lisbon (2010), describe a security environment that contains a broad and constantly evolving set of opportunities and challenges to the security of NATO territory and its population. While the possibility of an conventional attack against NATO is low, conventional threats can not be ignored. The persistence of regional conflicts continues to be a matter of great concern for the Alliance, as well as growth of defense expenditures in other parts of the world and the acquisition of more advanced capabilities by some emerging powers.

Globalization, emerging security challenges such as cyber threats, environmental and resource constraints, the risk of energy supply disturbance and the emergence of new technologies will continue shaping the future security environment in areas of interest for NATO. A number of vulnerable, weak and stranded, or in process of stranding countries, along with the increasing capabilities of non-state actors will continue to be a source of instability and potential conflict.

These disturbing factors, along with challenges such as terrorism and piracy, proliferation of weapons of mass destruction, the development of laser weapons, nuclear weapons and their means of delivery, electronic warfare, access to outer (circumterrestrial) space, threats posed by ballistic missiles, cyber attacks, actions that create health risks, climate changes, water scarcity and increasing energy needs will be in the future threats and vulnerabilities to the NATO security environment and areas of interest, with the posibility of influencing the political-military NATO actions, both in planning and during the course of actions.

According to the Lisbon Strategic Concept (2010) the three tasks set for the alliance will be continued, namely: collective defense, crisis management and cooperative security. Heads of states and governments participating in the Chicago Summit (2012), solemnly reaffirmed their commitment to preserve transatlantic connection sealed by the Treaty of Washington in 1949 and to fully respect the principles and purposes of the UN.

They highlighted that the Alliance will remain on a liaison framework in terms of collective defense, security consultations and shared decision making.

2. NATO IN THE CONTEXT OF THE CURRENT SECURITY ENVIRONMENT

Afghanistan will continue to be in NATO's attention after 2014, in the sense of material, political, financial and military (training and assistance missions) support, based on the existing long-term partnership.

Financial support will be developed based on the mechanisms and arrangements already existing, by implementing their principles of efficiency, flexibility and transparency, taking measures against corruption, respecting the decisions taken on the Conference on Afghanistan from Bonn (December 2011).

Besides involvement in Afghanistan, NATO is interested in the security and stability in the Balkan and in the Black Sea regions. KFOR mission will continue to run in compliance with the UN mandate (UNSCR - 1244) and in cooperation with major security actors and Kosovo authorities in order to comply with the EULEX law.

Simultaneously, NATO is involved in global peace and security through other missions, including: the counter piracy operation *"Ocean Shield"* in the Horn of Africa, with prolongation until 2014, which is conducted in cooperation with the EU *"Atalanta"* operation and other naval forces; the maritime operation *"Active Endeavour"* in the Mediterranean against terrorism; supporting the *African Union mission in Somalia "AMISOM",* on its request, by air and sea actions; the assistance mission in Iraq - *"NATO Training Mission in Iraq"* (NTM -1).

The Alliance has developed cooperative relationships and partnerships with majority of the global security actors. Among them we can mention the UN, EU, OSCE, Russia, the Mediterranean countries, the African Union, the Arab League and others. NATO will continue to have a special relationship with EU - an actor who currently shares its values and strategic interests.

The strategic partnership with the EU needs to be improved in the following directions: cooperation in the development of military capabilities in these days of austerity; practical cooperation in military and civilian operations; broadening the base of political consultation discussions through a structured dialogue between NATO Secretary General and High Representative for the Common Foreign and Security Policy.

All these must be understood on the background of close collaboration in terms of collective work within the main missions in progress. In this context, NATO recognizes the need and importance of further development of the CSDP of the EU and a strong European defense.

The NATO - EU close cooperation and common strategic objectives are visible in the approach to the problems of defense in the context of budgetary constraints.

Therefore, two concepts involving acquisitions (and sharing) of machinery and modern military capabilities as well as cost sharing among member countries have developed in parallel.

It is about the European *"Pooling and Sharing"* concept and the NATO *"Smart Defence"* concept which are intended to be complementary to each other, especially for member countries of both organizations. These concepts provide a basis for a new type of cooperation, for the acquisition and maintenance of military capabilities at the level of nowadays requirements, equally necessary in both NATO and the EU in order to fulfill all security tasks.

All measures of implementation involve carefully establishing priorities and precise coordination of material and financial efforts in the context of economic crisis affecting member countries since 2008.

Years of recession that followed have imposed restrictions in the defense budgets of the Member States and the effects can be seen at the level of contributions of the Alliance members, and also in the budgetary mechanisms of EU military operations, conducted under the aegis of the CSDP.

The crises have affected the current relations between different states, as well as governance systems of the states, especially in the Arab world of the Mediterranean area, leading us to the conclusion that the changes produced require the existence and use of modern military and civilian facilities, quick and easy-to-use anywhere in the world.

NATO is required among other things to demonstrate political determination to reduce the contribution gaps with funds and also the endowment and equipment level with military technology between the United States and other Member States. Until now, U.S. has always supported the Alliance, but in the current crisis it is necessary to review the situation through the concept of "Smart Defence".

3. THE EUROPEAN "POOLING AND SHARING" PROJECT

This project has legally took shape on November 30, 2011, at the Reunion of Defence Ministers from EU countries, when they talked and took a political commitment concerning the shared development of new military capabilities as well as their use in common. Moreover, the Defense ministers approved a list of 11 projects through which they have made a commitment to implement them together by using the *European Defence Agency* (EDA), which in principle takes into account four functions: promotion of research in the field of defense and technology, development of military capabilities, promotion of cooperation in armaments field, creation of a competitive European defense equipment market and strengthening the European defense, the industrial and technological base of it.

EDA performes in Europe a comprehensive approach by contributing to the development of military capabilities while setting the basis for a fair and genuine transformation of the European defense industry, where requests / demands and optimal logistics are connected in order to save time and money for EU participating countries.

The aim of the activity is to improve the EU's defense capabilities in order to solve the tasks imposed by the Common Security and Defence Policy (CSDP).

The cause that determined the concept of "Pooling and Sharing" represents the decline of defense budgets of EU Member States over the last decade, during the financial crisis. On the other hand European armies increased their international cooperation for developing military capabilities, but certain goals set by Project Global 2003 and 2010 remained unresolved. This is evidenced in the analysis of actions carried out in Libya in 2011. Initially, the concrete proposal, known as the "Ghent initiative" - initiative to intensify military cooperation (November 2010), came from the representatives of the ministries of defense of Germany and Sweden, participating in EU Defense Ministers' Meeting in the town of Ghent, with the aim of maintaining and improving EU Member States' operational capabilities, taking into account improvement of effect, sustainability and cost effectiveness. In May 2011, they demanded the High Representative for the Common Foreign and Security to request the European Defence Agency (EDA) to make concrete proposals for cooperation by applying concept of "Pooling and Sharing".

The purpose of this action is to operate in a pragmatic way in order to maintain and improve European defense capabilities in the context of cuts to national defense budgets. Is thus hoped that it will be established the premises for EU countries' armed forces to be equipped properly and to be well trained. It is also aimed that problems that have had a negative effect for actions in Libya (2011) to be rezolved.

By "Pooling and Sharing", Member States may collectively acquire capabilities that could not be purchased individually, thus amplifying cooperation by sharing the benefits of joint purchases of military capabilities, preventing duplication and reducing costs.

These capabilities are critical to operations under the Common Security and Defence Policy (CSDP) and will assure the independence of the EU regarding third parties.

The projects approved by the EU performed for the implementation of "Pooling and Sharing" concept by EDA covers a wide range of areas such as: field hospitals, helicopters units training, future satellite communications, air refueling, maritime surveillance, intelligent ammunition, European Satellite Communication Procurement Cell (ESCPC), pilots training, Intelligence Surveillance Reconnaissance (ISR), the European Centre for Transport, shipping logistics.

For example, through the helicopters units training program started in 2008, were trained over 150 crews using the expertise of "pooling and sharing". European Satellite Communication Procurement Cell (ESCPC) needs data that can only be obtained by using drones (UAVs) and further processing of data via SATCOM capacity. Using the European concept, costs of the whole process are reduced by at least 10% and it is ensured a fast access to information. By using the concept of "Pooling and Sharing",t he 5 European SATCOM satellite data procurement systems which exhaust their operational resource until 2025 can be replaced easily. In the same manner, the problem of intelligent ammunition, that proved to be insufficient and largely provided by the U.S during actions in Lybia, can be solved.

It can be said that there is a wide range of options for "Pooling and Sharing" project platforms and subsystems developed to synchronize national maintenance programs. This marks a new phase of CSDP military capabilities in the EU, representing a step forward from the EU's ambition to be a first-hand player to concrete actions in the establishment and maintenance plans of credible military capabilities.

To solve the tasks set by "Pooling and Sharing" concept, EDA works closely with NATO similar elements in order to avoid duplication of activities and to take into account the complementarity of the concept of "Smart Defence". At the present moment, assurances that the two concepts reinforce each other are given.

4. NATO MODERN COOPERATION CONCEPTS IN THE FIELD OF DEFENCE

NATO focuses its ***"Smart Defence"*** efforts to resolve key issues relevant to present and future actions. The projects in which the Alliance is engaged are especially strategic and consist of: force preparing and training, ballistic missile defense of the Euro-Atlantic area, intelligence, improvement of the research, surveillance and reconnaissance; effective engagement and force protection. To achieve the desired effect by applying the concept of "Smart Defence", Members need to prioritize and choose the best solution available for several countries. Currently, the Alliance can play a guiding role for choosing the best, most efficient, safest and cheapest solution for the benefit of all members in the current crisis.

For achieving success in terms of this concept NATO Member States have to cooperate so that most states could use equipment and capabilities that normally they would not permit. Cooperation must be based on the states interest for a certain category of deficient military capabilities, on geographical area of the various states, on states affinities, culture, economic and financial power. The primary responsibility of coordinating activities should belong to the Allied Command Transformation (ACT), with the objective stated to perform the tasks of NATO force vision for 2020.

NATO's partnership policy, recently approved by the Foreign Affairs Ministers in Berlin in 2011, represents the basis of cooperative security set in Lisbon (2010). This way, the foundation of a free and prosperous Europe was built, by establishing a lasting peace and developing Euro-Atlantic relations with the countries in the vicinity area of NATO. The main forms of cooperation are implemented by the Euro-Atlantic Partnership Council, Mediterranean Dialogue, Partnership for Peace, the Istanbul Cooperation Initiative, cooperative relations with third countries anywhere in the world, cooperation in the development of training and conduction of operational missions.

Cooperation involves among others the important issue of financial contributions which support NATO-led operations, especially during the crisis period that humanity endures. In Chicago, the importance of flexibility in the field of the cooperation was reaffirmed.

Common challenges and threats have generated policies to combat them. In this category there are policies against weapons of mass destruction, against terrorism, defense against cyber attacks and nuclear non-proliferation.

Alliance security is threatened primarily by: terrorist attacks, energy resource depletion, risks to human health, climate changes, increased energy consumption, deficit in water resources. Also, there should be considered potential ballistic missile attacks over the population, territories and forces of NATO European states, which have generated development of ballistic missile defense capabilities (BMD) in the Alliance. In the declaration of the Heads of States and Governments of NATO in Chicago, it is shown that the missile defense can be complementary to nuclear weapons in the discouragement phenomenon, but it can not substitute these weapons. These capabilities are purely defensive. At the same time it was stated that the Alliance has reached an intermediary capacity in this field.

NATO as an alliance whose main objective is collective defense, must confirm the power and capability of discouragement and defense. These objectives can be achieved through the existence and maintenance of reliability of nuclear, conventional and ballistic missile defense capabilities, thus being able to satisfy the Lisbon Strategic Concept (2010). On this basis it was decided the ***NATO Forces Objective 2020***, capable of maintaining the Alliance leadership position worldwide in defense and security problems.

NATO allows Member States to jointly acquire a higher level of security compared to the situation in which they would act on their own. It will give further consideration to the transatlantic link and solidarity within the Alliance and to the division of responsibilities, roles and risks in order to deal with the challenges that arise for European and North American states.

The Alliance recognizes the importance of a stronger and more capable European defense and welcomes the EU's efforts to strengthen its capabilities and to resolve common security challenges.

These efforts are themselves an important contribution to the transatlantic link.

The NATO power consists into Allied forces and is resumed to: training, equipments, interoperability and experience of forces that are led by the integrated command structure. The success of Alliance forces in Libya, Afghanistan, the Balkans and in fighting piracy is a fair example of action capacity of NATO that remains unmatched in the world in its ability to deploy and sustain military power in order to protect security of Alliance members and to contribute to global peace and security. The current results represent the effort of over six decades of close cooperation in the field of defense.

In light of these progresses, NATO has established the Objective of Forces 2020: modern, better equipped and connected, educated, trained and controlled forces so that they can work together and with partners in any environment. The fundamental thing to achieve this objective will be the improvement of the way in which will develop and ensure capabilities for Alliance missions. In addition to the essential national efforts and existing, proven multinational cooperation forms, such as strategic air transport, warning and air control segments, Alliance must find new ways to cooperate more closely in order to acquire and maintain key capabilities, high rank capabilities on what is imperative and regarding the defense plans changing. It also should be deepen connections between the Allies and between them and their partners, based on mutual benefits. Maintaining a strong defense industry in Europe and increasing the potential for cooperation in the Alliance defense industry remains an essential condition for achieving the necessary capabilities of the 2020s.

Smart Defense is the heart of this new approach. The development and implementation defense capabilities is primarily a national responsibility. But, as technology becomes more expensive and defense budgets are affected by the crisis, there are key capabilities that Allies must achieve by collective effort.

Are remarkable the Allies efforts and decisions to continue the specific multinational projects for a better protection of forces, a better air and land surveillance and a better preparedness. These projects will contribute to the improvement of operational efficiency, budget savings, and closer ties between the allied forces. Therefore, they will become the starting point for many others future Smart Defence projects.

Based on this success: the ***"Connected Forces Initiative"*** will be built, joint exercises will be enhanced and improved, education and the training of Alliance personnel will be extended, thereby complementing national efforts, NATO Response Force - NRF will be used more often, so that it can play an important role in improving the ability of Alliance forces to work together and to contribute to discouragement and defense missions; the ties between NATO command structure, NATO's force structure and national HQs will be strengthen. Last but not least, Allies connections with partners will be intensified as much as possible, so that we can operate together.

Although improvements have been made since the last Summit, more is need to be done on the line of capabilities and cooperation. For this purpose, the ***Defence Package*** was adopted to help the Alliance in the development and deployment of missions capabilities needed. Transformation of structures and procedures for greater efficiency and better use of national budgets will de continued. Defence Package is designed to advance the three components of the Rasmussen's plan: *cooperation, prioritization and specialization*. The last of these is particularly sensitive because it could deliberately involve countries to give up certain specific capabilities and rely on others to provide them during operations - thus raising issues of sovereignty. The package includes 20 projects, covering, among other things, the issue of sharing maritime patrol aircrafts and improving the availability of precision weapons for combat aircrafts. Each project will be acquired through volunteering by a leading nation. Their number is not too high, and these projects are called "emblematic" because some of them are essentially symbolical, designed to build mutual confidence.

CONCLUSIONS

Alliance leaders are determined to ensure that NATO keeps and develops the skills necessary to perform its core tasks of collective defense, crisis management and cooperative security so as to play a key role in promoting security in the world. NATO must fulfill these responsibilities while solving the problems created by the acute financial crisis and geo-strategic development challenges.

The basic capabilities of the Alliance generates a constant debate among members on the issue of "collective defense" in accordance with Article V of the NATO Treaty. Question arises whether this mission is the main engine of NATO Member facilities, or if, as the U.S. and other developed nations claim, the priority of having deployable, usable forces, prepared for international operations. To rephrase, we can wonder whether deployable forces are indeed available for use in all Member States, if considering the problems encountered by the Alliance during the major operation in Lybia.

Probably not all 28 NATO countries can participate in the efforts required by the ***Defence Package***. The reality confirms that only some groups of countries can offer capabilities to the Alliance. The focus is now on implementation of the concepts mentioned, which is a challenge and requires a strong political will among member states of the Alliance.

The development of European military capabilities will strengthen the transatlantic link, will increase the security of all Allies and will stimulate a fair sharing of burdens, benefits and responsibilities in cooperation with the Alliance. In this context, NATO will work closely with the European Union, as agreed, to ensure that Smart Defence and Pooling and Sharing initiatives of the EU are complementary and reinforce each other. The success of the Alliance efforts will continue to depend on mutual transparency and openness between the two organizations.

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PRODUCTS AND FORESIGHT METHODS IN NATIONAL SECURITY

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Abstract: *This paper has the aim of describing the main methods which are used to foresee some patterns in the field of security. One starts to analyse the field of foresight by pointing the 3 type of foresight products which are used in the field of security: estimations, predictions and scenarios. One argues that the state of security is described by five types of variables (military, economic, politic, social and ecologic). These elements could indicate us through a scientific approach if the insecurity is inherent, with one of the three products of foresight. The paper mainly refers to Tangredi, Kahn and Schwartz analysis in this field. Finally, the paper tries to emphasize the importance of using neural networks as modelling techniques in security, as a new, original way of discovering the future.*

Keywords: *prediction, foresight, scenario, estimation, security*

1. INTRODUCTION

Nowadays, our sketching image about the international system is generally incomplete, very uncertain and subjective. The future gathers possibilities none of which is certain - so the effort to indicate trajectories the international system may follow into the next period must be a relatively hazardous enterprise. Some would claim it is not even meaningful, but that meaning can be given to future-oriented research on the international system, as well as on any domestic system, if we split the task into three components:

1. Value research - the effort to establish not only basic values of the system, but also the conditions under which they are most likely to be realized.

2. Trend research - the effort to establish trends in the system, based on data from the past, and theories as to how extrapolations should be made.

3. Exploration of relations between trends and values - in other words, efforts to find out whether the trends do or not lead the system into the "promised land": and in case they do, how to reinforce and stabilize them; in case they do not, how to change them.

That means that the future research will shape essentially three main components or aspects, all of them well balanced and interconnected. The brand new element form the research of the future (but not new in the planning process) is the idea of rejecting the splitting of the tasks between ideologists who develop some values, scientists who develop some trends, and of course politicians who try to focus on administration, by a symbiotic approach to the three fields.

A consequence of the upper rejection is the process of nullifying any strict boundary between the values and the trends. Values are not anymore exogenous to the system; but they become a part of the hall system that may rise from the discovery of the new trends. These things happen just as much as the trends are seen as something that should adjust to the existing values. To conclude, we witness the birth of a more symmetric relation between values and trends from this type of approach.

Today we face an environment of increasingly technical background. This environment is essentially the product of globalization. Seen and interpreted in different ways (from good to bad), it remains, in one's view, a fundamental factor of the transformation of the society in one that is based on estimates, forecasts and scenarios.

The military forces, viewed as a natural continuation, responded in time to the needs of security of a state or of an international organization. The effects of globalization had not only allowed innovations in telecommunications but also the security risks to be a phenomenon passé-par-tout. The forces will have to meet different challenges of changing environments.

Crisis management paradigm, in terms of decision making, will evolve to scientific projections based on schemes, in order to provide sustainable solutions for development. From the conceptual point of view, the security finds its form and substance in the international scientific research of the Copenhagen School, which today is the widely used model for study. Barry Buzan's and Ole Waven's dissemination led the security from a military level to a landing containing five levels of analysis (military, political, societal, economic and environmental). The policy of limiting the power and the "Wilson-way" are seen by them as a failure. Focusing only on military matters was a limited way because it was based on a nuclear deterrence version.

Barry Buzan sets a different optical security analysis. He thinks in terms of security threats and vulnerabilities as the basis for its interpretation in this century. Through security, we will therefore understand the threat.

However, Buzan was criticized by McSweeny because he sustained that the security responds the needs of the state and not of the individual.

2. WHAT MEANS FORESEEING?

Following the history of the world, we see that the problem of foresight appeared in ancient times, bringing unrest (from mystical level) to people. The *Sibyls* are the starting point of the unrest. There was a mystical story in the ancient Rome about a mysterious set of nine books which contained a predefined history of the Roman people and some details of all future crises and wars which would happen to them. So, these women were being given the gift of prophecy.

Legends built around them teach us that they were surrounded by supernatural qualities of the gods. The story about their books which were discarded because of their willingness to negotiate with the Romans is the most representative legend about prediction role in Roman society.

The issue of the strategic foresight in the field of security was first analysed in the works of Herman Kahn. He was one of the builders of the strategic foresight. In the book "On Thermonuclear War", the author gave us the opportunity to use his probability-utility model in balancing a number of policy decisions. He uses in the preface the fact that the book was written in a matter that "tried to sink the probability of catastrophe and smoothing the consequences". This is why Kahn begins with some concerns of the probability and the disutility which are related with our life. One agrees that a relative priority could be attached to the "utilities" and to the "disutilities" (as the author names them) in choosing the road for an anxious nation. So a question is burn here: is the author more decided to lower the probability of nuclear war, or in to lower its destructive effects? Is he in to the need of lowering the probability of direct attack or in the need of lowering the diplomatic black-mail?

The essence of one's analysis is bassed on the assumption that the interests remarked are always incompatible, and of course one assumes that they reach some different values for each stake-holder. The author proposes in turns, some of the major policy recommendations which emerge from the upper tome. He tries to focus on three types of deterrence being distinguishable and significant for us.

-Type I deterrence is the deterrence that prevents a direct strategic assault on continental North America.

-Type II deterrence is the deterrence designed in order to prevent or lower extreme provocations -other than direct assault on the United States.

-Type III deterrence- the deterrence which seems to overlap considerably with type II-is intended to restrain the adversary from going beyond certain territorial or weaponry bounds in a limited military conflict.

The author identified six variables (stable, volatile, predictable, incidental, incalculable and binding) which by analysis and operationalization could lead to scenarios and predictions (Kahn, 2000:167). First of all, Herman Kahn defines prediction as "our try to adapt our expectations to a volatile reality, having as foundation a sophisticated setting" (Singer, 2000:203). Its symbiotic nature is heuristic and propaedeutic. Alongside Kahn's researches one choses to analyse Peter Schwartz's model of prediction. This completes into a profound form the art of foresight (Schwartz, 2003:109).

Classifications of foreseeing techniques and methods are provided by Dunn in 2003 and Kleiner in 1996. They group the methods in two categories: methods based on extrapolation and methods based on theoretical prospecting. In the first category, the authors describe the analysis of time series, the estimation of linear trends and the nonlinear time series analysis. In the second category they describe methods and techniques that try to emphasize informed judgments (Delphi technique, cross-impact analysis and technical feasibility).

Estimates, forecasts and scenarios

The methods which are specific to foresee the national security policy are described by Tangredi. He notes that the most important forms of foreseeing are the estimates, the forecasts and scenarios.

Generally, the estimates use a state of current conditions in order to identify part of future events. One concludes that this method is broadly associated with the official estimates from the field of intelligence which are provided by the most important intelligence agencies and services. In the USA the most important are the National Intelligence Estimates (NIEs). They summarize all the assessments which look important for the intelligence community.

These intelligence estimates usually joins the current information on a variety of components (technology achievements, industrial production, military orders) in a comprehensive way which is enough in order to identify the probability of the near-term policies. Nowadays most official intelligence estimates focus most on the capabilities of potential opponents and shy away from discussion of probable intentions.

That happens due the controversies from the Cold War, also by the natural conservatism and bureaucratic pressures for continuous accuracy (Tangredi, 2000: 88).

The second form of foreseeing is represented by the forecast. It gathers a group of longer-range assessments, which are blueprinting on some trends-based analysis.

The special fact about using trends is that it gives credibility to forecasts and least but not last they are issue-specific which means that they are composed under the assumption that a specialized expert is best qualified for making an assessment concerning the continuity or modification of current trends. An interesting fact is that when the forecasts are combined in an attempt doubled by comprehensiveness some variations of the Delphi Method are used.

One agrees that even though the majority of the assessments which are designed today can best be considered forecasts, the term is not preferred by the futurologists who use the scenarios. As Tangredi admits, "the success of the term forecasting is broadly mixed, and it is especially so in the areas which are experiencing some discontinuous change". The term forecasting has proofs of unreliability because it was wrongly used in order to predict the unrest of the unpredictable. But in the same lines we receive the next idea: "We utter that an organization needs to use the forecasts and also the scenarios".

The explanation is that forecasting enlightens us how predictable trends may combine in order to produce significant changes in the areas of business. But forecasts are not labelled as such, and we can implicitly use it in every strategic assessment. When we evaluate the validity of any new policy recommendation we have to determine the assumptions and the lines about the future. This gathers sense within the forecast, on which the process is based. The third main form of foreseeing is the scenario. It can be sketch like a range of forecasts, with the construct and the intent a lot more complex.

In the field of security, some scenarios can be blueprint from Herman Kahn's approach to analysing potential nuclear wars that might occur.

When we talk about the big popularity of scenarios in the field of business planning we have to understand that Pierre Wack applied the concept in Royal Dutch/Shell. From this point of view Wack is often believed to be the sole forecaster of the rise of OPEC and the appearance of the 1970's oil crisis. However, it is known that scenario builders are shaping the fact that their objective is not to foresee a particular future, but to help "decision-makers to take into account all the possible futures."

Also, Peter Schwartz had a significant role in spreading the scenario-modelling in the United States. The upper point of the scenario's development appeared when Wack changed the meaning of the scenario from the tool used for developing simple tales of possible futures to description with "full ramifications" which are designed to change and modify our leaders' view of reality.

For this reason the modern scenarios strive to some developed depictions of alternatives based on some possible changes in the current trends. As the author tries to resume: "The result of the scenario is not a frame of tomorrow, but a tool which could give better decisions for the future." We understand now the difference between scenarios and forecasting. The second term attempts to offer an accurate and predictive future.

The technique used for scenario building has become professional. Nowadays it gathers groups of experts from different subjects. Its initial steps are made by the drivers that will operate the future change. The operating drivers represent important factors in current trends. These factors are the population growth or decline, the technological development, the technological diffusion, the human factors.

To summarize, a scenario is a depiction from future which is based on some chosen directions from drivers. Being taken into consideration the multiple directions which are possible for multiple drivers, one agrees that could find a large number of scenarios required to depict all plausible future. In the same time as like theories, and opposite to predictions, the scenarios are not right or wrong.

They could only be plausible or implausible (Washbum, 1978: 96). The scenarios are used with an increasingly trend by the defence planners in order to grow the number of alternatives correspondent with the traditional military planning process.

Some practical examples used to apply the theoretical elements are shown in the report "*Mapping the Global Future" (Report of the National Intelligence Council's 2020)*. This report appeared in 2004 and was based on a selection and a symbiosis of several techniques and scenarios. It was developed as a concrete useful foresee for the decision makers from the field of security. U.S. continues to surprise us in the field of applied foresee in security. Along with the previous report, we have to mention here the *Global Trends 2025: A transformed world started* in the late of 2008 under the coordination of NIC. To create these reports there were created some extensive working groups who composed dozens of scenarios, and finally were chosen the most significant. They are a great example of the crucible for global scientific research.

3. NEURAL NETWORKING

When we look the upper methods we agree that the applied foresight in security is new as holist concept. The evolved methods in science and the security have to come into the line. In order to treat this difference, one proposes a new way of shaping the future based on the usage of the neural networks and on the black-swam concept.

When one outlines the field of neural networks in scientific research is necessary to establish the motivational occurrence of the concept. In its case the experience shows the facts. The complex managerial problems faced a long time two things: either they are too large for a rigorous mathematical formalization and solution algorithm is too complicated and too complex or they are too costly to be implemented through optimization and simulation techniques.

To overcome these difficulties, they were used several alternative solutions based on artificial intelligence-a term designating a branch of informatics oriented through the implementation of the logic properties which are similar to the human intellect on the computer.

Neural networks ("Artificial neural networks") appear as a smart solution that can be used as a last resort when other methods are inapplicable to develop computer assistance due to the poor structuring of the decision. The most important references related to neural modelling are made by Rendez-Tanali, Irmak and Abdul-Hamid, Husein in 2011 (Rendez-Tanali, 2011:100-103). Furthermore, the frame built for the information systems to assist data-driven decision is made by Newman in "The Structure and Function of Complex Networks". Analysing the research field one sees that the problem of applying neural networks in international relations was debated in a primary form by scientists from Harvard University and Georgetown University.

Supporters (Nathaniel Beck, Gary King, Zeng Langche, 2004; pp.30-39) argue that the use of neural networks in the conflict is a few-limited solution. They show that their theoretical conjecture about international conflict is functional. They blueprint that the group of de Marchi agrees with their main methodological points and that the out-of-sample foresight performance is to be a basic standard designed to evaluate all international conflict studies. They try to demonstrate that all other methodological conclusions drawn by de the group of Marchi, Gelpi, and Gryanaviski are false. The first example is that when it is used the same evaluative criterion for the models, it is very easy to see that the specified logit models really don't outperform neural network.

Of course, it is shown that flexibility of the neural network models are able to reach important empirical relations drawn between democracy and conflict which aren't seen with other means. That is an idea that is interesting since the classical models have more limits than the neural network model (Nathaniel Beck, Gary King, Langche Zeng, 2000: pp. 20-29).

On the other hand, a group of researchers (Scott De Marchi, Christopher Gelpi, Jeffrey D. Grynaviski, 2004: 40-49) argues that neural modelling is not mature enough to solve predictions. Despite important strengths in the field of neural networking, they take issue of three main aspects of the research. First of all, there is the substance of the logical model which is compared to the neural network. Second of all the standards they use for assessing forecasts, and least but not last the theoretical and model building implications of the nonparametric approach represented by neural networks. They replicate and extend the main analysis by estimating a more complete logical model and compare it both to a neural network and to a linear discriminant analysis. Their work reveals that neural networks do not perform mainly better than either model or the linear discriminant estimators. Given this result, they argue that more traditional approaches should be relied upon due to their enhanced ability to test hypotheses**.**

The second main component which one argues to be included in the prediction instrument is the black-swam concept. Reinvented by N. Taleb (Taleb, 2008:10-15) the black-swam concept refers to the importance of the unpredictable events. One agrees with the idea that there are events which could not be predicted and through their impact could influence the foresight product. So, in order to develop a functional instrument for improving the estimates and the predictions one chooses to agree with supporting the neural networking doubled by the measurement of the impact of black-swam. Their usage opens a new age in the field of predictions. That is happening because the neural model offers us the possibility of learning. It means that as long as the mode roles it will correct its errors and become more accurate. This accuracy will be increased by the identification of the black-swam and the programs developed with the purpose of protecting the organization in front of the unwanted black-swam.

4. CONCLUSION

One concludes that the neural network is a feasible solution for estimating and predicting the state of security. In this article one described the main methods and products of foresight, analyzing the work of H. Kahn and P. Schwartz. Over the upper analysis one agrees that the main methods used in estimates and predictions are limited because of their lack of holist view and of their possibility of reshaping and adapting. The reshaping of the network assures the new model the adaption of the system. The second main prediction component which one agrees to build the model is the usage of black-swam concept. This concept makes the linkage between predictions and scenarios.

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THE SECURITY ENVIRONMENT AND THE PHENOMENON OF GLOBALIZATION: DIMENSIONS AND PROCESSES

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Abstract: *The present paper shows that the impact of globalization can be felt in any field of activity and its effects are not only multiple, but also long-lasting. Today the world can be perceived as a 'global village' and Romania is part of it. Thus, Romania must bring its contribution to the economic, political and cultural life of the whole world. The Romanian institutions and the civil society organizations must shape a stable national security environment. By the 'Millennium Declaration', adopted in September 2000 on the occasion of the 'Millennium Summit', the wish of the sustainable development is the one determining the implications of the impact of globalization and integration on the national, regional and international security environment. The dimensions of globalization represent the strategic fields in which the multifarious ways of action manifest themselves in order to carry out the stages of its extension referring to the sequence of the processes meant to develop and integrate security. The concept of globalization might refer to a real process or only to an undemanding representation of the world. The definitions of the concept highlight a wide range of approaches to global transformation according to certain ideologies.The present study also presents the opinions on the phenomenon of globalization and the security environment, this part being based on a questionnaire applied to a number of 33 subjects. Thus, this work is based on both quantitative and qualitative research methods.*

Keywords: *globalization, dimensions, processes, security*

1. INTRODUCTION

The phenomenon of globalization is a real way of developing a new world order. The knowledge-based society is centered on globalization, security environment and sustainable development.

Each national state, region or international community is confronted with multiple positive and negative effects of social, economic, political, military or cultural nature generated, in certain cases, by globalization.

There have also come into being certain movements against globalization and regional integration at both national and international level. Romania is a European state, which must co-operate with the other states belonging to the same region as well as with countries all over the world and that is why it must be open to exchanges of goods accepting the influence of the social, economic, political, military as well as cultural phenomena at international level.

2. THE SOCIAL, ECONOMIC AND POLITICAL CONTEXT OF GLOBALIZAION

The *Millenium Declaration* adopted in September 2000 is the one establishing the *Millennium Development Objectives*, such as: reducing poverty, offering universal access to primary education, reducing infantile mortality, improving maternal health, HIV control, equality between sexes, global development partnerships.

The progress in the field of information technology has propelled the economic globalization associated with the changes which occured in the national approaches concerning the strategies used in the commercial field.

The interdependent channels of globalization are those which have a great impact upon the whole world. It is worth to mention here the new technologies, the flow of money as well as the migration of the workforce.

Most economies are not completely integrated in the global system.

There are certain persons who have certain doubts about the benefits of globalization being against an advanced integration.

We can say that new conditions are created for the economic development by the transformations made under the sign of the increasing globalization of the world economy.

3. THE DIMENSIONS OF GLOBALIZATION

Due to the fact that globalization is a complex and multidimensional phenomenon, its coordinates are not easily established.

Globalization has numerous effects in various fields of activity, such as: economy, politics, armed forces, society, culture and security.

In order to better understand the phenomenon of globalization, it is highly important for us to get conversant with its main dimensions. Thus, we should highlight a view on the way in which globalization exerts its power and influence on security.

Nowadays, the main dimensions of globalization are as clear as possible: the economic, political, informational, technological, administrative and cultural dimensions. We can state that the most important dimension of globalization is that of security.

3.1 The Economic Dimension

The economic dimension aims at integrating the production processes and markets. It deals with the interdependence of the national economies, the transnational corporations as well as sustainable development.

3.2 The Political Dimension

The economic dimension is interwoven with the political dimension manifested by international political innitiatives, pluralistic political views in international relations or the development of institutional structures of global political leadership.

3.3 The Information Dimension

The informational dimension (Tsang, 2008: 35) aims at widely connecting to the world flows of information.

This connection is made not only at the individual level, but also at the level of the whole community. The focus is laid upon the free access to information, a certain infrastructure being required by an appropriate development of the information society.

3.4 The Technological Dimension

The technological dimension is applied by the control of the access to the high technologies. The scientific research is oriented towards the sustainable development and the economic processes are technologically connected. The new discoveries should be used in the benefit of the citizens and the threats to the human existence should be eliminated.

3.5 The Administrative Dimension

The administrative dimension deals with the design of the spaces of vital interest, of the integrated communities, of sustainable development. The main aim is not only that of the people's survival but also that of progress and welfare.

The administrative entities of the shaping communities stand for important elements concerning the models of civilization, which might represent the basis of globalization in the other dimensions.

3.6 The Cultural Dimension

The cultural dimension of globalization is under construction being shaped by cultural development having in view the multinational integration laying emphasis upon the issue of identity as well as tolerance for a global and pluralistic culture. Within the framework of this particular culture, the national values develop together with universal values in the benefit of the whole international community.

The cultural dimension deals with the global unity in the diversity of specific cultures. The main aim is that of the mutual influences of the specific cultures, which should lead to the cultural uniformization at the global level.

3.7 The Dimension of Security

The most important dimension of the globalization is that of security, which is perceived as the evolution of the regional, continental and intercontinental stability by decisions taken at the multinational and international level.

It aims at eradicating the retrograde and autarchical phenomena, such as: international terrorism, anti-globalization movements of ethnic, nationalistic or religious nature or states confining themselves in far-fetched socio-economic development systems.

The security dimension of globalization is the most sensitive one both in the relation with the tendency of the globalization of terrorism and the idea of keeping the competence of the national states.

Today, in terms of security, a state is perceived as being small or big according to the threats to its security and to the possibilities of assuring its own security.

3.8 Globalization as a Multidimensional Process

Globalization is a multidimensional process, which rapidly and deeply restructures the national and global activities as well as the interactions among the social actors. The transformations made influence all the aspects of the human activity. But the rhythm differs according to the dimension in which they develop, be it economic, political or cultural

We cannot say that there is a universal definition of globalization, but it is perceived as being a process in which the obstacles in front of the international flows of goods, services, money and information are removed.

4. THE PROCESSES OF GLOBALIZATION

Globalization can be defined as a whole according to three fundamental theories: the world system theory, the theory of the world political organization and the world culture theory.

4.1 Globalization and The World System Theory

According to the world system theory, globalization stands for a process that ended in the 20th century by means of which capitalism spread all over the world. In the early 21st century, the economy of the capitalist world faces a huge crisis.

Immanuel Wallerstein is considered to be the strongest supporter of the world system theory. The exploitation of the markets cannot solve anymore the new economic crises.

4.2 Globalization and the Theory of the World Political Organization

According to the theory of the world political organization, globalization can be perceived as a process of growth and adoption of the world culture. The different views on progress, sovereignty and rights have developed various actions at both state and individual level offering a common background for international conflicts.

Thus, this culture turns into a common heritage supported by transnational groups. However, it is not accepted by the whole world.

The implementation of global models will not repattern a homogenous world. On the contrary, it will give birth to new conflicts.

4.3 Globalization and the World Culture Theory

As the world culture theory is concerned, globalization is viewed as the process of compressing or squeezing the world together highlighting its view as a whole. There are two different approaches.

On the one hand, some specialists consider that the world is represented by distinct communities highlighting the importance of the dissimilarities. On the other hand, others consider that the world is based on a unique model, thus, laying emphasis upon the interests of mankind perceived as a whole.

In this so-called compressed world, a cultural conflict can come into being due to the contrast and comparison of such perspectives, the key issue being represented by religion.

Thus, we can say that a globalized world is an integrated one, but not necessarily a harmonious one; it stands for a unique place, but at the same time a diverse one. It can be perceived as a whole, but, at the same time, it can be easily fragmented.

4.4 The Phenomenon and Processes of Globalization

There are numberless significances for the phenomenon as well as the processes of globalization. The definitions of globalization vary according to region, epoch or ideology. Thus, the meaning of the concept represents a topic of global debate.

Globalization refers to ”the increased transnational flow of people, goods, and money that has occurred during the second half of the twentieth century. This mobility has been greatly facilitated by advances in communications and transportation technologies, such as the advent of passenger air travel, the personal computer, the internet, and cellular communications” (Collins, 2007: 354). The impact of these technological transformations for international mobility can be overstated.

According to Levi (2002), they do not represent ”as great a leap forward as the invention of the telegraph or the steamship – inventions which did not lead to an explosion in transnational crime” (quoted by Collins, 2007).

The huge differences between the developing and the developed countries still exist. The number of civil conflicts increased all over the world. Globalization has also created new forms of co-operation among transnational criminal organizations.

As Teodor Frunzeti and Vladimir Zodian, the coordinators of the volume entitled *Lumea 2009*, consider in the *Introduction* of the previously mentioned work, globalization must be reconsidered according to several aspects: the economic one - due to the present-day economic crisis, the institutional one – in the context of the obsolete international institutions created after WWII and the geographical one – due to the predictable movement of the center of gravity of the contemporary world to the East, to Asia; the hierarchical one – due to the redistribution of the roles played by the main actors in the context of international relations, more precisely, the part played by the United States of America in the new world order as the USA can and is willing to play such a role (Frunzeti & Zodian, 2009:11).

According to Robert Kagan in *End of Dream. Return of History*, the world returned to normality, it has not transformed. The harmony of the post Cold War world without ideological conflicts can stand more for the projection of a desire than for the reflection of a reality being not so much transformed and the competition among the greatest powers still existing.

Kagan (2008:51) considers that the nations, the nationalistic ambitions and the competition among nations remain as strong as they have always been, thus shaping the history.

5. OPINIONS ON THE SECURITY ENVIRONMENT AND THE PHENOMENON OF GLOBALIZATION

5.1 The Questionnaire. In order to find out the opinions of the young people living in the present-day Romania on the security environment and the phenomenon of globalization, I suggest the following questionnaire, consisting of a set of 10 questions.

Q1. What is globalization in your opinion?

a. a complex and multidimensional phenomenon;

b. a concrete form of achieving a new world order;

c. the increased transnational flow of people, goods and money that has occurred during the second half of the twentieth century;

d. there is no universal definition of globalization.

Q2. What is your opinion about globalization?

a. globalization brings people together and splits them apart;

b. globalization homogenizes and diversifies, coagulates and fragments;

c. globalization enriches people and impoverishes them;

d. globalization creates and develops new international structures.

Q3. How do you perceive the phenomenon of globalization in the context of the present-day economic and political transition?

a. as being a beneficial phenomenon;

b. as being a malign phenomenon;

c. as being a phenomenon with more or less beneficial consequences;

d. as being an insignificant phenomenon.

Q4. What sort of effects does globalization produce?

a. multiple effects of social, economic, political, military and cultural nature;

b. multiple and long-lasting effects;

c. positive effects for the rich states and negative effects for the poor states;

d. insignificant effects for all the states.

Q5. What kind of process is globalization?

a. a process ended in the twentieth century by means of which capitalism spread all over the world;

b. a process of growth and adoption of the world culture;

c. the process of compressing the world, of squeezing it together highlighting its vision as a whole;

d. a multidimensional process which repatterns and redimensions the national and global activities as well as the interactions among the social actors.

Q6. What dimension of globalization is the most important in your opinion?

a. the economic and political one;

b. the informational one;

c. the cultural one;

d. the dimension of security.

Q7. According to you, what does the dimension of security represent within the framework of the phenomenon of globalization?

a. the evolution of the regional, continental and intercontinental stability;

b. the eradication of the retrograde and autarchical phenomena;

c. the eradication of international terrorism;

d. the most sensible dimension of globalization.

Q8. Do you think that a strategy of security in globalization is necessary at present?

a. yes, such a strategy is highly necessary being based on a holistic thinking of the social actors all over the world;

b. yes, such a strategy is necessary being based on the interdisciplinary understanding of the phenomenon and the processes animated by the regional actors;

c. no, such a strategy is not necessary;

d. I do not know.

Q9. What do you think that there could be the main objective of the strategy of security in globalization?

a. mutually adjusting globalization and international security

b. harmonizing the problems which differentiate security from globalization;

c. strengthening the stability, peace and security of the citizens;

d. I do not know.

Q10. How does globalization influence the relation between national security and international security?

a. by the mutations produced in the content of the states' sovereignty;

b. by the change of the characteristics specific to the traditional concept of state sovereignty;

c. by shifting the competence to certain regional or international organizations with attributions at the level of human security;

d. I do not know.

5.2 The Subjects of the Questionnaire

The previously presented questionnaire has been distributed to a number of 33 subjects aged in between 19 and 23. It is worth to mention the sex of the subjects: out of the 33 subjects, 12 are male subjects representing 36.36% and 21 are female subjects standing for 63.63%. Regarding the subjects' nationality, we confront ourselves with unity in diversity. Out of the 33 students,one student has Venezuelan nationality – 3.03%, another subject has German nationality (Hungarian and Czech) according to that particular subject's statement – 3.03%, 2 subjects have Hungarian nationality – 6.06% and 29 are of Romanian nationality – 87.87% as Figure 5 shows below.

All in all, except for the fact that all the subjects are students within the framework of the Cultural Studies program and all of them live in an urban area, we can say that we deal with the phenomenon of *diversity in unity* due to the various religious backgrounds and nationalities registered in this study based on 33 subjects or *unity in diversity* as although they belong to different categories, they are united within the framework of an academic environment, which offers them the same chances irrespective of sex, nationality or religion.

5.3 The Interpretation of the Data on the Phenomenon of Globalization and the Security Environment

At the first question of the questionnaire about the significance of globalization, a number of 5 subjects (15.15%) have chosen variant

a) considering that globalization is a complex and multidimensional phenomenon, 6 subjects (18.18%) have been in favor of variant

b) thinking that globalization is a concrete form of achieving a new world order, 19 subjects (57.57%) have selected variant c) and according to them globalization represents the increased transnational flow of people, goods and money that has occurred during the second half of the twentieth century and 3 subjects (9.09%) considered answer d) as being the most appropriate one as there is no universal definition of globalization.

At the second question ”What is your opinion about globalization?”, 10 subjects (30.30%) consider that globalization brings people together and splits them apart, thus they have chosen variant a), 8 subjects (24.24%) have selected variant b) thinking that globalization homogenizes and diversifies, coagulates and fragments, only one subject (3.03%) considered that variant c) is the most adequate according to which globalization enriches people as well as impoverishes people, and 14 subjects (42.42%) have thought that variant d) is the best as globalization creates and develops new international structures.

The third question is based on the way in which the phenomenon of globalization is perceived in the context of the present-day economic and political transition. Alternative a), according to which globalization is viewed as being a beneficial phenomenon, has been chosen by 5 subjects (15.15%), only one subject (3.03%) has seen globalization as a malign phenomenon, 27 subjects (81.81%) have considered variant c) as the most appropriate one according to which the phenomenon of globalization has more or less beneficial consequences and no subject (0%) has chosen variant d) which means that all the subjects think that the phenomenon of globalization is a very important one.

The fourth question referring to the effects of globalization has been interpreted as follows: 26 subjects (78.78%) have considered variant a) as the most adequate one considering that globalization produces multiple effects of social, economic, political, military and cultural nature, 2 subjects (6.06%) have chosen variant b) according to which globalization produces multiple and long-lasting effects, 5 subjects (15.15%) have selected variant c) considering that the effects of globalization are positive for the rich states and negative for the poor states and it is great to have nobody (0%) choosing variant d), which means that globalization produces significant effects for all the states.

The fifth question is centered on the typology of the globalization processes. Three subjects (9.09%) have chosen variant a) considering that globalization is a process which ended in the twentieth century by means of which capitalism spread all over the world, 8 subjects (24.24%) have selected answer b) according to which globalization is a process of growth and adoption of the world culture, 6 subjects (18.18%) have considered answer c) as being the right one as globalization can be perceived as the process of compressing the world, of squeezing it together highlighting its vison as a whole and 16 subjects (48.48%) have perceived globalization as a multidimensional process, which repatterns and redimensions the national and global activities as well as the interactions among the social actors.

The sixth question refers to the dimensions of globalization. 15 subjects (45.45%) have chosen answer a) considering that the most important dimension of globalization is the economic and political one, 3 subjects (9.09%) considered the most important dimension as the informational one according to variant b), 11 subjects (33.33%) have selected answer c) considering the cultural dimension as being the most important one and variant d) has been chosen by 4 subjects (12.12%) and according to them, the most important component part of globalization is the dimension of security.

The seventh question is focused on the significance of the dimension of security within the framework of the globalization phenomenon. 13 subjects (39.39%) consider that the dimension of security within globalization represents the evolution of the regional, continental and intercontinental stability. Only 3 subjects (9.09%) think that the dimension of security stands for the eradication of the retrograde and autarchical phenomena.

Variant c), according to which the dimension of security refers to the eradication of international terrorism, has been chosen by 7 subjects (21.21%), and answer d) by 10 subjects (30.30%) who consider it as the most sensitive dimension of globalization.

At the eighth question ”Do you think that a strategy of security in globalization is necessary at present?”, there have been registered the following answers: 15 subjects (45.45%) have chosen variant a) considering that such a strategy is highly necessary being based on a holistic thinking of the social actors all over the world, 17 subjects (51.51%) think that variant b) is the best according to which such a strategy is necessary being based on the interdisciplinary understanding of the phenomenon and the processes animated by the regional actors, nobody (0%) has chosen variant c), thus resulting that all the subjects consider such a strategy as being of paramount importance and only one subject (3.03%) declares that she does not know if such a strategy is necessary.

The ninth question refers to the main objective of the strategy of security in globalization, 8 subjects (24.24%) considering that this would be the objective presented in variant a), mutually adjusting globalization and international security; 11 subjects (33.33%) think that this objective is given in answer b), that is, harmonizing the problems which differentiate security from globalization, 13 subjects (39.39%) consider that this objective is the one formulated in answer c), namely, strengthening the stability, peace and security of all citizens and one subject (3.03%) declares that she does not know what this objective could be.

And the last question refers to the influence of globalization on the relation between national security and international security which is rendered as follows: 4 subjects (12.12%) have chosen variant a), by the mutations produced in the content of the states' sovereignty, 7 subjects (21.21%) have selected variant b), by the change of the characteristics specific to the traditional concept of state sovereignty, 20 subjects (60.60%) have considered answer c) as being the best, that is, by shifting the competence to certain regional or international organizations with attributions at the level of human security and 2 subjects (6.06%) think that answer d) is the most appropriate one in their case as they do not know what could be the impact of globalization on the relation between national security and international security.

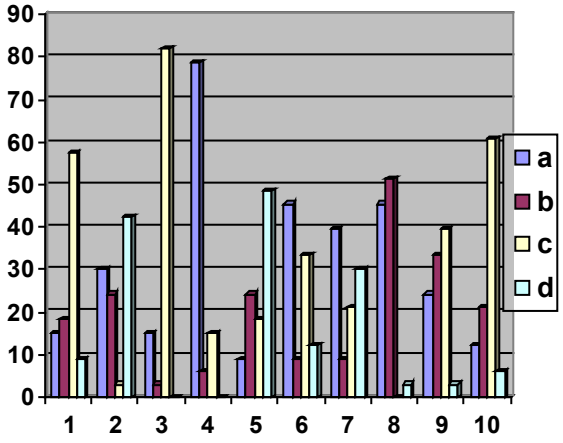

Fig.1 Interpretation of data on the phenomenon of globalization and the security environment: Q1-10

As the above Figure shows, there have been only three cases representing three alternatives that have not been chosen by the subjects.

The first case refers to the third question. Nobody has chosen variant d). Hence, the phenomenon of globalization is perceived as being of paramount importance in the context of the present-day economic and political transition.

The second case refers to the fourth question. Again, no one has selected variant d). This means that the phenomenon of globalization influences all the states all over the world.

The third case refers to the eighth question. In this situation, nobody has considered answer c) as being the most appropriate one. Thus, it results that the necessity of a strategy of security in globalization is generally accepted.

6. CONCLUSIONS

Globalization offers a high level of individual liberty, which cannot be offered by any state. The free competition at the global level freed the gifted ones and increased the number of technological innovations.

Unfortunately, globalization has a darker side, too. In the less developed countries, there were many people who suffered due to globalization without getting any support when referring to the social security system.

Globalization is perceived as a phenomenon, which unites and separates, homogenizes and diversifies, brings together and splits apart, coagulates and fragments, enriches and impoverishes. Globalization is the process which creates and develops new international structures. It exerts a certain pressure on the existing structures to take over more tasks than they can deal with at present accelerating the relations between societies and economies, between different zones and regions all over the world.

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NEW SECURITY DINAMICS AND THE RAPID-CHANGING REGIONAL ENERGY ARCHITECTURE OF THE BLACK SEA AREA

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Abstract: *In the last two decades The Black Sea region suffered serious transformations determined by: the fall of European communist regimes, the impact of globalization, United States` growing interest for the region especially after September 11, 2001 and the enlargement of NATO and the European Union. Additionally, the regional stability was threatened by the numerous crises and tensions between Russia and Ukraine, by the crisis which led to a war between Russia and Georgia in August 2008, by the discussions concerning the fate of the Black Sea Russian fleet in Sevastopol, by the impact of the Nagorno-Karabakh conflict on the Turkish-Armenian relations, by the events of Transnistria, by the changing nature of the relations between Russia and Turkey and last but not least by the economic and political consequences of the global financial crisis. All these elements reflect intense dynamics caused by the complex realities of the states located around the Black Sea region but also by the interest of global actors in a region which ties Europe to Asia, North to South and East to West. Oil, gas, commercial and transport routes, geopolitical interests of regional and global actors are crucial in explaining the increased relevance of the Black Sea area.*

Keywords: *geopolitics, the Black Sea Region, security, energy, strategy*

1. INTRODUCTION

The strategic location between the hydrocarbons of Caspian basin and Europe, depending on oil and gas imports, places the Black Sea in an unique position. Given that the opportunities offered by the transfer of oil and gas from the Caspian Sea to the European markets can lead to the development of regional cooperation and economic prosperity, the tough competition for controlling pipelines and transport routes creates security risks both at regional and global levels.

Despite the growing interest in the Black Sea region, the main priorities and real necessities of the area are obliterated by the regional actors` failure to offer a coherent vision of the future. Thus, transforming the Black Sea in a region in between regions is compromised by the diverging economic and security interests of the regional and global actors involved.

2. NEW SECURITY DINAMICS

Defined in geopolitical terms as a border region, a bridge, a buffer zone or a pivot placed in the centre of a Mackinder Heartland, the Black Sea region is one of the key areas in which a tough competition is undergoing between the major global powers, Russia, United States and partly the European Union (Ciută, 2008: 128). Each of them developed their own regional policy: Russia – the Near Abroad policy, United States – the Wider Black Sea region policy, and the European Union – the European Neighbourhood Policy/ ENP.

These divergent and exclusive regional policies employ different instruments, starting from negotiations for EU/ CSI (*the Commonwealth of Independent States*) accession and the construction of pipelines, to supporting fellow governments or impairing hostile ones and finally, extending regional influence in order to build economic and political domination.

Smaller states from the region have also been trapped in this competitive spiral and have become a piece of the geopolitical puzzle (Aydin, Triantaphyllou, 2010: 23).

From Russia` s and Turkey` s perspective, the most important regional powers, the Black Sea area is composed of the 6 coastline states – Bulgaria, Georgia, Romania, Russia, Turkey and Ukraine. The European Union suggests that the region is composed of 10 states – the 6 coastline states plus Armenia, Azerbaijan, Greece and Moldova while BSEC (*Organization for Black Sea Economic Cooperation*) considers that the region has 12 member states – the 10 states defined by EU plus Albania, Serbia. The United States, especially during Bush administration, considers a much wider region, which includes parts of Middle East and North Africa (Asmus, 2006: 15-33).

Excepting the restrictive definitions of Russia and Turkey, all the other interpretations have interregional dimensions (such as South-East Europe or Middle East) or/ and subregional dimensions (such as South Caucasus), which reflects the multiple geographic identities of the regional state actors.

The same rule also applies in the case of the involved actors` political identities, given that some of them are either EU and/ or NATO members or they are a part of the CSI.

Even though the Black Sea area displays both regional and non-regional actors, three main actors exercise a critical influence over the security options in the region: 1) Russia; 2) The transatlantic community through NATO and European Union; 3) The regional states with their own security priorities.

Russia is one of the main players in the geopolitical and security game concerning the Black Sea region which Russia believes it represents a crucial component for its national security. The most important strategic objective of Russia with regards to the *Near Abroad Policy* is concerned is maintaining and consolidating its power and blocking or limiting access for other regional powers. In the last two decades, after the fall of the Soviet Union, Russia`s vision and politics with respect to the Black Sea experienced at least four phases:

1) *the initial phase* (1991-1994), characterised by proliferating ethnic conflicts, followed by their ceasing and afterwards, by setting a new post-soviet status-quo;

2) *the Chechen phase* (1995-2002), when Russia saw the situation in the Black Sea region through Chechen War lenses;

3) *the recovery phase* (2003-2008), when Russia began to act on many plans and in many directions. As far back as 2003, the Russian President Vladimir Putin referred to the Azov- Black Sea region as one of strategic interest for Russia and insisted on the fact that the area confers Russia direct access to the most important transport routes that require an effective regional security system;

4) the *new phase of active regional strategy* (august 2008-present) began with the Caucasus war and is characterised by the firm attitude of Russia in relations with United States and European Union (Kobrinskaya, 2008: 1).

Considering that United States exercised simultaneously its political and military influence in the Black Sea region by: extending NATO, signing bilateral security agreements and supporting governments and pro-western national political elites that oppose pro-Russian influence and governments, Russia`s deep rooted impression that it is surrounded and dammed by the West has come to an alarming level, which became evident during the crisis and war in Georgia in August 2008.

Russia`s interests in Black Sea region can be defined as follows: 1) maintaining its position as one of the key players of the geopolitical and economic game while other regional and global actors increase their influence in the area; 2) preventing new actors or projects from getting involved in the energy domain, with the only exception of those which are already under Russian control; 3) preventing any emerging military coalitions against Russia; 4) preventing NATO enlargement in the Black Sea area; 5) combating and suppressing separatism, fundamentalism and terrorism (Celikpala, 2010: 9). The 2008 Russia- Georgia war changed security perceptions in the Black Sea region, because it has clearly showed that the security in the area is extremely volatile due to unsettled or frozen conflicts.

The 2008 Georgian crisis strengthened Russia` s role as a regional actor which led to building new military bases in Caucasus while the transatlantic community was rapidly losing the interest in the region (White, 2011).

The second important factor influencing the area is the transatlantic community with its dual approach with respect to the regional problems: United States from the Wider Black Sea perspective and European Union from the European Neighbourhood Policy but also from those of the Black Sea Synergy and the Eastern Partnership/ EaP. As a consequence of the 9/11 attacks in 2001, United States and European Union started reorienting their focus on Central and Eastern Europe, on the Greater Middle East but also on the Wider Black Sea area.

United States has rapidly reconsidered its geo-strategic interests in the area, which supposes among others an important military component that was acquired by increasing the role of NATO.

The action generated the hostile reaction of Kremlin especially because Russia` s security doctrine places NATO as the main threat for the national security. The US strategy has three major objectives:

1) exporting its political and economic system (promoting democracy and capitalism);

2) integrating the region in the global economy by promoting free trade and increasing the number of energy corridors;

3) the regional security, by combating terrorism and organised crime by securing the borders.

In order to strengthen its presence in the area, United States developed close bilateral relations with regional actors such as Georgia, Ukraine, Bulgaria and Romania. Moreover, US has supported the efforts of Ukraine and Georgia to enter NATO, but nevertheless through this action, NATO found it impossible to supply effective security in the Black Sea region.

The 2008 war between Georgia and Russia had a negative impact on US` credibility in the region and the local security environment. Starting with Obama` s administration, the relations between US and Russia are about to be reconfigured and, from this perspective it is highly unlikely for US to openly contest the Russian interests in the region.

An eloquent example is represented by ceasing the enlargement of NATO in the region which had negative impacts on certain regional actors.

EU can be seen as a regional actor, although the Black Sea region was not one of its priorities during the 1990s. After 2003, when the European Security Strategy became the first official document to declare the EU` s growing interest in the Wider Black Sea area, the European Security and Defence Policy/ ESDP assigned a greater importance for EU` s involvement in the area.

Based on ENP, the Black Sea Synergy has been developing since its creation in 2007, which represented a new intermediary step towards EU` s strategic vision with respect to the Black Sea region. In 2009, as a consequence of the Russian- Georgian conflict, EU launched the *Eastern Partnership/ EaP* in an attempt to lower the volatility in the Black Sea region by its active involvement in the regional economic and security problems.

The third factor which influences the security arrangements in the Black Sea region is represented by regional actors, the most important being Turkey, who had a cautious attitude in maintaining the status-quo given that the security environment begame volatile especially after 9/ 11 2001.

Between 2001 and 2008, as US had divergences with Irak and tensions increased between Russia and NATO, Turkey attempted to protect initiatives such as the Black Sea Naval Task Force (BLACKSEAFOR), Operation Black Sea Harmony (OBSH) and BSEC.

The Russian- Georgian conflict in 2008 marked Turkey` s strong comeback to an active regional diplomacy, especially in the Caucasus region.

The regional security initiative launched by Turkey under the Caucasus Stability Platform, which would have to include all the regional actors, restarted the debates with respect to the opportunity of setting up a new security architecture governed by Turkey and Russia.

Other regional actors have their own priorities: Romania and Bulgaria, as NATO and EU member states, are more interested in strengthening the bilateral relations with US.

As a matter of fact, Romania is the main promoter of the US` position in the region but it also aims to become the most important actor inside the EU concerning Black Sea region problems (Celikpala, 2010: 12).

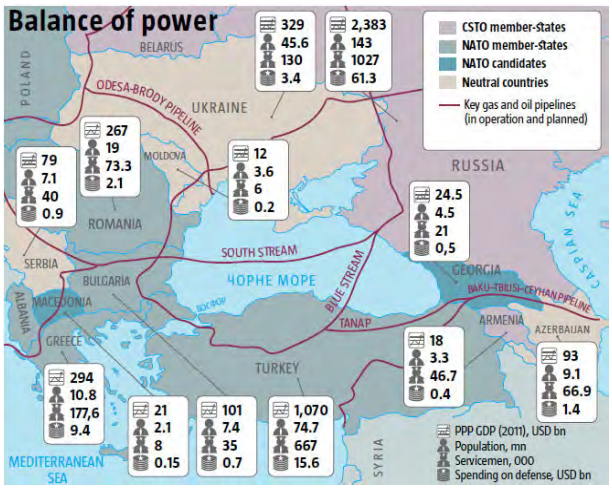
3. THE RAPID-CHANGING REGIONAL ENERGY ARCHITECTURE

The new Russian strategy with respect to the Black Sea region is based on *realpolitik* principles and it is clearly motivated by geo-economic and geopolitical interests. Russia` s pipeline strategy proves to have a major influence on the European architecture of energy security.

Since the beginning of 2000s, the Kremlin bet on reinventing Russia as a resurgent power (Aggarwal, Vinod K., Govella, K., 2012), as an exporter of natural resources rather than the classic industrial development. Russia`s impressive natural resources serve a dual scope: increasing the energetic and economic interdependence of Russia with its exterior and the ability to project power (Aggarwal, Govella, 2012).

Russia possesses 26,6% of the global natural gas reserves and between 6,2 and 13% (depending on different estimations) of the global oil reserve. Additionally, Russia is the world leader in supplying natural gas through pipelines. Almost 90% of the Russian energy exports are directed towards the European states who find themselves in an uncomfortable state of dependence on Russia (Rykhtik, 2012: 20). Even though the European states seek alternative sources of energy, there is no real alternative to hydrocarbons, at least in the near future. The problem is also complicated by the fact that most of the countries that are rich in energy resources (Iran, Irak, Saudi Arabia, Latin America and the African countries) are politically unstable, therefore there are high chances for turbulences in the global energy market (Chevalier, 2009).

This context creates a series of opportunities for expanding the Russian influence through the pipeline policy. This policy has two main dimensions: the North Stream and the South Stream.



Sursa: Oles Oleksiyenko, "*The Black Sea (In) Security*", The Ukainian Week, 22.05.2012

The northern route (the North Stream)- fundamentally a new pathway- is characterized by the lack of transit states which allows Russia to reduce costs and to eliminate any political risk. The end markets of the gas flux passing through this route are countries such as Germany, Great Britain, Netherlands, France and Denmark.

The southern route (the South Stream) poses a much more complicated problem mainly because of the great geopolitical and geoeconomic importance of the Caucasus and Central Asia regions for Russia's national security. In the region of the Caspian Sea, the oil and gas production continue to grow at a steady pace while Azerbaijan is about to become the regional leader attributable to the oil field of Azeri-Chirag-Gyuneshli and the gas fields of Shaz-Deniz. In addition, Kazakhstan (whose main field is Kashagan) and Turkmenistan are on the verge of becoming the main suppliers of natural gas. Russia is extremely keen on maintaining its influence in the Caspian Sea region and the gas pipelines strategy remains one of the main instruments of projecting Russia's power in the area, especially under the circumstances of existing alternative projects of transportation of the region's resources to Europe which elude Russia's territory. The most important streams are Baku-Tbilisi-Ceyhan (BTC), Baku-Tbilisi-Erzurum (BTE) and the recently failed Nabucco project whose purpose was the construction of a gas pipeline from Turkey to Europe to transport the gas from Iran, Kazakhstan and Turkmenistan.

At the same time, Kazakhstan and Turkmenistan are engaged in projects aimed at building natural gas streams for the transportation of gas to China.

It can be assumed that Russia will exercise the full extent of its influence to protect its interests in the Caspian Sea region, advantaged by it still being the only transit country for the oil and natural gas of the area alongside the Caspian Pipeline Project (CPC).

Nonetheless, there is the risk that the oil flux through Baku-Novorossiisk to be interrupted by the time the BTC pipeline reaches its maximum capacity. However, even under this scenario Russia still has a large chance of compensating its losses owing to the Blue Stream and the Burgas-Alexandropoulos pipelines which are still under construction and which elude the Turkish straits.

Another important actor is Turkey whose enhanced influence has been advanced by an extremely high growth rate-its GDP growth rate ranking 16th in the world in 2012.

In order to maximize its economic potential Turkey is doing everything in its power to reduce its energetic dependence both on Russia and the gas transported through Ukraine, Romania and Bulgaria. Furthermore, Turkey is trying to make the countries in the region dependent on it through its attempt to monopolize the flows of gas and oil from the Caspian Sea region.

In addition, it is hoping to take over a large part of the Russian fuel transportation to Europe and the Mediterranean given the fact that the South Stream route is to be operating entirely in the Turkish economic area and the fact that Ankara continues to limit the passage of Russian oil vessels through the Bosfor Strait.

Furthermore, Turkey is trying to dominate water-trade between the countries of the Black Sea and the rest of the world. To this end, in 2011, Turkey made public its intention to build a functional canal by 2023 between the Black Sea and the Marmara Sea with the purpose of relocating the entire cargo traffic through Bosfor.

The completion of this project would represent a substantial improvement in Turkey's position in the area given the fact that, unlike the Bosfor Strait which is subject to international conventions, the new canal would be regulated entirely by Turkish law meaning that the government from Ankara alone would have the power to decide upon the tariffs and regulations applied to foreign vessels.

This neo-ottoman strategy of Turkey is designed to restore its status in the Islamic World or at least the Middle East through the establishment of a relative distance from the USA.

The competition of the alternative projects of pipelines has intensified given the prospects of the gas energy from the Azeri field of Shah Deniz II entering the global market in 2017. The exploitation from Shah Deniz is being operated by the British giant BP, in partnership with Statoil (Norway), SOCAR (Azerbaijan), Total (France), Lukoil (Russia), NIOC (Iran) and TPAO (Turkey).

The possibility of this gas and potentially that coming from Turkmenistan and Kazakhstan to spell the end for the Russian monopoly has brought forward the antagonism between the alternative natural-gas-transportation projects.

Given this context, the launch of the TANAP projects and the South Stream have the power to change the regional energy game. By the end of 2011 Turkey has concluded two agreements with possibly large consequences over the Black Sea region's energetic architecture.

The first accord deals with the construction of TANAP (*the Trans-Anatolia Gas Pipeline*) which will transport the natural has from Shah Deniz II (Azerbaijan) to Europe while the second, signed in Moscow, stipulates the cooperation between Russia and Turkey for the South Stream project.

The construction of TANAP will take 5 years and will cost 8 billion dollars. Turkey will be able to utilize 6 BCM of natural gas out of the 16 BCM which will be transiting this pipeline.

Under the initial terms of the contract Azerbaijan (through its company SOCAR) will own 80% of the pipeline while Turkey will get 20% (the state-owned companies BOTAS and TPAO will each own 10%).

Once the TANAP project has been finalized, there will be an expansion of the natural gas transport infrastructure from Shah Deniz II to Europe along with, if the circumstances will favour it, the gas from Turkmenistan, Kazakhstan and possibly Iran. The accord signed in Moscow in December 2011 has granted Russia an advantage in the energy game of the region.

The South Stream project inaugurated in Anapa on the Russian coast of the Black Sea on December 7 2012 will have a capacity of 63 BCM and will allow Russia to sell natural gas to Europe directly through the Black Sea, eluding Ukrainian territory.

The shareholders of the South Stream project include the Russian giant Gazprom which will own 50%, the Italian giant ENI with 20% and the German company Wintershall Holding together with the French company EDF each with 15%.

By signing this contract, Turkey has permitted the transit of the South Stream pipeline through its *Exclusive Economic Zone / EEZ* in the Black Sea. In exchange it will receive discounts on the gas prices coming from Russia (Celikpala, 2013: 2).

The TANAP and the South Stream projects have had a strong influence on the Nabucco project as well transforming it into a smaller-scale project as compared to the initial plans. Nabucco is supposed to transport the natural gas from Turkey's border to the countries from the East of Europe through Bulgaria, Romania and Hungary reaching the Central European Gas Terminal of Baumgarten, Austria. Nabucco was supposed to transverse the Turkey territory also amounting to a length of 3.900 kilometres, an estimated cost of 7.9 billion euros and a capacity of 31 BCM of natural gas every year.

After its revision, the project was renamed Nabucco West, its length has been scaled down to 1.315 kilometres passing through Bulgaria, Romania and Hungary. The partners of Nabucco West are OMV (Austria) Transgaz (Romania), BEH (Bulgaria), MOL (Hungary), BOTAS (Turkey) and GDF Suez (France).

Put in a nutshell, as opposed to the initial conditions when it was considered a central part of the Southern corridor designed to transport natural gas from the Caspian Sea region and Central Asia to Europe, Nabucco has been scaled down and replaced by TANAP together with TAP (*the Trans Adriatic Pipeline*). The TAP project is designed to transport the Azeri natural gas from Turkey, through Greece, Albania and Italy, crossing the Adriatic Sea and reaching its final destination, Italy.

The shareholders of this project are Axpo (Switzerland), Statoil (Norway) and E.ON (Germania). The final decision of the consortium which owns the giant natural gas deposit from Shah Deniz has been taken at the end of June 2013. As a consequence, TAP project has been selected as an export route to Europe of the Azeri natural gas. The decision has been made shortly after SOCAR, the Azeri state-owned energy company has benefitted from Gazprom's withdrawal from the competition to buy DESFA, the Greek natural gas transport operator, Greece being one of the key states of the TAP project.

The competition between Nabucco and South Stream has also affected the equilibrium of the national energetic policies of the EU member state given the fact that the South Stream has the great powers of the EU partnered up-Germany, France, Italy- while Nabucco is being supported by smaller states such as Ukraine, Bulgaria, Romania and Austria. In the absence of a common energetic policy of the EU, the competition between the two groups of countries puts Russia in a better position.

The energetic balance of the region is also influenced by the complicated relation between Russia and Ukraine, 80% of all Russian gas exports being transits shipped through Ukraine and generating 75% of the large energy companies' profits. In order to scale down their dependence on Russian gas imports, Ukraine together with Georgia and Azerbaijan are focusing their efforts on the construction of a facility able to process the liquefied natural gas coming from Azerbaijan. There have been several attempts to building such a facility that would have been located in the vicinity of the oil terminal of Kulevi-on the Georgian costal region at the Black Sea- and that would directly transport the Azeri gas to Ukraine. There is still one more project aimed at transforming the Black Sea into a transit area, the Azerbaijan-Georgian-Romanian Interconnector. AGRI is expected to transport 8 BCM of gas from Azerbaijan to Georgia and from there, in the form of liquefied gas, through the Black Sea to Ukraine and some other East-European states.

The competition between the alternative projects is enforced by efforts to diversify the sources of energy by exploring and exploiting internal gas and oil resources of the countries from the Black Sea region.

In this direction, the Turkish company TPAO (*the Turkish Petroleum Corporation*) has recently concluded an accord with Royal Dutch shell to explore an area of 1500 square kilometres, a project which might bring gains of hundreds of millions of dollars.

Ukraine has recently announced it will reignite the exploration project of the 13000-sq km-wide region near the Kerch Strait (which apparently has a potential of 10.8 BCM) and the Shifska field in the Black Sea (which indicates a gas potential of 250 BCM) with the latter being operated by a consortium of businesses led by Exxon.

Additionally, Exxon Mobil is leading the exploration procedures of the Romanian territorial waters, a region with an estimated gas potential of 85 BCM.

However, it appears that the grand prize lies with the shale gas. EIA (*the U.S. Department of Energy's Energy Information Administration*) estimates that Ukraine holds reserves of shale gas amounting 42 TCM, fact which led to the conclusion of a 10 billion dollars contract between Ukraine and Shell. EIA estimates that Romania, Bulgaria and Hungary have shale gas reserves amounting up to 450 BCM, number which represents the annual consumption level of the entire European Union.

Likewise, Turkey, Armenia and Georgia are expected to commence their own exploration procedures in search for shale gas.

As a consequence of the dynamics shaped by the exploration and exploitation of natural reserves in the Black Sea region together with the opportunities provided by the shale gas and the flexibility of LNC, the prevailing pipeline predicament, supported and dominated by Russia is likely to become part of a more complex energy architecture in the years to come.

4.CONCLUSIONS & ACKNOWLEDGMENT

The energy architecture of the extended Black Sea region is in perpetual change. The European Union will continue its efforts to diminish the dependence on the Russian imports. However, despite existing alternatives, entirely replacing the Russian gas will be difficult and probably unfeasible. Russia does own the largest gas reserves in the world on top of a very developed pipeline infrastructure which connects the Russian resources with Europe and the huge financial interests of the largest EU companies in the relation with the Russian companies. The greatest challenge for the EU will continue to be the achievement of a common energetic policy. As an important transit region for the energetic resources from the Caspian Sea basin and Russia, the region of the Black Sea has become a testing zone of the relationships between the producers (Russia, Azerbaijan, Turkmenistan and Kazahstan), the transit states (Russia, Georgia, Turkey and Ukraine) and, last but not least, the consumers (the EU and other countries such as Turkey).

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THE PSYCHOLOGICAL AND STATISTIC INSTRUMENTS USED TO MEASURE CAPACITY TO BE MOTIVATED – THE BASIS OF LEADERSHIP

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Abstract: : *This paper has the purpose of transmitting information and ideas about the capacity to seduce characteristic of the persons with leadership skills. What impresses, enlivens, fascinates and hypnotizes in a person with leadership skills is the profound side of his/her charm, which works as a magnet wit :the harmony between what one thinks and does.*

Keywords: *management, seduction, leadership, charisma, leader, authenticity*

1. CAPACITY TO BE MOTIVATED

At the level of the organization, the selection for managerial positions must necessarily be made relying on a battery of psychological tests, with the purpose of employing people with leadership skills, so that any manager, regardless of his hierarchical level, may be a natural leader, which would translate into:

-The fact that the person in question will constrain no one to behave according to a pre-established scenario suiting his/her personal needs, but will rather impose the observation of the internal organization regulations of the company, the application of the labour norms, of the country's laws and of the principles of Christian morals, by the methods acquired from the management knowledge.

-The fact that the person is self-confident;

-The fact that the person is genuine;

-The fact that the person will act according to his/her own values and, by way of consequence, will do what he/she preaches and would not have a problem saying what he/she does.

A leader is a happy person, and the source of his/her capacity to the reach this state of mind is in fact the harmony he/she permanently finds himself/herself in, with what he/she thinks and does, the congruence of his/her psychic having the wonderful gift of carrying others away in his positive dynamics.

This harmony between the thoughts/ emotions/actions of an individual, the congruence, is a marker of the psychical maturity and a state where the ideas form a natural and creative chain, and the emotional experiences are calm, having a self-appreciative inner tranquillity. Under these terms, all actions of the individual are effective, consuming an extremely small amount of energy, but with maximum results.

The fact that some people are more congruent than others are poses two problems that need to be solved:

-The occupation of leading positions, regardless of the hierarchic level, by people who are psychically congruent.

-The increase of mental congruence within the individual, as a side of personal development of any employee of the organization.

Cognitively speaking, all employees comprehend and are capable of explaining several things, but not all people are able to apply them in other actions other than those adequate to their biological age.

2. CASE STUDY: 2008-2009 SURVEY

The survey aims to evaluate the charisma of future officers of the Air Force and the Army, military leaders with a degree in 'organizational management'.

The analyzed data have been collected by the filling out of the form presented in Figure 1, containing the items of the psychological tests combined, aiming the dimensions that measure the magnetism of the personalities of the subjects from within the two groups.

The instruments used for the data collection A battery of psychological tests has been prepared, containing the adapted variants of the components below:

Psychological test :

-evaluates the „congruence – 2 spirituality" dimension

-The bibliographic source of origin is the 'Corpus of psychological tests to get to know yourself better', by Gilles D'Ambra, Litera International Publishing House, 2008, page 30.

-The evaluation scale is of 4 points distributed as below:

1	2	3	4
Materialist	Low spirituality	High spirituality	Very high spirituality

The battery of psychological tests used for the collection of the data needed to verify the hypotheses materializes in the adapted instrument, presented in the succession of items below:

1. Check the box each time your answer to the statements below is YES:

□ You thing that objects may have souls.
□ You do not ever spontaneously go to a place of prayer, (church, temple, synagogue, mosque).
□ You have never donated blood.
□ You are convinced that the Apocalypse will come one day.
□ You have the feeling that you are pursued by misfortune.
□ To you, Christmas is just a time for gifts.
□ You think that human nature is essentially good.
□ You believe people who talk to their plants to be ridiculous.
□ You are convinced that we are alone in the Universe, that there are no aliens.
□ You think someone wants you at this very moment.
□ You never give charity to an alcoholic beggar.
□ You are afraid of cats.
□ You are convinced that someone might check the data from your PC.
□ You believe the devil exists.
□ You worry about the future.
□ When you find a spider in your room, you kill it.
□ You believe in the predictions of fortune-tellers.
□ When a salesperson makes a mistake when counting the money, you say nothing if it is in your favour.
□ You avoid passing under scaffolds.
□ You have placed a bet on your birth date in the lottery.
□ You think there is nothing more after death.
□ You are convinced that science will one day prove the existence of God.
□ You have never had the impression of witnessing a supernatural phenomenon.
□ You do not believe in telepathy.
□ You are capable of leaving your spouse and/or children to do humanitarian volunteering at the other end of the world.

3. INTERPRETATION OF THE ANSWERS

The number of the unchecked boxes (that you have answered NO/NOT) will be multiplied by 4 to get the SQ (i.e. the Spirituality Coefficient, a concept that designates the hope, motivation and faith that the subject can have), an aspect revealing the congruence of the psyche, as category for the subject to fall under.

Score < 30% spirituality coefficient

The type is not spiritual

- Characteristics: materialistic / searches for ephemeral things / doesn't feel the need for spiritual food / lacks feelings.
- Advantage: bodily awareness is very high.
- On a scale measuring the individual's congruence through his/her capability to hope, believe and be motivated, this subject scores 1 point.

30% ≤ Score < 55%

The pragmatic type

- Characteristics: low spirituality / loves routine / is anchored in small habits / is unable to take joy / does not believe in what he/she does.
- Advantage: does not delude him/herself.

- On a scale measuring the individual's congruence through his/her capability to hope, believe and be motivated, this subject scores 2 points.

56% ≤ Score ≤ 75%

The spiritual type

- Characteristics: this type relies more on values than on material criteria / stays down on the earth / is excessively lucid / misses opportunities.

- Advantage: is rational in order to limit the risk of failure.

- On a scale measuring the individual's congruence through his/her capability to hope, believe and be motivated, this subject scores 3 points.

Score > 75%

Very spiritual type

- Characteristics: high spirituality / innocence / high moral standards / many hopes / his/her own convictions / great motivation / credulity.

- Advantage: is courageous, underestimating obstacles / signals of alarm / evil.

- On a scale measuring the individual's congruence through his/her capability to hope, believe and be motivated, this subject scores 4 points.

4. THE STATISTIC INSTRUMENTS USED TO MEASURE THE PROBABILITY OF ERROR OF THE RESULTS

$$Average = \frac{\left[\sum (value \cdot number\ of\ subiects)\right]}{Sample\ group}$$

(1)

$$St\ andard\ deviation = \frac{\sum (value - average)}{number\ of\ value - 1}$$

(2)

$$Variance = \frac{\left[\sum values^2 - \left(\sum values\right)^2 \Big/ number\ of\ values - 1\right]}{number\ of\ values - 1}$$

(3)

The "t" test is applied in its form in which two averages calculated in two separate, independent groups are compared by applying the formula:

Note : Standard deviation = Sd
Standard common deviation = SCd
Sample group=Sgr
Deviation Sample group=DSgr

$$t = \frac{average\ of\ sample1 - average\ of\ sample2}{SCd \cdot \sqrt{\frac{1}{Sample\ group1} + \frac{1}{Sample\ group2}}}$$

$$SCd = \sqrt{\frac{DSgr1 \cdot (Sgr1 - 1) + DSgr2 \cdot (Sg2 - 1)}{(Sgr1 + Sg2) - 2}}$$

$t_{calculated} \leq t_{critical}$ - the null hypothesis is accepted
$t_{calculated} > t_{critical}$ - the null hypothesis is rejected

The 't' test is applied in its forms comparing the average calculated in a single sample.

$$SD = \sqrt{\frac{\sum values^2 - \left(\sum values\right)^2 / Sgr}{Sgr - 1}}$$

$t_{calculated} \leq t_{critical}$ - the null hypothesis is accepted
$t_{calculated} > t_{critical}$ - the null hypothesis is rejected.

5. CONCLUSIONS OF THE HYPOTHESIS VERIFIED WITHIN THE 2008-2009 STUDY

Two study groups were formed whose subjects are military students. They agreed to take part in the study:

Group 1- made of 13 non-flying, military aviation students (air traffic controllers) and artillerymen of the Air forces.

Group 2 – made of 24 infantry military students of the Army.

The hypothesis we aimed to verify is:

Do most subjects manifest psychological congruence through the capacity to hope and through strong motivation in both groups or not? This hypothesis may have the following significances:

- The null hypothesis: 'innocence, high moral standards, the capacity to move the mountains relying on one's own convictions'

- Rejection of the null hypothesis: 'scepticism, low hopes, pragmatism, lucidity, anchoring in petty habits, routine, the lack of faith in what they do, the choice to live a monotonous life filled with remorse about that'.

Congruence through their capacity to be motivated in sample 1 :

$-t_{calculated} = -(-6,0408442) = 6,0408442$

$t_{critical} = 5,70$

$-t_{calculated} > t_{critical}$

- We therefore conclude that a risk of error of 0,01%, is in sample 1 - Rejection of the null hypothesis: 'scepticism, low hopes, pragmatism, lucidity, anchoring in petty habits, routine, the lack of faith in what they do, the choice to live a monotonous life filled with remorse about that'.

6,0408442> 5,70

Capacity to be motivated		
Eşantion 1 (efectiv=13)		
Punctaj	Efectiv	%
4	2	15,38%
3	7	53,84%
2	4	30,76%
Eşantion 2 (efectiv=24)		
Punctaj	Efectiv	%
4	7	29,16%
3	15	62,5%
2	2	8,33%

Congruence through their capacity to be capacity to be motivated in sample 2 :

$-t_{calculated} = -(-6,5957732) = 6,5957732$

$t_{critical} = 5,631$

$-t_{calculated} > t_{critical}$

- We therefore conclude that a risk of error of 0,001%, is in sample 2 - Rejection of the null hypothesis: 'scepticism, low hopes, pragmatism, lucidity, anchoring in petty habits, routine, the lack of faith in what they do, the choice to live a monotonous life filled with remorse about that'.

6,5957732>5,631

Sample 1 Average = 2,846
Standard deviation = 0,688779

Sample 2 Average = 3,208
Standard deviation = 0,5882545

$t_{calculated} = -(-1,3321067) = 1,3321067$

$t_{critical} = 1,31$

-t calculated > t critical

- With an error risk of 20% we conclude that 84,6% in Sample 1 and 70,83% in Sample2 - Rejection of the null hypothesis: 'scepticism, low hopes, pragmatism, lucidity, anchoring in petty habits, routine, the lack of faith in what they do, the choice to live a monotonous life filled with remorse about that'.

1,3321067>1,31

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GRAPHIC EXERCISE USED AS AN ACTIVE BREAK IN TIME MANAGEMENT (INTELLECTUAL TRAINING)

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Abstract: *Students' academic performance is, mainly, based on their attendance to classes and individual study. Lately, class attendance decreased and, therefore, individual study seems to gain more and more importance in obtaining academic success. The main problem associated with this is the reduced time that students allocate to study. Given these circumstances, we suggest that graphic exercise, used as an active break during individual study, improves the way students manage their time. Statistical analysis of data confirmed our hypothesis.*

Keywords: *graphic exercise, time management, active break, individual study*

1. INTRODUCTION

Nowadays, a widespread phenomenon that takes greater amplitude with each academic year is the last minute (or last hundred meters) phenomenon. This phenomenon is associated with reduced time allocated by students to individual study and class attendance, with superficial homework or exam preparation in only two or three days. Alongside socio-economic factors (the number of employed students is significantly high), there are other determinants of the phenomenon, mainly those regarding motivation and time management.

In a previous study (Indreica *et al.*, 2011: 1096-1102) we showed that time management is highly correlated with academic performance.

Also, when obtaining academic success students are highly motivated and they better organize their working time. In the mentioned study, we proposed a complex time management program requiring an educational counsellor as coordinator.

In the present study, we intend to offer an alternative (Dale, 1993) for optimizing time management in order to improve learning.

2. GRAPHIC EXERCISE AS AN ACTIVE BREAK

2.1 The graphic exercise

The concept of graphic exercise is used in educational sciences with reference to learning writing skill (in preschool and primary education) or to hand-eye coordination development.

In visual arts this concept is much frequently use (Ailincăi, 2000), to describe the practice of repeating and setting a simple or complex hand-eye movement by drawing a spontaneous or elaborate representation. The line and the dot are the main elements of plastic language use in graphic exercises (2013:11.09). Through modulation and modelling, the line and the dot become bi- and tri-dimensional forms. The colour splash can be used only as support for line and dot.

2.2 Types of graphic exercises

Taking the form into consideration (Ailincă, 2000), graphic exercises are elaborated or spontaneous. According to the elements of graphic language that are used, there are simple (based either on the line or the dot) or mixed graphic exercises (combining the line and the dot).

According to the degree of difficulty of the execution, there is an ample scale of graphic exercises from very easy to very difficult. In the study presented below we used only exercises with a low level of difficulty as none of the participants had drawing skills.

Elaborated, simple and low difficulty level graphic exercises can be drawn using a helping instrument, as the one presented in figure 1.

Fig. 1 *Serrated wheel with disk* instrument

When using this instrument, one holds the serrated wheel with the left hand fixated on the paper, inserts the pencil tip in one of the disk holes and moves the disk in clockwise direction. Graphic forms as those presented in figure 2 are obtained.

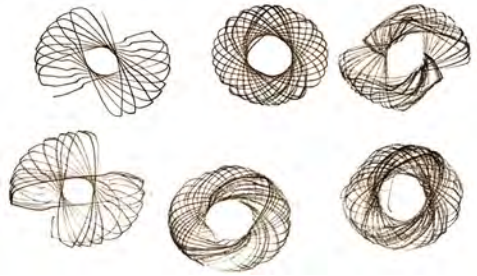

Fig. 2 Models of graphic exercises made with serrated wheel with disk

Spontaneous graphic exercises are much easier to execute and preferred by those with low drawing skills as they considered them a game. No searching and probing is necessary. Music is an effective method of eliminating blocks, by moving the pencil in the rhythm of the music. It is considered that the trace left by the pencil on the paper has a positive psychological effect on the person (Lauric, 2011: 102-107; Gauthier, 1990), preparing her or him for the upcoming effort. This is way graphic exercises are being recommended during habituation with the task, at the beginning of individual study.

Fig. 3 Spontaneous graphic exercises

Elaborated forms can be made based on spontaneous graphic exercises, which activate expressive creativity, intrinsic motivation and imagination. This type of graphic exercises (Figure 2) is recommended during individual study, at an interval of 50 minute of continuous effort. Also, these exercises can be combined with elaborated ones made with the instrument presented in figure 1.

Fig. 4 Graphic exercises elaborated on spontaneous forms

Graphic exercises based on elaborated require more time and, therefore, are recommended at the end of the daily study period as a form of relaxation after sustained effort.

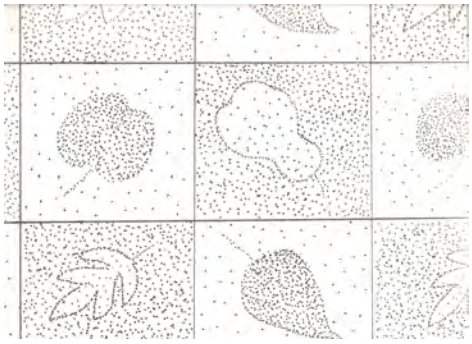

Fig. 5 Graphic exercise on elaborated forms

In elaborated graphic exercises, with chromatic support, the colour splash is not used for creating forms; usually, it is being used a coloured line on a coloured background.

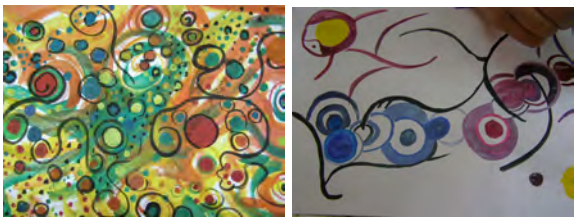

Fig. 6 Elaborated graphic exercises, with chromatic support

The exercises presented in figure 6 are recommended as an active break only when the person is involved in individual study an entire day. These exercises can be executed during two long periods of intellectual effort (for example in a daily schedule that starts with 4 or 5 hours of individual learning in the morning, continues with a lunch break, an active break – elaborated graphic exercise with chromatic support, and ends with 4-5 hours of study in the afternoon).

3. METHODOLOGY

3.1 Research hypothesis

The main hypothesis of the study is that *graphic exercise, used as an active break during individual study, improves time management.*

We intend to determine the extent by which an intellectual training program improves management of time. After implementing the program, we expect to identify differences on the following aspects: students will better organize their time, will be stronger intrinsic motivated, will strongly engage in solving the tasks, will allocate more time for study, and will be much more satisfied by their learning activity.

3.2 Research design

We test the hypothesis in an experimental design, with pre-test and post-test, with one experimental group and no control group. The pre-test took place in 16 – 20 July 2011, while the post-test took place in 20 - 23 September 2012. The experimental intervention consisted in implementation of active break by students during individual study (august 2011). All participants were instructed (in 22-28 July 2011) on how to use active breaks while learning.

3.3. Methods

The following methods were used for collecting the data: 1) analysis of school documents – used for data on school performance (SP) which was quantified on a 5-step scale, with 1= very low level (VL), 2 = low level (L), 3 = medium level (M), 4 = high level (H), 5 = very high level (VH); questionnaire for assessment of motivation for learning (Magher, 2005: 174-176), comprising of 20 items on a 5-step scale ranging from 1 (VL) to 5 (VH) and measuring intrinsic motivation (IM), extrinsic motivation (EM) and satisfaction level (SL); self-observation for determine the time necessary for mobilizing for task solving (MTS); analysis of the inventory of activities that had to be done and the one that were done, with the time period allocated to each – for measuring the management of time (TM) and the duration of time allocated to individual study (TIS); the experiment – having an intellectual training based on active breaks during individual study; statistical methods.

3.4 Sample

The participants to the study were 47 persons, 24 boys and 23 girls, attending psycho-pedagogical module. All participants were recorded with school failure after the summer period of exams at their main specialization (Economics, Design of products and environment, Materials science and engineering, Wood industry).

Participants have been assessed in two distinct moments, before and after experimental intervention on the following dimension: management of time (TM), intrinsic motivation (IM), extrinsic motivation (EM), school performance (SP), time allocated to individual study (TIS), time necessary for mobilizing for task solving (MTS), and satisfaction level (SL).

3.5 The experiment

In order to respect the individual rhythm of learning, participants were given general recommendations on the organization of study time. The instructions referred to theoretical aspects regarding ultradian rhythm, the effort curve, active breaks, and practical aspects regarding elements of plastic language, graphic exercises, and execution of graphic exercises.

Active breaks during individual study were recommended as part of the experiment: 5 minutes of spontaneous graphic exercises, simple or combined, at the beginning of the effort curve; at each 50 minute interval, a 5-10 minutes of graphic exercises based on spontaneous forms or made with serrated wheel with disk; and other 10-15 minutes of graphic exercises made on elaborated forms at the end of the study period. Participants were asked to write in a protocol the duration of time allocated to mobilizing for task (the time necessary for beginning the task), the time allocated to individual study in a day, the frequency of active breaks (adapted to individual rhythm).

3.6 Findings

The Wilcoxon test for the differences of ranks of two paired samples showed significant differences for all of the seven measured dimensions, before and after the intellectual training.

The main hypothesis was confirmed, after participating at the intellectual training, students reported using better learning strategies. A surprising finding was that participants recorded a higher level of extrinsic motivation after the experimental intervention, when only intrinsic motivation was expected to differ significantly.

Table 1 Pretest values

	Pretest			
	Mean	Std. Dev	Min	Max
TM	1,55	,65	1	3
IM	1,10	,31	1	2
EM	2,38	,49	2	3
SP	1,89	,69	1	3
TIS	1,34	,47	1	2
MTS	1,44	,61	1	3
SL	1,51	,50	1	2

Table 2 Post-test values

	Posttest			
	Mean	Std. Dev	Min	Max
TM	3,68	,75	2	5
IM	2,61	,70	1	4
EM	3,80	,57	3	5
SP	3,53	,68	2	5
TIS	3,44	,54	2	4
MTS	4,40	,57	3	5
SL	3,61	,53	3	5

Table 3. Statistical significance of ranks differencens between pre-test and post-test

	Wilcoxon Rank Test	p
TM	**-6,111**	<.001
IM	**-5,845**	<.001
EM	**-5,787[b]**	<.001
SP	**-6,017**	<.001
TIS	**-6,177**	<.001
MTS	**-6,065**	<.001
SL	**-6,098**	<.001

One of the most important results is that students improved their school performance after following the training.

Observed differences are significant even when taking gender of participants into consideration. Both boys and girls record improvements in using learning strategies after the experimental intervention. Mann Whitney test for independent sample showed no significant differences between boys and girls for none of the measured dimensions.

Table 4 Statistical significance of ranks differencens between ore-test and post-test, according to gender

		gender			
		masculin		feminin	
		Z	Asymp. Sig. (2-tailed)	Z	Asymp. Sig. (2-tailed)
Posttest-Pretest	TM	-4,378[b]	,000	-4,311[b]	,000
	IM	-4,199[b]	,000	-4,104[b]	,000
	EM	-4,104[b]	,000	-4,118[b]	,000
	SP	-4,202[b]	,000	-4,416[b]	,000
	TIS	-4,388[b]	,000	-4,413[b]	,000
	MTS	-4,377[b]	,000	-4,249[b]	,000
	SL	-4,399[b]	,000	-4,266[b]	,000
a. Wilcoxon Signed Ranks Test					
b. Based on negative ranks.					

TM = management of time, IM = intrinsic motivation, EM = extrinsic motivation, SP = school performance, TIS = time allocated to individual study, MTS = time necessary for mobilizing for task solving, SL = and satisfaction level.

According to the type of living, participants record similar positive effects of the training, either they live with their parents or in the students house. Learning strategies optimize both for students living with their parents (LP) and those living in the students house (LSH). Mann Whitney test for independent samples showed no significant differences between the two types of livings (LP and PSH), for none of the measured dimensions.

Table 5. Statistical significance of ranks differencens between pre-test and post-test, according to LP/LSH

		LP		LSH	
		Z	Asymp. Sig. (2-tailed)	Z	Asymp. Sig. (2-tailed)
Post-test- pre-test	TM	-4,771[b]	,000	-3,943[b]	,000
	IM	-4,744[b]	,000	-3,502[b]	,000
	EM	-4,656[b]	,000	-3,493[b]	,000
	SP	-4,667[b]	,000	-3,862[b]	,000
	TIS	-4,818[b]	,000	-3,943[b]	,000
	MTS	-4,776[b]	,000	-3,785[b]	,000
	SL	-4,815[b]	,000	-3,787[b]	,000
a. Wilcoxon Signed Ranks Test					
b. Based on negative ranks.					

Considering the association between learning strategies dimensions, we obtained the following results based on Spearman correlation coefficients:

-There is a positive significant association between time management and intrinsic motivation, $\rho(45)= .363$, $p = .012$, students who efficiently mobilize their effort report a higher level of intrinsic motivation.

-There is a significant positive association between intrinsic motivation and learning satisfaction, $\rho(45)= .34$, $p = .019$. Students with a high level of intrinsic motivation, are greater satisfied then those extrinsic motivated.

-There is a significant negative association between time allocated to study and the level of mobilization for the task, $\rho(45)= -.324$, $p = .026$. Students allocating more time to study, mobilize themselves harder in solving the task. This result might show the tendency of using inadequate the time resource, the tendency to postpone task solving and to allocate the resources disproportionate.

4. CONCLUSIONS

The main hypothesis of the study was confirmed, which allow us to conclude that using graphic exercises as an active break during individual study leads to improved time management, has a positive effect on school performance, on learning satisfaction and on motivation.

Subjectivity bias in answering the questionnaire, memory limits in making weakly inventory of activity, the presumption of inconsistency in using active breaks at recommended frequency, reduced contact with participants during intervention are some of the limits of our investigation.

Still, one must stress the advantages of intellectual training such as: organizing learning activity increased time allocated for individual study, intrinsic motivation, increased satisfaction with the result, neuro-psychic relaxation through active breaks that maintain the effort curve close to maximal level, the easiness of using this type of active break.

Obtained results may constitute a first step into a new line of research in the area of improving time management in learning.

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FROM TEACHING TO ACTIVE LEARNING

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Abstract: *Starting from the hypothesis that learning is co-evolving with teaching, to bring up the quality of learning stands for an inherent analysis of the teaching activity. Knowledge of mechanisms, as well as of the power and limitations of the human learning represents the condition for creating specific and efficient learning situations through teaching. The dynamics of the contemporary world, together with the information explosion impose the promotion of an active, innovative learning, as the only one capable to provide the contemporary individual with an adjustment to the accelerated pace of changes. The implementation of the heuristic-type strategies, of active-participative methods, intended to cultivate the critical thinking, transforms the classroom into a place where a better future for humankind might be prepared and designed.*

Keywords: *teaching, active learning, maintenance learning, innovative learning, shock learning, active listening, individualized education.*

1. INTRODUCTION

"The authority of those who teach is often an obstacle to those who want to learn" **(***Cicero***)**

The quintessence of teaching is one and the same with the didactic performance: it is both the science and the art of teaching others.

To ignorant people, it may appear as an easy and at everyone's hand task. To others, yet, people involved in the didactic career and devoted to it, the activity of teaching represents a continuous challenge, a state of freshness and intellectual activism, capable to contaminate everybody around, and firstly, students. Teaching is the activity carried out by a teacher during the lesson and meant to provide students with the skill of learning.

By observing and analyzing the contemporary education's realities, we can notice that there is a tendency to show less interest in teaching and much more in learning, although these two are interdependent activities.

2. FORMATIVE FACTORS OF LEARNING

Among the determining factors of learning is the very quality of teaching. There are fewer and fewer teachers to be aware of their teaching deficiencies, yet, there are many more to bring accusations to their students' quality of learning, thus ignoring the fact that learning is co-evolving with teaching.

Should we accept this truth, certified by experience, then it means that learning chances depend to a great extend on the quality of its conditioning on teaching, on forming positive attitudes toward learning through the teaching performance.

Similarly, the evolution of learning detains the value of a corrective, ameliorating criterion for teaching.

Progress or regress at each level of the didactic performance will hold consequences over the others, the system functioning as a unitary whole.

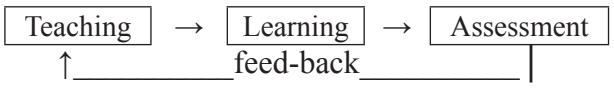

Fig. 1 The educational process perceived as a system provided with self-adjustment

Nevertheless, the leading role is taken by teaching, which determines the entire process, and by education's agent – the teacher. Consequently, teaching confirms its efficacy provided it induces learning, which presupposes that it should be adequate for the concrete processing of the human learning. Hence the necessity of the psycho-pedagogical training background of the teacher, irrespective of his or her area of expertise and specialization.

Knowledge of mechanisms, as well as of learning's power and limits, represents the premise of creating efficient learning instances, through teaching. Being designed on psycho-pedagogical grounds, teaching has to convert the contents of learning, its methods and didactic techniques into accessible elements for each and every student. The accomplishment of science's logic is doubled by the didactic logic and by the logic of the pedagogical discourse. Other elements that define the quality of teaching are various methods, strategies, didactic styles etc.

3. LEARNING STYLES

Mircea Malița (Botkin *et al*., 1981) observed that behind each of the teaching methods there is a hidden hypothesis related to the student's learning mechanism.

In 1979, a group of researchers drew a Report for the "Club of Rome", with the title of "The Unlimited Horizon of Learning". This report argues that the human gap, including that between societies, occurs due to the fact that people do not learn as much or as well as they should. If, to former epochs, maintenance learning (predominantly reproductive) used to be sufficient for assuring the social adjustment and reproduction, under the circumstances of the information explosion and of the perishability of information, there is need for a new style of learning – the *innovative learning*, distinguished by specific traits, among which the most relevant is its anticipative and participative character.

The non-critical acquisition of deeds and the mechanical imitation of behavior patterns, the disregard of significances and contexts, when transmitting and receiving information, lead to the alienation of the human being, to an estrangement from the self and from society. The French sociologist Georges Friedmann, concerned about the effects of the modern technologies over the human psychic, analyzed the deteriorating process of the human condition. He coined the phrase "the driver's civilization" (Paris, 1986), in order to reflect the limitations and dangers of the reproductive learning, of a mechanical type, emptied of significances and taken out of context. This phase must be surpassed. Ignorance of contexts and meanings impedes learning and leads to *shock learning*. The unpredictable character of the actual world imposes the assimilation of some vast collections of contexts, so as to avoid, if possible, surprise events. This is a requirement of the innovative learning. From the didactic perspective, the accomplishment of this learning style involves the promotion of active learning methods, able to stir the student's curiosity, self-confidence in his own powers, his capacity of communicating and interacting with people around him, all of which may confer him a greater liberty of thinking and acting.

The *active learning* is the one able to take students out of their status of object of forming and to transform them into active, co-participating subjects in their own becoming. From the teacher's perspective, strategies of the heuristic type need to be promoted, together with active-participative methods and methods of developing the critical thinking. To activate stands for muster, animate all psychic forces of knowledge, understanding and acting in students.

4. LEARNING THEORIES

Jean Piaget and Robert Gagné, two of the most important scientists who contributed to learning theories, supported and promoted education based on active discovery. At the same time, they criticized the excess of verbalism in teaching, its supplying ready-made truths, which condemned students to passivity and intellectual laziness.

Similarly, the Romanian psychologists and pedagogists Ion Albulescu and Mirela Albulescu stated: "It is not sufficient to speak to students for teaching to be achieved" (Albulescu & Albulescu, 2000:9).

Traditional pedagogy fostered the "knowledge bucket" theory in association with the "funnel theory", as theories of the learning process: "Our head looks like a leaking bucket, through whose holes, information coming from the wide world seeps inside". Moreover, "the bucket is attached to a funnel, through which knowledge is poured in" (Stan, 2004:28).

In the post-modern society, among all explicative models of learning, *constructivism* is the most prominent. Based on the constructivist paradigm, learning is the "process of readjustment of mental patterns for the purpose of their putting up with new experiences" (Stan, 2004:115). To George Hein, learning stands for constructing meanings (Hein, 1991). This is why, the teacher who confuses teaching for 'talking' is not modern, nor is he efficient. From the constructivist viewpoint, the efficient teaching implies the understanding of mental patterns used by students for perceiving and decoding the world around them, a world of presuppositions on which these mental pattern rely. The purpose of learning turns into stating a personal meaning: "by reflecting on own experiences, each individual constructs his own conception of the world, draws his own rules and mental patterns, which he will use for understanding his own experiences" (Stan, 2004:114-115).

In this theoretical context, assessment becomes itself a part of learning, providing students with data about the quality of their own learning. The constructivist model highlights the capital role played by the "learner's behavior and experience" (Mackenzie *et al*., 1975:54) in the dynamic, interactive process of learning. Learning is no longer reduced to internalizing some explanatory patterns or existent meanings; on the contrary, it leads to new constructions, intimately connected with already existent mental structures and with one's experience.

This approach has generated the phrase "individualized education", which currently brings up the necessity of following the students' individual particularities (not only age related particularities) for the accomplishment of quality education. Each human being learns in his or her own style, capable of revealing his or her own uniqueness and specific singularity.

The American trait psychologist, Gordon Allport noticed the fact that when an individual takes part in various actions, he discovers that his deeds hold a meaning and that his social attitudes are understood by others and his contacts are appreciated. Participation affects the human personality to a great extent; it determines one's essential values. Participation is also one of the challenges addressed to education by the transformations of the contemporary world. Therefore, within the area of pedagogy, it generated the "creed of active learning", an adaptation by a Japanese teaching:

What I hear, I forget.

What I hear and see, I remember a little.

What I hear, see and ask about or talk with somebody, I begin to understand.

What I hear, talk and do, I learn and get used to it.

What I teach to someone, I learn it.

What I apply into practice changes me.'

The theory of active learning is associated with the *active listening*. The active listening has the purpose of offering an individual the possibility to help himself, through a creative thinking and by walking different paths from traditional ones. The theory was initially fostered by the American psychologist Carl Rogers and taken over by different schools. The purpose of active listening within the school boundaries consists of helping students to help themselves, thus proving that the plurality of the human condition, and its infinite resources, lies in talking and doing.

5. CONCLUSIONS

Living in an epoch of technological and information outburst that affect the very human condition, we wonder to what extent learning might contribute to smoothing crises or to annihilating the humankind's spiritual and existential regress. The answer was given by the chairman of the Club of Rome, Aurelio Peccei, almost half a century ago, but it still preserves its veracity: "What we all need at this point in human evolution is to learn how to learn what is to be learnt and even… to learn" (Botkin *et al*., 1981:13). And the avant-garde of this message's believers is represented by teachers, to the extent to which they accept that the classroom may be the place where future is prepared and designed, through the quality of people teachers form.

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SOME ASPECTS CONCERNING OF IMPLEMENTATION OF LEAN MANUFACTURING IN THE MANAGEMENT OF HIGHER EDUCATION

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Abstract: *This paper refers to the implementation of Lean Manufacturing process in a higher education institution taking as a case study of the Transilvania University of Brasov secretarial service. The paper presents the Lean Manufacturing concept features and the techniques and tools used. Then presents the assumptions on which the case study started. It presents an analysis of actual secretarial work of the institution and steps taken to implement the concept of Lean Manufacturing.*

Keywords: *Lean Manufacturing, educational services, quality of service, customer satisfaction.*

1. INTRODUCTION

One of the most used methods in the world for the continued growth of the performances of an institution is the Lean Manufacturing method of management. Reducing costs and maintaining competitiveness is a challenge for many companies or institutions. Without innovation and without the use of several methods which lead to minimum resources for maximum results, many institutions may fail in crossing an economic crisis like the one we are experiencing at the moment. Implementation of Lean Manufacturing process is beneficial at times just because it has the consequence of eliminating waste in the value streams and increase efficiency.

One of the definitions used in explaining this concept says that Lean Manufacturing is the creation of "value without loss" (Hobbs, 2003) the purpose of its usage being to optimal coordinate all activities involved in creating value, while eliminating any unnecessary steps.

2. LEAN MANUFACTURING CONCEPT FEATURES

The basic concept in Lean Manufacturing, is the value that a company/institution generates for the client, while all activities that do not add value for the customer are seen as a waste, making the subject of an optimization effort, simplification, reduction or total elimination.

Fundamental concepts of Lean Manufacturing are: quality, cost and service.

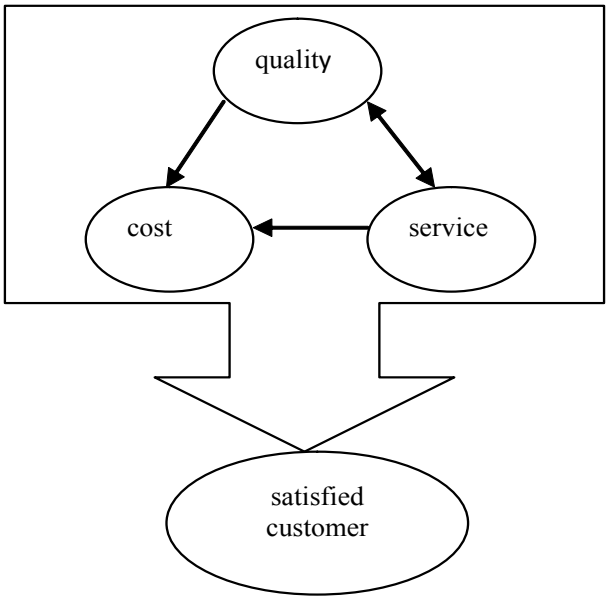

Fig.1 Lean Manufacturing concept features

Improving services and reducing costs leads to the growth of the customer satisfaction. At the same time, it is to know how fast it would be provided a customer service and how quickly I can provide while increasing quality and reducing costs. These three concepts are the core concept of Lean Manufacturing.

The major benefits of implementing Lean system at the administrative level are reducing order processing errors, streamlining order execution in order to reduce waiting time, reduce the total processing time of information in all administrative departments, increasing the number of orders processed by the same operator documentation requirements for safe outsourcing of business functions.

In Lean Manufacturing is mandatory to understand that the value is given by the customer's perception. When a customer wants something, he wants his application to be satisfied in desired amount at the destination where he needs as cheap as fast, as good as also, and accompanied by services allowing its using from increasingly performing.

Any deviation from these expectations produces dissatisfaction and affects the price and the cost of losses even if sometimes to the customer, however, often reduces company profits. Some Lean Manufacturing tools that can be used after a careful assessment of the initial situation and proper adjustment to the activity are:

Process unit **-** Type of production that involves the processing and the movement flow components from a work station to the next, piece by piece. It can be applied to services also - for example, you can organize a treatment process for refund of tuition fee to perform the activities required in a continual flow from the receipt and up to customer satisfaction. The opposite is batch production, which means that on the stream processing applications, a man performs a specific operation for many applications, which then transmits them all in one post following the flow of the process, which runs other parts of the required operations, and so on. Out of the flow will be more demand satisfied customers who will be expected to complete the whole lot of applications, not only for theirs. The unit can run on production lines or cells.

Kanban **-** Production control back through cards, signs, containers, boxes, buffer stocks, etc., which triggers movement downstream process flow of products between work stations (Hobbs, 2003: 28).

Visual management **-** The set of methods and means used to facilitate the carrying out of and to highlight the losses to be eliminated. It includes visual presentation of the elements that must be known by everyone for the purposes of the tasks, but also visual control means to facilitate the decisions in case of deviation from the normal situation.

5S **-** Methodology for organizing, cleaning and discipline at the workplace, with beneficial effects: improving the safety and productivity, better maintenance, better quality. Includes: 1S (Seiri) Sort and Filter (Organization), 2S (Seiton) Stabilization (Order), 3S (Seiso) Brightness (Clean), 4S (Seiketsu) Standardization (Compliance), 5S (Shitsuke) Sustaining change (self-discipline).

Value Stream Mapping (VSM) **-** Sitemap value stream mapping and value stream map means the graphical representation of material flows, people and information which leads to a family of products.

Reduction of manufacturing change **-** During the change of production of the product "A" into the product of "B" in a given working position - the time from the last good piece of "A" to the first good piece of "B". Changing manufacturing includes several components: the actual work done on work equipment for the replacement of the devices or making some adjustments, the preparation may make changes to the manufacturing settings at the production line. And in an equivalent situation arise the administrative "change" manufacturing, such as uploading a file from your desktop to your laptop before you go to make a presentation to a client or preparing a presentation folder before the arrival of a potential customer, resumption of activity from arrival of lunch, etc.

Kaizen **-** Japanese for "continuous improvement by involving all". It is a methodology of systematic teamwork to solve problems and implement solutions for improvement. To achieve the desired results in labor office or in other service provider organizations must consider at least three different perspectives on Lean, namely: Lean as a methodology of action, Lean as a set of tools to improve processes, Lean as a philosophy of life (Hobbs, 2003: 80).

By applying Lean principles and tools in an educational institution, the objectives can be achieved: simpler, better, faster, and more efficiently.

3. LEAN IN THE MANAGEMENT OF HIGHER EDUCATION

Every organization has some goals and some strategies implemented through a series of processes, in order to achieve results.

Lean involves among others a set of tools to improve processes and operational performance, but also their continuous improvement methodology. Thus, all organizations, including those providing educational services, can benefit from advantages through the application of Lean methods for power management.

One of the fundamental tools used to apply the principles of Lean is to standardize processes so as to take up and to generalize best practices for achieving a task, with visible results into the obtained results - with lower consumption of resources (time, material resources, stress, etc..) but with higher satisfaction for those involved (rewarding for those in the system, especially for service users).

Doing a more complete analysis, we can identify key processes, problems and chronic losses on realization flow current activities, leading to the choice and adaptation of appropriate methods of improvement, whether it is visual management application for a proper communication (within the university, and the students) to establish more reasonable activities or exams - focusing on activities that add value to the student - using methods of planning and programming activities to balance and streamline tasks performed or other application specific methods to reduce losses.

In the case of services, there are a number of losses, which can be inserted into one of the following seven groups: repeated checks unnecessary, achieving the same task repeated by two people who doesn't communicate with each other; standardized work processes, disorganization, frequently changing priorities; accumulation and use of materials and unnecessary information -

-irrelevant, redundant, outdated; sluggishness and resistance to change (syndrome "As we have always done"); failure to use acquired knowledge - poor communication, non-expanding solutions for improving tested in practice, lack of knowledge implied valuation framework; expectations due to overly complex procedures, unnecessary delays by participating in discussions, levels of responsibility and delegation unclear inappropriate; decisions, without an analysis of available data and the possible consequences.

Lean means saving the available resources, better performance, greater satisfaction for those within the system, but also for the beneficiaries, improved quality results. But the possible results obtained by applying Lean principles and tools may not be relevant as long as those involved in producing education (civil servants in the ministry, university departments coordinators, teachers, union leaders, etc..) do not become aware of the need of not wasting the available resources and cannot find the motivation to find solutions for continuous improvement at every level of activity.

The activity of a particular importance in an organization is the secretariat. The secretariat of the Transilvania University of Brasov is divided into specialized departments. It takes place at different levels, both in the central departments of the University and the faculty. Therefore, structure, organizational form, extent, number of functions and some functions are different.

Secretariat is considered as the management interface higher education institution with staff and with people outside the organization (candidates for admission, students, graduates) and also represents (in some cases) a doubling of the auxiliaries departments by taking on specific tasks at the department level. Therefore the secretary takes a series of duties on the administrative and public relations activities.

A series of losses identified through a comprehensive analysis of the secretarial work of the Transilvania University of Brasov, using the 7 categories of typical losses (MUDA), defined by Ohno and included in Lean Manufacturing methodology are: overproduction, over-process defects, transport, waiting, stocks and unnecessary movement (Masaaki, Dorobantu 1997:77-89).

Overproduction - registration documents at the registry office using input-output register classic pre-printed format, with complete incoming and outgoing documents manually without being able to trace the route by the applicant for approval of documents.

To eliminate this loss would be useful to implement a registry system for electronic document management that has as advantages:

-documents management, eliminating the loss of documents;

-provides management structure able to access independent statistics and situations regarding the smooth running of the institution documents;

-ensure the safety and discipline in working with documents;

-reduce retrieval of a document according to different criteria or to obtain a situation;

-tracking status and how to resolve claims, including those urgent warning;

-allocation of departments and employees documents;

-streamline operations;

-eliminates human error;

-reduce operational costs.

Over-process - high consumption of resources beyond what is necessary and sufficient to achieve a specific task: the existence and use of a large number of documents in print throughout secretarial service and beyond; completing the same data in several situations - for example, the identification of the student enrolment is completed in the application for admission, then in each contract year of study, and in the student management application, and finally in the application writing diplomas and certificates.

The solution would be to carry out a single database; completion of data relating to both student academic situation management application and evidence of student as well as in the school register and the summary of notes that are currently completed manually, not as a report generated from the computer system; completing data relating education plans and its member of functions in two different applications, the solution for this problem being given by the filing in of a single application data;

double evidence of the situation by pursuing their tuition fees by both faculty secretariat as well as the financial accounting service; communication situation both by secretarial school students as well as through the university portal.

A solution to solve this problem could be the introduction notes into the portal by teachers immediately after the examination, thus solving the problem of waiting.

Defects - mistakes, errors, non-compliance, non-compliance with contractual requirements, such as partial and inadequate operation of the portal modules used for communication with students.

Transport such as:

-visits of the staff within the Registry rectory/faculty without a timetable established for the collection and delivery of mail;

-shifting the students to social services for declaring the bank account to be transferred the stock or equivalent passes and train tickets and/or urban transport, although the secretariat of the faculty has the opportunity to add their data management application and registration of students;

-shifting the students to a particular office (each faculty is ascribed a certain cashiers) to pay tuition fees, examinations, and so on, although this can be done at any point of collection of taxes;

-shifting the graduates residing in Brasov to the social services for proper visa liquidation sheet, as this is required by the faculty secretary, although data supporting exists at the secretary concerning the student place of domicile;

-transportation of documents from the University archive to the services that requires them, whenever needed.

Waiting: waiting for the arrival of documents and for writing the diplomas from colleges and departments, and especially of their signature by authorized persons (dean, rector); waiting for finding repeated application to the registration of the university.

Stocks: materials and outdated messages kept long time on the portal used to communicate with students or on the faculty website, which do nothing but to complicate the use of the still current ones; Ordering and storing a large number of forms of diplomas and certificates which subsequently become useless because they change almost every year or because the ministry name is changed whenever the person changes to its management.

The unnecessary movement such as: business disruption faculty and staff of the secretariats bureau graduating and a nonexistence planning of the phone calls and responding to non-office hours; searching for information/files in the list of materials used for communication on the portal with students - as there is a file naming rule (to be easily found by users) and the portal does not provide facilities for sorting, searching a file into a list of dozens of files is not always a quick and enjoyable activity.

A different useful tool for organization of the activity of the Secretariat 5S. The name comes from five Japanese words starting with the letter S, respectively *Seiri*, *Seiton*, *Seiso*, *Seiketsu* and *Shitsuke*.

The 5S process includes 5 steps (Masaaki, Dorobantu 1997:67-73).

1.Seiri (Sort):The first step of the process refers to free up space to work and eliminate all unnecessary materials and articles (for example, programs, files, forms, certificates wrong, accessories, unused materials, and so on). Sorting impacts the mentality of the people who have to give up the habit to collect and preserve all kinds of useless materials and objects. After applying this step we have separated the useful things of the useless.

2.Seiton (Stabilization order). The second step of the process refers to the efficiency and reduces the time required to access the equipment and work tasks. This step is useful in storing documents in a predetermined location in a logical order to facilitate their use to be easily accessed or brought back to the same place faster (eg school register, the summary notes, catalogs notes, etc.).

It must be established fixed locations such as modular racks, cabinets with transparent doors, panels, floor markings for doorways, and their storage being realized according to the frequency of use. If everyone has access to any document or material the workflow becomes more efficient and, therefore, the staff becomes more productive.

3.Seiso (Brightness). The third step of the 5S process consists in a cleaning job, making him "shine". Cleaning should be done by each employee. All units which form a job must be cleaned, without exception because any deviation from the established order in the second S can be readily observed. Quality can be achieved only in clean working environments. Also unnecessary items at workstation hinder and reduce the productivity, increasing the possibility of mistakes.

4.Seiketsu (Standardization). The fourth step of the 5S process is to define standards (rules, customs and procedures) to which personnel must measure and report the maintenance of order and cleanliness. An important element is the visual management Seiketsu. Color-coding and standardized in a uniform manner of the various elements can be an effective way of identifying abnormalities present at a workplace.

5.Shitsuke (Supporting change). The last step of the process means discipline and respect for the 4 S above. Assume shared commitment of all staff to maintain order and to practice as a first 4S currently working. Shitsuke foundation is to eliminate bad habits and generalization of good practices. Without the support of change, it can quickly return to a situation similar to the first.

5S is a task for several weeks, and the advantages of this method is applicable only occur when all five S.

Reaction time at the request of a student's phone, graduate depends on the time required to retrieve useful information.

A study done in 2005 in the U.S. show that 50% of managers interviewed considered the order of desk employees as an addition to their promotion and that 51% were doing a correlation between the cleanliness of the office and productivity.

But at the same time, 49% of these managers are considered "professional and relaxed" if the tables had ordered several stacks of documents, 31% accepted an "organized chaos" on their desks, 13% belonged to a "creative type" of manager while only 7% considered themselves to be "organized and orderly."

"The documents in an office tend to multiply until occupies the entire space available" (law of Douglas). Therefore, 5S is the best instrument for fighting clutter and unnecessary accumulation of data and objects for service providers. Benefits permanent application of this process were observed by increasing productivity by eliminating time searching for documents, can more quickly identify problems and quickly identify nonconformities.

4. CONCLUSIONS

Implementation of Lean Manufacturing concept presents an approach that helps identify losses duration of the secretarial service and increasing productive capacity while reducing costs. Implementing Lean concept focused on optimizing working conditions through continued compliance with cleanliness, order and discipline, standardization of work procedures, improving service quality and reducing all forms of waste and rational use of working areas.

Lean means saving the available resources, better performance, greater satisfaction for those within the system, and increased quality outcomes for beneficiaries. But the possible results obtained by applying Lean principles and tools may not be relevant as long as those involved are not aware of the need not to waste existing resources and cannot find the motivation to find solutions for continuous improvement at every level of activity.

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COGNITIVE STRATEGIES CONCERNING THE NUTRITIONAL PROFILE OF THE PATIENT

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Abstract: *Implementing a personalized nutritional program involves the application into a sequence of the medical history and of some cognitive strategies designed to identify the nutritional profile of the patient in question. In this context the implementation of the attitudinal-behavioral-nutritional investigation file (PABNF) represents in our opinion a sine-qua-non condition concerning the knowledge, but mostly, the implementation of a correct, viable and efficient nutritional program. In this way the nutritionist may determine with the aid of the file, considered as an absolutely necessary cognition instrument, the logistic platform from where he will start in patient's medico-psycho-social investigation. The efficiency of the cognitive strategy consists in delimitation and then elimination of impediments that determine dissolutions which may increase and even modify attitudes and nutritional behaviors finding the answer to the eternal dilemma "we eat to live or we live to eat".*

Keywords: *instrument, investigation, nutrition, cognition, attitude, behavior, personalized program*

INTRODUCTION

Knowing the fact that nutrition, R. Segal [1] is the science of alimentation that involves: food digestion, nutritional needs, food science and eating behavior, we end to what Yudking (1999) after Z. Garban [2] defined the concept as being a relation between man and his food with psychological and social involvement and of physiological and bio-chemical aspects.

In this context what arouses interest from our point of view is the manner in which through nutrition, practically the nutritional act, we can maintain the equilibrium between health and illness, determinations exercised by certain conditions and conceptual states of other concepts that transform everything in energy ensuring the human evolution and development [3].

Thus, in the situation when the cognitive behavior concerning the nutritional profile of the patient we can start from what R. Ballentine [4] related to the inner world brought into attention the observation upon own body, own reactions to foods and drinks, own emotions, spiritual experience and thinking.

We come to differentiate the elements that after P. Holford [5] determine the personalized nutrition starting from:

-improving the mind, the spiritual state and the ability of concentration;

-increasing the IQ level;

-improving physical performances;

-improving sleeping quality;

-improving the resistance to infections;

-enjoying a longer and healthier life duration.

As well at the concept former reminded, competes the fact that the personality is always unique and original reporting to: the appurtenance to human race; the quality of social being and so member of the society; the quality of conscious being, gifted with thinking and will; participation to culture, equipped with values and orientation after this values; the potential of creativity, so that the identity is included to a bio-psycho-socio-cultural system representative and well established.

It is distinguished in the context the vision of A. Roşca [6], to whom "the personality represents the unrepresentative combination of psychical attributes that characterize more strongly and with a higher degree of stability the concrete man and his ways of behavior" so the personality is identified with the human subject as object of cognition and valorization of own being and of the living environment.

Under these aspects the existence of a personalized nutritional program becomes a necessity in the equation of medical-psycho-social success pleading for this theory of P. Holford with own thoughts: "There is no one like you. There are few rules applied to human success, for example we all need vitamins but the quantity that we need to reach to top results varies for an individual to another.

It depends on the genetic material that you inherited from parents together with strengths and weaknesses, and of the interaction between genetic inheritance and environment starting from the intrauterine life and first childhood.

The complex interaction of those factors ensures that each individual is born unique from a bio-chemical point of view, but there is for sure a resemblance with other individuals.

Constructive, progressive and cognitive we can register the fact that those items stand at the basis of necessity of existence but also of elaboration of viable instruments designed to code and then decode the complex information concerning the nutritional identity of our patient.

The initiation and development of the patient's attitudinal-behavioral-nutritional file (PABNF) represents the identity of a cognitive strategy concerning the nutritional profile of this one determining a whole complex approach of the nutritional phenomenon.

As work instrument, PABNF involves a special logistic approach concerning its conceptual identity and also the application techniques that start in their structure from:

-where is applied the file (the place) = in the nutrition practice by the nutritionist;

-when is applied the file (the time) = in the moment of shaping the medical history;

-how is applied (the way) = with tolerance, trust, acceptance and understanding, without bringing any prejudice to the person concerning the personality;

-who applies it = the nutritionist, used as a way of communication with the patient;

-why is applied (the motivation) = to be able to identify the particular elements of the patient concerning his own feeding process.

As structural identity PABNF captures four sequential components as follows:

1. The identity elements = where we find items that code among name and surname the age, sex, provenience environment, educational, social and marital status elements related to: profile, working place, medical diagnostic, height, weight, body mass and contact address, all competing to a more detailed preparation from this point of view in what concerns the patient. The first component helps us in explaining the qualitative value of the answer of the following components.

2. Psycho-nutritional connotations = are the items that code the modality of involvement form a psychological point of view in the nutritional act, the motivation being the key element of the cognitive sequence. Thus, starting from the respect towards food at its time, place and purpose and ending to motives related to the image, trust and self esteem, the items integrate gradually in the psycho-nutritional knowledge of the patient proving its componential efficiency.

3. Nutritional characteristics = the component refers to patient's involvement in cooking and preparing the food but also of serving shaping: habits, stereotypes, knowledge, traditions but also personal elements related to attitudinal-emotional-behavioral states created by a certain nutritional product.

4. Nutritional-dietary recommendations = will consider cognitive sequences related to: patient's registration; total value of nutriments; medical diagnosis; regular nutritional control; the results from former chapters; prescribed drug therapy; team work (doctor, nutritionist, psychologist).

5. Personalized nutritional program = will take into consideration all the annotations made in the file until now and it will materialize starting from: the awareness of the personalized nutritional act by the patient; the responsibility; the period of time well established being limited (days, weeks, months, years) or unlimited; the necessity of concordance with the medical diagnosis; the psycho-pedagogic-nutritional motivation in sustain the program by the patient and his direct involvement in the program; team work (doctor, nutritionist, councilor, psychologist, psychotherapist).

In this context the information coded by the components of PABNF competes through their complexity to the implementation of the nutritional profile of our patient.

After the nutritionist will go through the file identifying the specific componential structures will be able to decode the information in concrete terms realizing an efficient communication and cooperation with the patient and the patient's self involvement in own treatment.

Practically the file is a work instrument that: identifies, surprises, measures, notes and decodes: attitudes, emotions, behaviors, all co-working in realizing the nutritional profile of the patient.

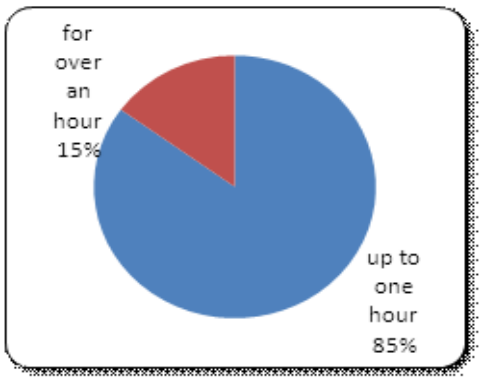
For the viability of the file we passed to decoding the impact not only to the patients, the sheet being apply to 60 subjects, but also on the effect of those who used it as a practical tool, a total of 30 nutritionists. To find the reliability of the file in terms of nutrition, we made their interpellations using a questionnaire, as part of the feedback file. Basically, the structure of the questionnaire was intended to be standard FIACNP application efficiency, decoding and surprising the following, by processing data.

To the first item, its usefulness as a viable work instrument resulted in a 100% percentage between reasons we found: provides a lot of complex information; is practical; is very useful in history; suggest a psychological and nutritional profile; open relationship with the patient; customize the nutritional program; is required.

The second item complete the first by motivating its application in practice, 100% represent the best opportunity to become a work instrument.

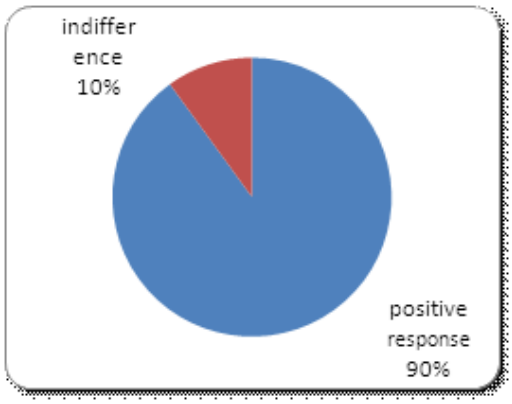
It was argued by the fact that: is effective in history; is useful in communication; avoid to forget some questions; useful knowledge of eating habits; better knowledge of the patient; prompt method of nutritional investigation.

Time was established as the main element of the third item, in addition to file, 85% of respondents needing up to one hour, and 15% for over an hour, as is configured in Figure no.1.



The efficiency is based on effective use of time for the period of history.

On the patient's response to application file, measured positive response in 90% of cases gave the verdict, recording the state of indifference 10%, which can decode a certain attitude regarding a possible future nutritional risk, fourth item. These results are illustrated in Figure no.2.



Awkward questions related to the fifth item, 95% of respondents don't claimed the existence of this impediment, 5% were those who felt slightly uncomfortable because some elements of self-knowledge, perceived as such, confidence and self-esteem not play an important role in the personality profile of the patient in question.

Although, there were phrases that refer to: contact address (it showed a certain reluctance regarding identity in terms of confidentiality); recipes and preparation required (direct involvement in nutrition education compartment); weight (self-acceptance); looking in the mirror (*Do you look in the mirror?* - especially for male patients the interpretations raised certain doubts regarding ego and personal identity).

In this context, we wanted to represent the questionnaire like an efficient and logistic instrument of measurement by the direct involvement of specialist/dietetics.

The results prove that is necessary: accept new experts; making changes in perception of nutritional phenomenon by cognoscible identity; find viable working tools of investigation range; get involved personally in self-education; have the courage to support what is a possibility and opportunity to come into relationship with the patient, showing professionalism and responsibility, all giving and taking specialist endorsement.

The efficiency of such a personalized work instrument helps and directly involves the nutritionist in his communication relation with the patient because it is entered into areas of knowledge where motivation is the strong point in decoding the information from a medico-psycho-social point of view and not only.

In the same time the file determines a certain approach from the nutritionist this one working in an interdisciplinary team making from the nutritional act the customary element between the cause and the effect of the human evolution being improved and adapted from case to case its basis components as structure remaining the same.

If the file responds to the everlasting dilemma: we eat to live or we live to eat, than through its concrete results determining new behavioral-nutritional attitudes outlining the man as being and not as an object involving the man directly in his own evolution and not involution [7].

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THE CUSTOMARY LAW OF THE SAXONS FROM ARDEAL

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Abstract: *The Germans who settled in Transylvania as a result of the Hungarian kings' colonization policy introduced into this area behavioral and social rules representative for the Western society of their origin. Thus, old Roman law elements were adapted to customary law and subsequently transformed into a legal framework guiding the conduct of this population. Its provisions can be traced back to documents like city statutes or municipal codes, guilds' documents or the regulation establishing the University of the Saxons, all of which were enforced in the areas where the Saxons benefitted from autonomous jurisdiction or in the Romanian-Saxon mixed communities. The customary law was so powerful within these groups that it directed social norms and behavior to be observed/enacted at various events like balls, neighborhood gatherings and other ceremonies. Moreover, clerks and priests played an important role in making sure this law was observed. Children attending German schools were trained in the spirit of these behavioral norms that were passed on from generation to generation.*

Keywords: *colonization, trial courts, city statute, family law, behavioral norms, punishments, lèse majesté.*

1. SAXON HISTORY: AN OVERVIEW

The colonization of the German population in the Center and East of Europe during the High Middle Ages led, first of all, to an economoc homogeneity of these geographical areas and, later, to their socio-political development.

At the time, by comparison, the West of Europe was more developed, but it was also subject to problems typical of the period: a steep rise in the exertion of central power by German princes, increased dependency of the population on the priests and feudal officials, growing poverty among peasants and small craftsmen. All this contributed to the movement of a large number of people to the East areas of Europe that seemed to promise a more prosperous life.

The kings of the newly formed Hungarian state that had a two-century history in the Great Hungarian Plain tried to conquer new territories in order to consolidate their power and influence. Since in West Europe there were already powerful states, the most feasible and achievable alternative was to expand to the Eastern areas of Europe.

One of the initial intentions of the Hungarian kings was to populate the Great Hungarian Plain, Moravia, the Meridional area of Poland, the west of Vistula and Transylvania with the so called *hospites* (i.e. colonists) and to establish a flourishing economic area. The colonization was the main goal of the policies pursued by the Hungarian Kings Geza II and Andrew II and, as a result, they offered the German population willing to colonize these areas a lot of benefits.

1.1 The initiative of the Hungarian kings

Starting with the 9th century, the Hungarian kingdom pursued a colonization policy in the territory that nowadays is known as Hungary, and in the areas that it conquered.

At the time, the Hungarian state was characterized by a stable political environment. Hence, the causes underlying such an initiative were not military grounded, but rather economically justified.

In this respect, one of the goals of the initiative was the development of cities, a phenomenon characteristic of the whole Medieval Europe.

The German colonization of Hungary took place in stages:

- during the reign of St. Stephen and his wife Gizella (around the year 1000) the German population was established in the Great Hungarian Field and in the North of Hungary in the Zips area;

-King Ladislau (1077-1096) invites more German *guests*;

- Geza II (1142-1161) is the king who grants the German population most of its rights and his policy is furthered by King Andrew II.

- after 1242- during the reign of Bela IV the Tatar invasion leaves behind disastrous efects.

The German population settled on Hungarian territory benefitted from certain economic and autonomy rights and their presence in the area yielded a number of positive effects both in economic (i.e. the deveopment of cities and fairs) and demographic terms.

The German population established in nowadays' Hungary was organised in counties, that is administrative structures characteristic of the Middle Ages. These were to be found in the South-West, in Öldenburgen and Gisenburg, in the North-West of Hungary, namely the Bars, Hart and Kograd counties, and in the Zips area where the autonomous organization of the colonists resembled the one of the Saxons from Transylvania.

1.2. The German population in the Zips area

According to linguists, both the Saxons from Transylvania and the Germans from the Zips area "came from the same regions: the South of Düsseldorf, Luxembourg and the West of the Rhine and talked the same language"[1]. They were called by the Hungarian King, Geza II between 1142-1162.

In 1173 they got organized in a Diocese and a provostship by the name of "Zipser Probster" and were under the responsibility of a count.

The first document confirming their presence in the Zips area is dated 1209 and it is in the name of a colonist, Adolf, and his sister. The Hungarian King, Stephen V, acknoeldges their right to autonomous organization. In 1317 and 1370 some of the priviliges initially granted are renewed.

Their most important document is **Constitution of Zips (***Willkür***)** dated 1370.

In the 14th century *Universitas Saxonum de Seeps* is established. In addition, there are "documents confirming 43 German settlements – parishes and towns- in Zips"[2].

According to their Constitution, the German colonists could organize their own gatherings and were entitled to have and run their own trial courts.

The towns had their own seal and had to fulfill some obligations with the Hungarian royal court: to pay annual taxes, to send certain amounts of products, cattle and wine to the court and to do military service.

Apparently, some of the German colonists settled in the North of Maramureş and in the North of Bucovina.

Some of them were assimilated by the population in these areas, but "there was also a tight-knit group of colonists who spoke a language similar to modern German and that was different from the language spoken by the Hutsuls and Ukrainians"[3].

In the 15th century the Northern part of the Zips area was under the control of the Polish and after the death of Matthew Corvin the territory was sold to the noble Emmeric of Zapolya. During the next century the area was claimed by several Hungarian nobles.

Thus, in 1604 it was under the rule of the Transylvanian Prince, Stephen Bocskay.

In the 16th century most of the German population in Zips was Protestant. Therefore, they started having conflicts with the Hungarian nobility.

In the 18th century, Zips got under Habsburgic rule and the reforms of Maria Theresa succeeded in renewing the German spirit. Her policy was continued by her son, Joseph II. The population in the area played an active role in the events of 1848, Artur Görgey being a representative figure for their fight against Habsburg absolutism.

After 1867, Zips was under Hungarian administration and, as a result of a large scale assimilation policy on behalf of the two-hatted government, the Germans underwent an intense magyarization process.

After 1914, the people in the Zips area massively emigrated to the USA and, as a result of the Treaty of Versailles, the area became part of Czechoslovakia.

1.3. The settlement of the German population in Transylvania

The German colonists were brought to Transylvania during the rule of Geza II when the policy of the Hungarian royal crown was to keep this territory under control.

The colonization started from the North-West of Transylvania and continued to the South-West of the Carpathian basin in several stages and it culminated with the establishment of the provostship and of the Sibiu Province.

At the same time, upon the initiative of the Hungarian royal crown and the Pope, the Teutonic Knights were allowed to settle in Tara Barsei. However, several years later, they were banished from the area due to their independence tendencies.

"Fundus regius", a territory inhabited by the Saxons, was established afterwards and acknowledged through the *Golden Bull* granted by the Hungarian King, Andrew II, in 1224.

Their initial privileges were maintained and extended with the foundation of the University of the Saxons in the 15th century.

The Saxons had to fulfill the following obligations to the Hungarian royal court:

- a tax – *Martinzins*. The local authorities divided the tax by groups of ten households called *Dica*;

- war related obligations that were very demanding in the centuries that are under the scrutiny of this article and that included activities like fortress consolidation or military service;

- contributions in money and products in times of war;

In exchange for all of the above, the Saxons were granted the right to administrative control and autonomous organization (districts and seats), and the cities were acknowledged as administrative entities by the the royal crown.

They were ruled by a county chair from Sibiu, and by royal representatives and seat chairs running the administrative units.

The Saxons were entitled to be first tried by their own trial court. Hence, most penal cases were settled by the Saxons' committees and by the University of the Saxons.

The guilds-organizations of the craftesmen from the cities and rural areas- also had their own statute and were acknowledged by the University of the Saxons.

They were a landmark for the prosperous economic life in Transylvania. The involvement of the church, especially the Evangelical one, in community life mainly concerned the preservation of healthy moral principles.

The development of schools is a sign that the Saxon community was a homogenous one. In addition, the associations of "the boys and the girls from administrative units first recorded in 1370 in the Sibiu Province" [4] are evidence of the constant care for the youth and for their education and development in accordance with moral principles.

2. TRIAL COURTS AND THE STATUTES OF THE CITIES

Once they were granted the right to autonomous administration, the Saxons from Transylvania established their own trial courts that, at first, worked based on the customary law of the Saxons that was based on elemenets inherited from the German law and the Roman law.

The customary law preserved the identity of the Saxon communities from Transylvania and regulated their culture and administrative organization, the administration of the lands they were provided by the Hungarian kings, their political and administrative representation, schools and church organization.

Hence, it is obvious that the customary law was an integral part of the legal framework in effect at the time in Transylvania.

The organizational forms established by the customary law contributed to preserving the civic order.

As a result, the civic and moral rules had been in effect before any trial court was formally established and they were part of the Codices or county codes.

As far as the Saxon law is concerned, the work of the great Transylvanian humanist, Johannes Honterus, dated 1544 and known by the name of *Compendium juris civilis în usum Civitatum ac Sedium saxonicalium Transylvania colectum* (A Brief Overview of Civil Law for the Needs of the Tranylvanian Citizens and saxon Seats) is a landmark in the field.

Another important figure for the Saxon law is Matthias Fronius, a member of the Senate of Braşov city.

The latter, ”starting from the work of Honterus improved the Saxon customary law by introducing elements belonging to the Roman law and thus, in 1570, *Statuta jurium municipalium Saxonum in Transilvania* was issued[5].”

Consequently, the customary law was adapted to the profile of the Saxon community from Transylvania. As a result, “The statutes are representative for the German county law …and their elements are highly heterogeneous since they can be identified both within the canonic law, and in the German and Hungarian legal frameworks.”

Their validity is based on three factors: the privileges mentioned in Andreanum(1224), the confirmation of the statutes of 1583 by Stephen Bathory, and ”subsequent documents signed by this ruler that reconfirmed the rights of the Saxons from Transylvania”. [6].

2.1. The trial courts on the land under within the rule of the Hungarian kings

The first trial courts of the Saxons were communal and they were headed by the village ruler along with the most important male figures of the community. ”Within the free villages the disputes among the inhabitants were mediated by the community head and the good and old people in accordance with customary laws”[7].

The appeal court, higher in power than the trial court, was represented by the local nobility (also called ”greavi”) who would pronounce the sentence.

Besides the aforementioned types of trial courts, the Saxon community had other courts whose activities were conducted in accordance with written laws:

-the court of the royal judge (who was a representative of the Sibiu committee and acted as the highest legal authority for the seats and districts);

-the higher assembly of the seven seats from Sibiu (that would meet 2-3 times a year in Sibiu);

-the court of the University of the Saxons (established in the 15th century after the number of Saxons’ privileges granted by the Hungarian King, Matthew Corvin, was extended);

-the Prince’s court (the Prince’s Curia) and the imperial office as the highest legal entities enabled to judge a trial.

2.2. The trial procedure

The trial procedure was stipulated in the county codes of the Saxon cities, as well as in those of the church issued by synods and deans.

These codes contained provisions concerning behavior and civic rules to be observed within cities.

The church codes referred to the moral and Christian principles that were to be followed. An example, in this respect, is the Statute of the Sighişoara city that clearly mentioned that the right to buy houses was exclusively granted to the German colonists, whereas the newcomers could only settle in the lower area of the city (a sort of subsidiary area), as well as the procedure for the city’s officials’ election (who also acted as judges) and the priest’s role who, besides taking care of church bussinesses, also had to ensure the proper conduct of school activities and the prohibition of weapon use within the citadel.

The same codes establish the roles of clerks like the royal judge, the seat judge and the lawyer. At first, the former carried out their job related tasks in their own dwelings, in a room specially assigned to fulfilling their official roles.

Later on, the seat and district authorities provided them with their own place to conduct their activities.

There were two days a week allocated for trials to unfold. A trial started with witness hearing, then the documents were checked and a sentence was pronounced.

The judge had to solve economic disputes concerning property rights, and also the private issues occurring among the inhabitants of the city.

Old documents were as valuable as the evidence provided by witnesses: "he who makes a complaint about having been the victim of a crime can bring witnesses under oath to support it" [8].

The lawyer was hired by the parties involved in a trial. The sentence came into effect by mutual agreement or, if one of the parties was dissatisfied could appeal to the University of the Saxons in Sibiu.

The latter would investigate the complaints and send a team into the territory to check the properties under dispute (in case of property related disputes) or to hear the witnesses (if these were too many or could not get to Sibiu to testify).

More often than not, the sentence pronounced by the Universiy was accepted and no further appeals were made. However, should there have been such appeals, these were forwarded to the Prince's office and, later, to the Transylvanian government or to the imperial Curia.

2.3. Family law

The information sources concerning family law are the city statutes or county codes.

According to these, men had political rights and, depending on their birth rights, were entitled to a certain position within the community. It was only those benefitting from these rights that could run for public office, act as craftsman and be part of a guild.

Young people could only marry to someone of German origin (mixed marriages were forbidden) and with parents' approval. Their engagement was a public event and unfolded in the presence of witnesses, which made the event be both a ceremony and a formal agreement.

The prenuptial agreement was signed before the wedding. It mentioned all the goods brought into the marriage by the two spouses who would preserve their rights over these and use them as personal property. The wife took the husband's name and benefitted from his position within the community, as well as from everything that her new status involved.

Taking care of the household and of the children's education were her main tasks. Divorce was an exception within the Saxon community.

The marrital disputes were mediated by the priest and by the judge. The two spouses were kept in an isolated room for a week and had to share a single cuttlery and dish item. Most often the isolation period made spouses settle their disagreements.

When the husbad was found guilty and convicted, the wife would also be a scapegoat and was removed from neighbours' associations. Moreover, she had to take care of her children on her own and/or with the help of her own family.

2.4. Penal court trials

Penal trials were open to the public by the model of the Roman law in order to set an example for all community members.

Political betrayal, adultery, prostitution and witchcraft were penal crimes and the punishemnt for them was death in the public square. Harsh sentences like tongue or finger cutting were pronounced for theft or perjury.

Those who forged documents were severely punished by having all their rights removed and by being banished from their community. Theft (defined as the wrongful taking of somebody else's good and pledging it to get a loan or other goods) was also strictly punished in accordance with the old German law.

Putting counterfeit money into circulation was also a penal crime. Therefore, in every fair there was a pair of scales to weigh up coins and anyone discovered to have counterfeited money was executed. Murder was also punished by death and the type of execution: hanging, burning or drowning depended on the type of offence

3. CONCLUSIONS

The information presented by this article refers to the Medieval law. This evolved from the Roman, as well as from the ancient and Medieval German law into a legal framework characteristic of the Middle Ages.

The customary law was an important part of and regulated people's behavior. Most of its provisions were orally passed on, but starting with the 15th century they were included in the statutes and codes of the cities and counties inhabited by the Saxons.

Whether recorded in the oral tradition or in writing, the customary law actually preserved a previous state of affairs and imposed the observance of a set of rules on the German population.

Both the civil law stipulating the rights of the spouses, the procedures for gaining an inheritance or other goods, and the penal law unveil a world governed by moral values. The latter were preserved and passed on within the community through institutions like the church, the school, the University of the Saxons and the trial courts of the Transylvanian Saxons.

By observing the moral provisions of the customary law, as well as the clauses within the legal framework, this world made valuable material contributions.

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