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COMPUTATIONAL INTELLIGENCE IN ENVIRONMENTAL CHANGES DETECTION

Abstract: *Changes detection is helpful in determining strategies for natural resources management, environment monitoring, for urban development politics and also for natural disasters resilience and mitigation. Changes detection and monitoring involve the analysis of multi-temporal data of different types, obtained from different sources, including common databases, aerial or satellite images and old printed topographical maps. In populated areas, the changes are easily observed and analyzed, but for inaccessible areas, like forested mountain areas, the automatic analysis based on remote sensing imagery is required. Also, some features of the land, like type of soil, land cover type or humidity, are not perceptible by the human eye, so, multispectral images must be used for an accurate analysis of the studied area. In this paper we propose a strategy for environmental changes detection based on multispectral images.*

Keywords: *changes detection, image fusion, multispectral image, features detection.*

1. Introduction

The changes detection domain involves the usage of data for which the geographic position is the main feature. Thus, the Geographic Information Systems are an important component in these applications. Multi-temporal analysis requires data obtained from the same or different sensors or sources, at different times. The time interval may be years or even decades in case of environmental changes analysis and hours or days in case of natural disasters effects analysis (Parece 2013). The data used in analysis is extracted from databases (features based on ground observations), aerial or remote sensing images and also topographical maps in case the analysis covers a longer period of time, including periods for which images are not available or are too expensive (Noaje 2008).

The strategies used in changes detection are classified in (Carincotte 2006): classification of feature extracted from images or maps; classification and comparison of individual objects visible in the available images; direct classification of images pairs. To increase the accuracy of results, the images must have the same resolution, scale and must be acquired from approximately the same position and in good atmospheric conditions (Parece 2013). While images are obtained from different

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sources, some of these conditions are difficult to fulfill. In case of multispectral images, different frequency bands have different resolutions. Useful information is included in all bands, e.g. the panchromatic band which has a higher resolution offers a more precise positioning and border limits discrimination and infrared bands have four times lower resolution but offers more accurate information about temperature or humidity. As a consequence, image processing techniques are used to increase resolution (Bejinariu 2013b). Similarly, image registration methods are required to perfectly overlap images obtained from different sensors or from the same sensor placed in different positions (Bejinariu 2013a). In case of misaligned images the change detection methods will fail by detecting false differences between source images (Parece 2013).

The most common changes detection applications are land cover monitoring (Yadav 2012), (Phukan 2013), land usage monitoring (Zhou 2004), (Uzoukwu 2010) and land damage detection. Environmental changes of hydrological elements and vegetation in the Danube delta and coast area of Black Sea were monitored in (Noaje 2008) using multi-sensor and multi-temporal analysis of remote sensing images. The study is based on medium resolution images and the authors conclude that higher resolution images allow obtaining more accurate results. To can extend the studied period they used also old topographical maps of the area. Similar methods were used in (Noaje 2012) to analyze changes in urban areas. Given the diversity of source image types, the analysis has been accomplished partially through visual analysis.

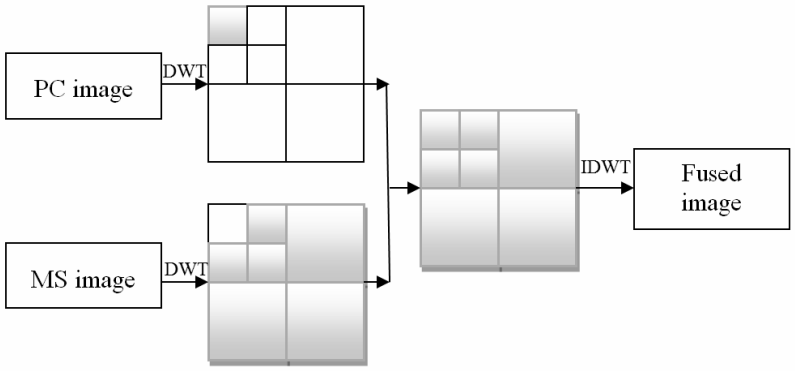
Different methods are used for evaluation and monitoring of forestry areas changes. In (Forkuo 2012) it is used a supervised classification procedure which is able detect eight different classes of land usage and cover. The results of the object detection based method are compared to the forest inventory in (Desclée 2006), obtaining a detection accuracy higher than 90%. The forest cover change was analyzed and also predicted until 2020 using time-series maps and GIS in (Giriraj 2008). Other methods used for forest cover evolution are: Principal Component Analysis and Fuzzy C-Means (Kesikoglu 2013), (Nielsen 2008), combined statistical and fuzzy methods based on Fuzzy Hidden Markov Chains (Carrincotte 2006), fusion of attributes (Jouan 2005). Other methods and case studies are presented in (Hashemi 2011), (Narzary 2013), (Singh 2011), (Skiran 2013), (Sakthivel 2010) and (Wachiye 2013). Another application, which links changes detection to ecology to investigate the effects of forest pathogens, is presented in (DeChant 2009). The proposed method uses high resolution images, finds the polygonal contour of each tree and tracks its change through the subsequent images.

In the following sections some instruments used for the multi-temporal analysis of multi-spectral images are presented. In the second section it is described a pansharpening method used to increase the spatial resolution of the multispecral images. In the third section a contours fusion method is proposed for a more accurate segmentation of satellite images. An experiment based on Landsat images for the analysis of forestry areas multi-temporal evolution is presented in the fourth section of the paper.

2. Multi-spectral images preparation through image fusion methods

The multi-temporal analysis method of remote sensing images proposed in this paper is based on the usage of multispectral images (MS) which offers more accurate details of the studied terrain area, not perceptible by the human eye. A multispectral image contains a set of images obtained by acquiring the reflected or emitted radiation in different spectral bands. The multispectral bands are: Blue (atmospheric and water details), Green (vegetation and water), Red (soil, vegetation and water), Near-infrared, Mid-infrared (vegetation, soil humidity, fire), Thermal-infrared (night images) (Bejinariu 2013b). In most cases, multispectral images are accompanied by a panchromatic image (PC) of finer spatial resolution in which region boundaries (edges) or textures can be more accurately detected.

While multi-spectral bands have the spatial resolution 2 or 4 times lower than the panchromatic image, an enhancement of the resolution is required for a unified analysis framework. The combining process of multispectral (MS) and panchromatic (PC) images is known in literature as pansharpening, an image fusion method which allows enhancing the spatial resolution of multispectral images using detail information from the panchromatic images. The most used pansharpening methods are based on the multiresolution analysis and component substitution. The Wavelet decomposition or Laplacian pyramids are used for multiresolution analysis. The transform is applied to both MS and PC images using a different number of decomposition levels depending on their resolutions ratio and then the scaled signal from the PC transformed image replaces the scaled signal in the MS transformed image. Finally, the inverse transform is applied, as presented in Fig. 1.



Source: Bejinariu 2013b.

Figure 1. Component substitution in the multi-resolution transform based pan sharpening.

3. Changes detection through contours fusion

The contour detection procedure offers different results when it is applied for different spectral bands. While useful information is contained in every band, it is

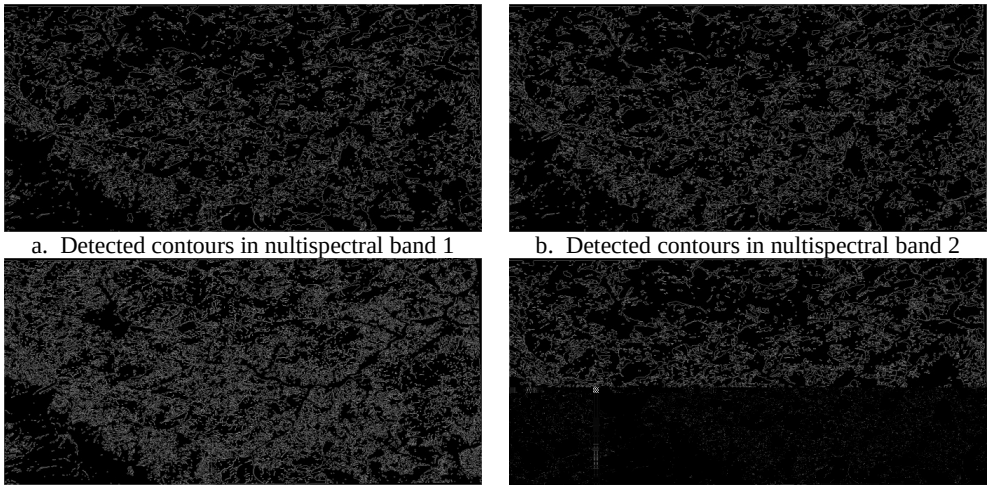
obvious that this information must be unified in a single result. To achieve this, a contour fusion procedure is proposed. As input of the fusion procedure, all the bands of the multispectral image and also the corresponding panchromatic image are used. In the following a number of N spectral bands is considered.

a. For each multispectral band Im_i, $i = 1 \ldots N$, the image is binarized and then a contour detection function is applied. All the remaining contours are filled and contours images $Contour_i$, $i = 1 \ldots N$ are created for each band. In the same manner, the image $Contour_{PC}$ is created using the panchromatic image.
b. A temporary image *SumContours* in which the value of each pixel is computed as weighted sum of the values of the corresponding pixels in images $Contour_i$, $i = 1 \ldots N$ and $Contour_{PC}$.

$$SumContours = \sum_{i=1}^{N} Contour_i + N * Contour_{PC}$$

The values of pixels in $Contour_{PC}$ have a greater weight because the panchromatic image offers a more precise border limits discrimination.
c. The image *SumContours* is segmented using a user defined threshold. The threshold value used for the experiments in the next section is $Thr = 0.2 * MaxCnt$, where *MaxCnt* is the maximum value of the pixels in *SumContours* image.
d. The final result is determined by tracing again the contours in the thresholded image.

In figures bellow, the results of the image fusion procedure are presented. Figures 2.a, 2.b, 2.c show the contours detected in the Red, Green and Blue bands of the multispectral image and the final fusion result is presented in Figure 2.d.



a. Detected contours in nultispectral band 1 b. Detected contours in nultispectral band 2
c. Detected contours in nultispectral band 3 d. Results of the fusion procedure

Source: images processed by author.

Figure 2. Results of the contours fusion procedure applied for 3 spectral bands of the original image in Fig. 3.

4. Procedure for forestry areas changes detection

The proposed procedure is based on the usage of multi-spectral satellite images. This kind of images is available at (Landsat 2015), but only low resolution images can be freely downloaded. The image dataset contains multispectral images acquired at large time intervals (about one year) in good atmospheric conditions, without overcast.

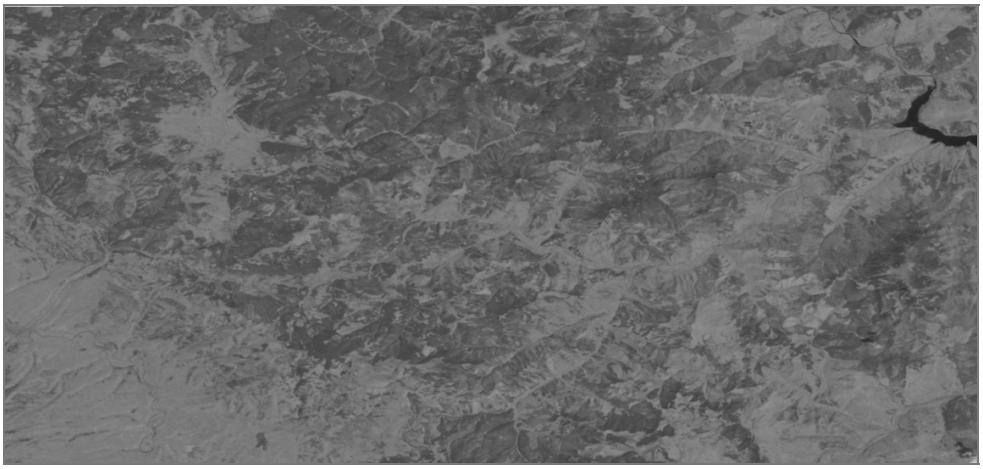
a. **Image registration**. This step is optional. Usually, it is not required, because the multispectral satellite images are acquired simultaneously and are already registered.
b. **Pansherpening**. All multispectral images must be scaled to the higher resolution of the panchromatic image, using the method described in the second section.
c. **Segmentation**. For each multispectral image in the input dataset, the pixels in each band are classified in the two classes of interest: occupied or not occupied by trees. Then, the objects detected in each band are unified in a single segmented image using the method described in the third section.
d. **Evaluation**. The objects detected in each multispectral image are compared by image differencing, in order to detect the changes between each pair of consecutive images which are then reported. The total area of the surfaces not covered by trees is also computed in each multispectral image.

We must note that the proposed procedure may be used for images that contain only forestry areas. In case the images contain also other types of land coverage, like agricultural plots or residential areas, the analysis must be restricted to the interest regions.

5. Experiment

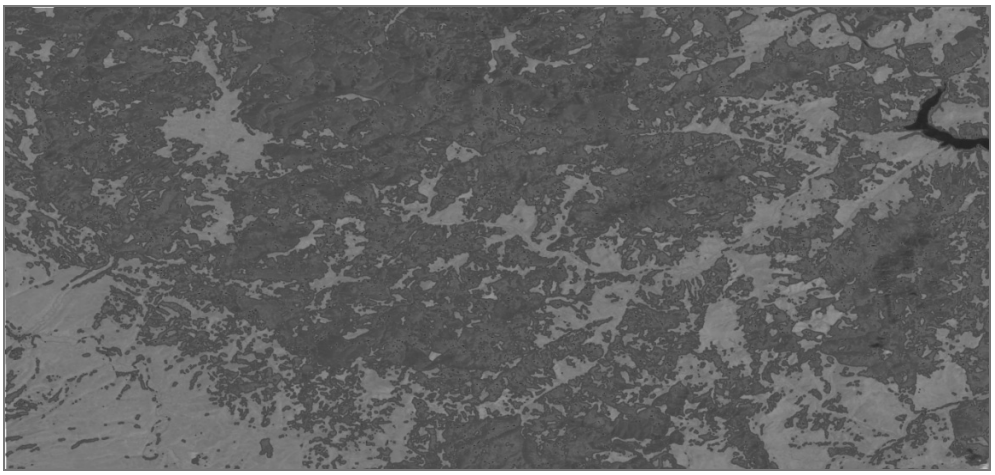
In our experiment, a set of six multispectral Landsat images of a region in Harghita County were analyzed. The images were acquired in the same period (summer) but in different years, as follows: 05.06.2000, 21.08.2002, 15.07.2009, 12.08.2010, 22.08.2011, 24.09.2014 (Landsat, 2015). Atmospheric conditions and clouds coverage are similar in all images. The geographic coordinates of the studied are: 25°20’19”–26°00’25” E longitude and 46°49’48”–47°08’37” N latitude. One of these images is presented in the following figure. We must note that the imaged have o low resolution of about 25m/pixel.

The proposed method was applied for the images set, to detect the contours of the not covered areas. An example of contour detection results is presented in the Fig. 4. The contours are traced in red, but some very small elements whose detection is caused by the noise in the input images were eliminated using geometric criteria. The percent of eliminated contours is about 60% of the total number of detected contours.



Source: Landsat, 2015.

Figure 3. Image acquired on 15.07.2009.

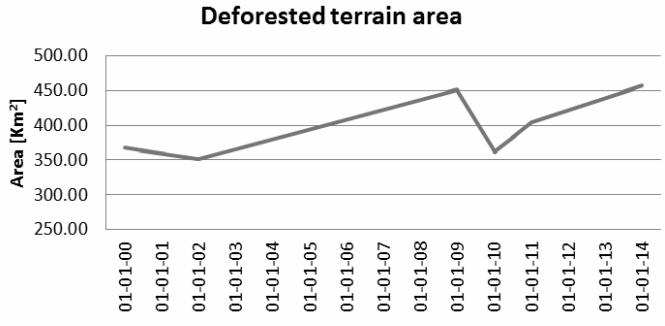


Source: image processed by author.

Figure 4. Contours detected in the image presented in Fig. 3.

Considering the geographic coordinates of each detected contour, their area is then computed. The variation of uncovered surface in forested areas between 2000 and 2014 is presented in Figure 5.

In the next step, the images containing only the detected contours are compared in order to identify the differences. Because the used images have low resolution, the accuracy of the resulted differences is reduced and the interest regions must be either analyzed by an operator or the procedure must be applied locally on each region of interest using high resolution images.

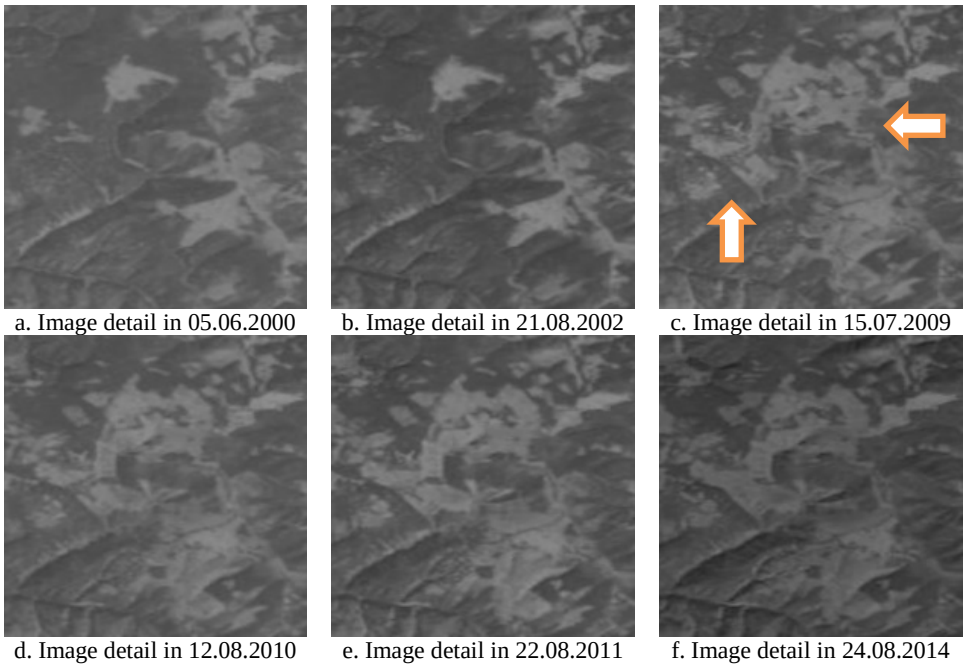


	05-06-00	21-08-02	15-07-09	12-08-10	22-08-11	24-09-14
Area	367.42	351.38	451.66	362.43	403.97	456.69

Source: results obtained by author.

Figure 5. Area variation of deforested surfaces.

Next, we focus on such region of interest of about 25 Km^2, located near the top-left corner of the original images. The deforested area (indicated by arrows in Fig. 6.c) may be easily identified by visual analysis of detailed images, but we can repeat also the analysis procedure. The results are presented in Figure 7 and Figure 8.

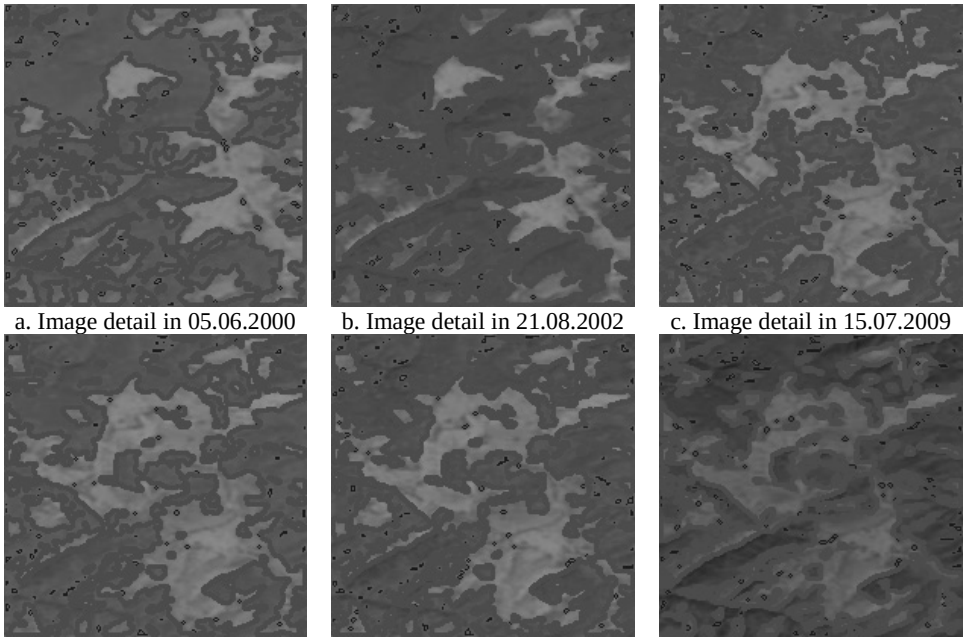


a. Image detail in 05.06.2000 b. Image detail in 21.08.2002 c. Image detail in 15.07.2009

d. Image detail in 12.08.2010 e. Image detail in 22.08.2011 f. Image detail in 24.08.2014

Source: images processed by author

Figure 6. Detail image containing an area in which changes were detected (near the top-left corner of the full image). The arrows in (c) indicate the area which was deforested between 2002 and 2009. The maximum area value of the deforested surface is observed in 2010.



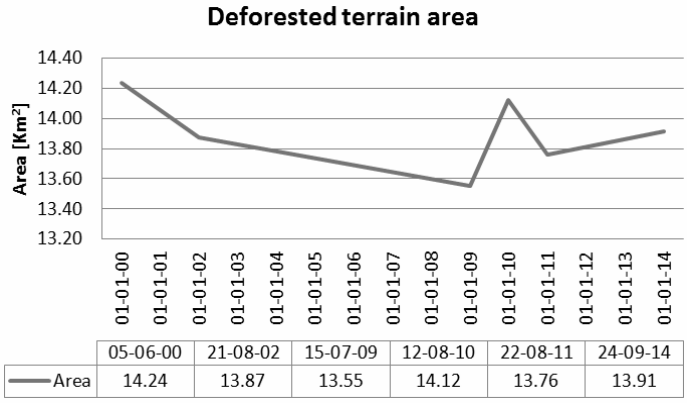
a. Image detail in 05.06.2000 b. Image detail in 21.08.2002 c. Image detail in 15.07.2009

d. Image detail in 12.08.2010 e. Image detail in 22.08.2011 f. Image detail in 24.08.2014

Source: images processed by author.

Figure 7. Contours detected in the detail images.

As it is indicated in Fig. 6.c, the forested area decreased between 2009 and 2010 year by about 0.7 Km^2 in the studied area. The deforested area is centered at coordinates 25°24'01" E longitude, 47°04'42" N latitude. We must note that the accuracy of these results is affected by the atmospheric conditions which were slightly different in some images.



	05-06-00	21-08-02	15-07-09	12-08-10	22-08-11	24-09-14
Area	14.24	13.87	13.55	14.12	13.76	13.91

Source: results obtained by author.

Figure 8. Area variation of deforested surfaces.

The proposed changes detection procedure was implemented in C++ using Microsoft Visual Studio 2010 as development tool. The OpenCV open-source library was used for images manipulation and some pre-processing functions.

Conclusion

In this paper it is proposed a features level fusion procedure for contours detection in multispectral images. It was applied in the multi-temporal analysis of satellite images to detect changes in the forestry areas. The proposed method can offer more accurate results than in this experiment, in case higher resolution images are available. The method was implemented and it can evaluate the area of deforested surfaces indicating also the exact geographic position in which the changes occurred.

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CLAUDIU SERGIU HÂRTOPANU[1]

ANALYSIS OF UNCERTAINTY IN IMPLEMENTING A FES EXOSKELETON SYSTEM USING ELEMENTARY FUZZY NUMBERS

Abstract: *We intend to build a system for the rehabilitation of the upper limb in people who have suffered a stroke. This study shows an analysis of the uncertainty in developing a FES-Exoskeleton system using elementary fuzzy numbers. Uncertainty is a term that includes both negative and positive aspects, and that is why we can differentiate it from the risk.*

Keywords: uncertainty, analysis, fuzzy, numbers, methods.

1. Introduction

With the advancement of technology, the state of uncertainty caused by natural processes and natural events can be avoided, and major investments in the field of robotics have been made. If we reduce the nature of the uncertainty to a feeling (Hofstede G. p. 133) acquired as a result of a personal experience or of the experience of a group to which it belongs, its size directly and indirectly influences the performance of the economy, and we can no longer know exactly what will be the possibilities to achieve the factors for the patient's recovery.

The method used by the fuzzy systems directly or indirectly involve the implementation of a set of heuristic rules in a system. We must consider that when we apply a method, it will not avoid certain answers, such as the extreme ones.

Nowadays we can consider uncertainty as a norm for the processes that are taking place in economy, because the information needed by the economic operators to achieve the best results under the given conditions are not available, and when these are obtained, they are partially affected by errors or incomplete (Prunea P., p. 19).

In the decision-making phase uncertainty refers to the preference of choosing a solution as good as possible. The decisions in uncertainty are chosen using several techniques. The most commonly used techniques are: the pessimistic or the prudence technique (Abraham Wald), the optimist, the optimality technique (Leonid Hurwicz),

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the technique of balance or equiprobability (Bayes-Laplace) and the minimisation of regrets (Leonard I. Savage). In this study we analyze the choice of decision using the methods mentioned above helping us with the elementary fuzzy numbers corresponding to each technique.

What we have proposed is to develop a system that combines an artificial exoskeleton with electrical stimulation, for the recovery of the persons with motor disabilities. The challenge of this project lies in choosing suitable motors for the drive of the exoscheleton. These motors should be small in size and develop a force enough to achieve the flexion and extension of a finger. We have three types of motors that we can use in this project, namely, linear motors, and step by step motors. These types of motors will be at the base of the scenarios taken into account for the study below in order to establish the decisions in cases of uncertainty.

2. Analysis of uncertainty using elementary fuzzy numbers

Prior to the completion of this prototype we need to identify uncertainties that may occur in the system's implementation. There were two teams for the evaluation and finding of uncertainties. A team of five specialists from the department of research and development and another team of three experts in management and marketing. The scenarios' rating was made on a scale of 1 to 5 (1 – the lowest result, 5 – the highest result). Also, for every uncertainty we established its importance for the project.

The following possible scenarios in the case of reduction risks, delay and exceeding of funding, the following uncertainties may occur at the implementation of this system, that have been drawn up by the team of experts in marketing and management.

We will consider three scenarios, namely the use of linear motors, of servomotors and of step by step motors. For each scenario separately we shall study the uncertainties set out by the two assessment teams, i.e. *the uncertainty of the personnel* referring to the personnel which is involved both directly and indirectly in the project. In this case it may appear the uncertainty of finding qualified personnel, the uncertainty of personnel fluctuation and the uncertainty of the personnel's skills. To avoid the risk of finding qualified personnel, the search will begin before the starting of the project, in order to have enough time to study the skills of each employee. Personnel fluctuation can occur due to both the payroll and the stress at work. In the case of uncertainty of the costs of acquisition and processing of materials, we will conclude contracts to establish the prices before beginning the development of the system, to avoid the risks regarding the acquisition costs. However the costs' uncertainty will remain and it may be caused by the change in the political regime, changes in taxes.

In the case of the three scenarios, the *failures uncertainty* may appear on the following systems:

– sensorial;

– of actuation;

– of electrical stimulation;

– of feeding.

These failures may occur both because of the cost but also because of the unqualified personnel, or because of their lack of attention.

Time uncertainty regarding the supply of:

– parts;

– documentation.

This uncertainty of supply time can be caused both by the financial risks and by those related to stock and transport provided by the supplier.

1st CASE SCENARIO

In this scenario we will describe the uncertainties that we may face while using linear motors.

The linear motors serving the project's requirements (size, strength, power supply) are available from a single supplier, in Canada, and this will make more difficult to find the qualified personnel to work with this type of engines. Due to the distance and having a single supplier, the uncertainty of the costs and of the delivery time appears. The advantages of using these motors are the small size and a decrease in the extensive use of the system (Sergiu Hartopanu *et al.*, 2015).

Just like any electronic component, the engines have a longer lifespan than the servomotors and the step by step motors, and so they have a lower risk of failure of the driving system or any other system that is part of the project.

In case of motor failure, it can occur the risk of damaging other components if it is not replaced by a qualified person.

2nd CASE SCENARIO

The advantage of using servomotors consists in the easier finding of qualified personnel, and at lower cost, but the major disadvantages are the dimensions of the motors, the developed forces and the frequent failures that can occur due to their construction, namely the use of plastics that deteriorates very quickly (S. Hartopanu *et al.*, 2013).

When using this type of motors, extra expenses occur due to higher dimensions, as they need a special fixture. The advantages of servomotors and linear motors consist in a good movement precision. Servomotors are very often used in robotics.

3rd CASE SCENARIO

The stepper motor is a synchronous motor because the rotation speed, which depends directly on the feeding pulse frequency, expressed by the number of steps made during one unit of time.

During the use of these motors for our recovery system is much easier to find qualified staff, because they are very often used in industry, as well as for automation and many household electronic devices.

The major disadvantages of these motors are size and accuracy at higher rotation speeds.

In the following table we have the ratings from 1 to 5 depending on the importance of the two teams' evaluations for the three scenarios:

Table 1

Scenarios of possible uncertainties when using linear motors

Uncertainty	**uncertainty**	**Team 1**		**Team 2**	
		Note	**importance**	**note**	**importance**
Uncertainty regarding the personnel	Qualified personnel	**5**	**50%**	4	45%
	Personnel fluctuation	**4**	**25%**	3	25%
	Personnel skills	**4**	**25%**	4	30%
Uncertainty regarding the costs	of acquisition of the parts	**4**	**60%**	5	45%
	of processing of materials	**3**	**40%**	5	55%
Uncertainties of failures	on the sensorial system	**3**	**45%**	2	30%
	on the actuation system;	**1**	**15%**	2	30%
	on the electrical simulation system;	**2**	**15%**	3	30%
	on the feeding system;	**3**	**20%**	1	10%
Uncertainty of the time to supply	the parts	**4**	**45%**	5	40%
	the documentation	**2**	**55%**	3	60%

Table 2

Scenarios of possible uncertainties when using servomotors

Uncertainty	**Uncertainty**	**Team 1**		**Team 2**	
		Note	**importance**	**note**	**importance**
Uncertainty regarding the personnel	Qualified personnel	**2**	**30%**	3	40%
	Personnel fluctuation	**2**	**30%**	3	50%
	Personnel skills	**1**	**40%**	2	10%
Uncertainty regarding the costs	of acquisition of the parts	**2**	**60%**	3	70%
	of processing of materials	**4**	**40%**	4	30%
Uncertainties of failures	on the sensorial system	**4**	**40%**	3	40%
	on the actuation system;	**5**	**30%**	3	20%
	on the electrical simulation system;	**3**	**20%**	3	20%
	on the feeding system;	**4**	**10%**	3	20%
Uncertainty of the time to supply	the parts	**2**	**50%**	3	40%
	the documentation	**1**	**50%**	2	60%

Table 3

Scenarios of possible uncertainties when using stepper motors

Uncertainty	Uncertainty	Team 1		Team 2	
		note	importance	note	importance
Uncertainty regarding the personnel	Qualified personnel	**3**	**30%**	4	40%
	Personnel fluctuation	**3**	**50%**	3	50%
	Personnel skills	**4**	**20%**	4	10%
Uncertainty regarding the costs	of acquisition of the parts	**3**	**65%**	3	55%
	of processing of materials	**3**	**35%**	3	45%
Uncertainties of failures	on the sensorial system	**4**	**35%**	3	20%
	on the actuation system;	**5**	**25%**	4	30%
	on the electrical simulation system;	**4**	**30%**	3	30%
	on the feeding system;	**2**	**10%**	1	20%
Uncertainty of the time to supply	the parts	**3**	**50%**	3	60%
	the documentation	**4**	**50%**	4	40%

In order to determine the triangular fuzzy numbers we need the weights for each uncertainty, that are calculated below:

Table 4

Consequences matrix

	Weights								
			I1		**I2**		**I3**		**I4**
S1		**0,475**	**(4; 5)**	**0,525**	**(4; 5)**	0,400	(2; 3)	0,425	(4; 5)
		0,250	(3; 4)	0,475	(3; 5)	0,225	(1; 2)	0,575	(2; 3)
		0,375	(4; 4)			0,225	(2; 3)		
						0,150	(1; 3)		
S2		0.35	(2; 3)	0.65	(2; 3)	0.40	(4; 3)	0.45	(2; 3)
		0.40	(2; 3)	0.35	(4; 4)	0.25	(5; 3)	0.55	(1; 2)
		0.25	(1; 2)			0.20	(3; 3)		
						0.15	(4; 3)		
S3		0.35	(3;4)	0.60	(3; 3)	0,275	(4;3)	0.55	(3; 3)
		0.50	(3; 3)	0.40	(3; 3)	0,275	(5;4)	0.45	(4; 4)
		0.15	(4; 4)			0,300	(4;3)		
						0,150	(2;1)		

S1, I1: 0.475 × (4; 5) + 0.250 × (3; 4) + 0.375 × (4;4) = (1.9 + 0.75 + 1.5; 2.375 + 1 + 1.5) = (4.15; 4.875)

S1, I2: 0.525 × (4; 5) + 0.475 × (3; 5) = (2.1 + 1.425; 2.625 + 2.375) = (3.525;5)

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S3, I4: 0.55 × (3; 3) + 0.45 × (4; 4) = (1.65 + 1.8; 1.65 + 1.8) = (3.45; 3.45)

After processing the information for the three scenarios the following consequences matrix was obtained:

Scenario	I1	I2	I3	I4
S1	[4.15; 4.875]	[3.525; 5]	[1.625; 2,775]	[1,955; 385]
S2	[1.75; 275]	[27; 3.35]	[3; 405]	[1.45; 245]
S3	[315; 3.5]	[3; 3]	[2.975; 3,975]	[3.45; 345]

We will further use fuzzy numbers for a ranking of the scenarios, according to the Savage, Abraham Wald and maxi-max methods. In our case we have m = 4 (columns/criteria) and n = 3 (lines/scenarios/decision-making variants).

Matrix of results (initial matrix)

	V1	V2	V3
C1	4.15 4.875 4.512	1.75 2.75 2.25	3.15 3.5 3.325
C2	3.525 5 4.262	2.7 3.35 3.025	3 3 3
C3	1.625 2.775 2.2	3 4.05 3.525	2.975 3.975 3.475
C4	1.955 3.85 2.902	1.45 2.45 1.95	3.45 3.45 3.45

In the table above we have the extremities of the fuzzy number and the centre of gravity which represents the arithmetic average between extremities.

The utilities of the results are obtained as follows:

$$\tilde{R}_1^{\max} = \max_{1\le j\le n} \tilde{R}_{ij} = \max[(4.15, 4.875)_{4.512};\ (1.75,\ 2.75)_{2.25};\ (3.15,\ 3.5)_{3.325}] = (4.15,\ 4.875)_{4.512}$$

$$\tilde{R}_1^{\min} = \min_{1\le j\le n} \tilde{R}_{ij} = \min[(4.15, 4.875)_{4.512};\ (1.75,\ 2.75)_{2.25};\ (3.15,\ 3.5)_{3.325}] = (1.75,\ 2.75)_{2.25}$$

$$\tilde{u}_{11} = \frac{\tilde{R}_1^{\max} - \tilde{R}_{11}}{\tilde{R}_1^{\max} - \tilde{R}_1^{\min}} = 0$$

The maximum number is the rectangle fuzzy number with the higher center of gravity.

Among the best known and used decision criteria to identify the optimum action direction we include:

– the pessimistic criterion (Abraham-Wald)

$$V^* = \max_i \min_j \left(\tilde{R}_{ij}\right)$$

– optimistic criterion (maxi max)

$$V^* = \min_i \max_j (\tilde{R}_{ij})$$

– the criterion of minimum regrets – minimax (Savage)

$$\tilde{A}_{ij} = \max_i (\tilde{R}_{ij}) - \tilde{R}_{ij}$$

$$V^* = \min_i \max_j (\tilde{A}_{ij})$$

Maxi-Max	$\tilde{M}_j = \max\limits_{1 \le i \le m} \tilde{u}_{ij}$
Wald	$\tilde{W}_j = \min\limits_{1 \le i \le m} \tilde{u}_{ij}$

Operation of the normalization of the lines (***linear interpolar,*** at the interval [0, 1]), it can be achieved simultaneously for all the $2 \cdot 3 = 6$ (real) components on each line.

For the first line:

$$R_1^{\min} = \min(4.15;\ 4.875;\ 1.75;\ 2.75;\ 3.15;\ 3.75) = 1.75$$

$$R_1^{\max} = \max(4.15;\ 4.875;\ 1.75;\ 2.75;\ 3.15;\ 3.75) = 4.875$$

$$R_{1x} \to \frac{R_{1x} - R_1^{\min}}{R_1^{\max} - R_1^{\min}} = \frac{R_{1x} - 1.75}{4.875 - 1.75} = \frac{R_{1x} - 1.75}{3.125},$$

$$4.15 \to \frac{4.15 - 1.75}{3.125} = \frac{2.4}{3.125} \approx 0.768,$$

$$4.875 \to \frac{4.875 - 1.75}{3.125} = \frac{3.125}{3.125} \approx 1,\ \ldots,\ 3.45 \to \frac{4.875 - 1.75}{3.125} = \frac{3.125}{3.125} = 1.$$

The other 5 lines are calculated similarly. The matrix of utilities is as follows:

Matrix of utilities

	V1	V2	V3
C1	0,768	0	0,448
	1	0.32	0.56
	0,884	0.16	0,504
C2	0,369	0	0.13
	1	0,282	0.13
	0,684	0,141	0.13
C3	0	0,567	0,556
	0,474	1	0,969
	0,237	0,783	0,762
C4	0,206	0	0,833
	1	0,416	0,833
	0,603	0,208	0,833

Weighted utilities shall be obtained by multiplication with the fixed weight $\frac{1}{m} = \frac{1}{4} = 0.25$:

$$\tilde{u}_{11} \leftarrow \tilde{u}_{11} = 0.25 \cdot (0.768,\ 1)_{0.884} = (0.25 \cdot 0.768,\ 0.25 \cdot\ 1)_{0.884 \cdot 0.25} =$$
$$\approx (0.192,\ 0.25)_{0.221}\ , \ldots,$$
$$\tilde{u}_{43} \leftarrow \tilde{u}_{43} = 0.25 \cdot (0.883,\ 0.883)_{0.883} \approx (0.22,\ 0.22)_{0.22}\ .$$

Matrix of weighted utilities

	V1	V2	V3
C1	0,192 0.25 0,221	0 0.08 0.04	0,112 0.14 0,126
C2	0,092 0.25 0,171	0 0.07 0,035	0,032 0.32 0,032
C3	0 0,118 0,059	0,141 0.25 0,195	0,139 0,242 0.19
C4	0,051 0.25 0.15	0 0,104 0,052	0,022 0,022 0,022

a) ***The maxi-max method***

The specific indicator $\tilde{M}_j$,$\mathrm{j} = \overline{1,3}$ is calculated as below (the maximum fuzzy numbers are chosen in the columns of the previous table):

$$\tilde{M}_1 = \max_{1 \le i \le 6} \tilde{\mathrm{u}}_{\mathrm{i1}} = \max(\tilde{u}_{11}, \tilde{u}_{21}, \tilde{u}_{31}, \tilde{u}_{41}, \tilde{u}_{51}, \tilde{u}_{61}) = \tilde{u}_{11} = (0.037, 0.062)_{0.05}\ \ldots$$

The fuzzy number $\tilde{\mathrm{u}}_{11}$ was chosen because it has the largest center of gravity.

The 3 indicator values are listed in the first row in the following table.

The fuzzy values of the specific indicators of the 2 ranking methods (Maxi-max and Wald)

	V_1	**V_2**	**V_3**
$\tilde{M}_j$	0.192 0.25 0.221	0.141 0.25 0.195	0.139 0.242 0.19
$\tilde{W}_j$	0 0.118 0.059	0 0.07 0.035	0.022 0.022 0.022

By ordering in descending direction the centres of gravity of the specific indicator and the variants, we have the ranking by the maxi-max method:

$$0.221 > 0.195 > 0.190$$

$$\boxed{\mathbf{V}_1 \succ \mathbf{V}_2 \succ \mathbf{V}_3}$$

b) ***Wald's method***

The specific indicator W_j, $j = \overline{1,3}$ is calculated as follows (minimum fuzzy numbers in columns):

$$\tilde{W}_1 = \min_{1 \le i \le 6} \tilde{u}_{i1} = \min(\tilde{u}_{11}, \tilde{u}_{21}, \tilde{u}_{31}, \tilde{u}_{41}, \tilde{u}_{51}, \tilde{u}_{61}) = \tilde{u}_{21} = (0.000, 0.015)_{0.008} \ \ldots$$

The 3 indicator values are listed in the 2nd row of the previous table.

By ordering in descending direction the centres of gravity of the specific indicator and the variants, we have the ranking by the maxi-max method:

$$0.059 > 0.035 > 0.022$$

$$\boxed{\mathbf{V}_1 \succ \mathbf{V}_2 \succ \mathbf{V}_3}$$

4. Conclusions

We had in mind the carrying out a study for the decision making in case of uncertainty in making a system that combines the electrical stimulation with a functional artificial exoskeleton, a system used for the recovery of the persons who have suffered a stroke and that have an outstanding potential in terms of the motor function of the wrist.

Three cases have been developed and commented for this study, namely the use of three types of hydraulic motors for the actuation of the exoskeleton (linear motors, servomotors and stepper motors).

In the decision-making phase uncertainty refers to the preference of choosing a solution as good as possible. The decisions in uncertainty are chosen using several techniques. The techniques used were the pessimistic or the prudence technique (Abraham Wald) and maxi-max.

Therefore, the method of innovation proposed within our system is described and proposed in the first scenario, and it assumes the achievement of the system with linear motors. The duration of operation of the device will be longer, without problems regarding the electrical part.

The present analysis shows that the achievement of the system using linear motors has considerable advantages that can justify the investment required.

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ENTREPRENEURIAL POTENTIALITIES IN EUROPE: ITALY IN COMPARISON TO OTHER COUNTRIES

Abstract: *Entrepreneurship is an important driver of development, employment and productivity. Economic system in modern and developped countries is founded on a dynamic "entrepreneurial system", where innovation plays the role of main driver of economy and society. First part of the paper intends to analyze the structure of REDI index elaborated by a team of experts for measuring entrepreneurship in 125 macro-regions of European Union. This index has the objective of capturing differences in the quality of entrepreneurial activity, taking in account the different environmental factors. Second part of the paper is dedicated to a comparative analysis of the REDI index calculated for Italian macro-regions and Romanian ones. Finally, several on field researches are utilized in order to analyze the characteristics of Italian entrepreneurial situation.*

Keywords: *entrepreneurship, innovation, REDI index, entrepreneurial park, Italian human capital/social capital/creativity.*

Introduction

Entrepreneurship is an important driver of development, employment and productivity.

Economic system in modern and developed countries is founded on a dynamic "entrepreneurial system", where innovation plays the role of main driver of economy and society.

This tendency is confirmed by the following phenomena:

(1) importance of knowledge is increasing in organizations in comparison to tangible assets and labour;
(2) individuals are the main actors in knowledge-based organizations;
(3) small and medium enterprises are increasing their role in translating innovative products and services in the market;
(4) central and territorial institutions understand that entrepreneurship is driven by individuals but it needs of a wider economic and social context;
(5) political institutions pay attention to promote entrepreneurial innovation and to support high-potential start-ups.

This paper and the research will be utilized to investigate points 4) and 5).

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The purpose is to evidence that the level of entrepreneurship is influenced by characteristics of territories where entrepreneurs act.

1. The architecture and the components of REDI index

The REDI index[2] has the purpose of measuring regional entrepreneurship by a complex index that incorporates both individual and regional levels of analysis. Actually this position is supported by Acs *et al.* (2013): they declare that the interaction between individuals and their contexts determines the economic and social benefits delivered through entrepreneurship.

The REDI index has the objective of capturing differences in the quality of entrepreneurial activity (such as creativity, innovation, knowledge and technology intensity, value creation, orientation and potential for high growth), taking in account the different environmental factors. Actually, the efficiency and quality of institutional environment has a big influence on the quality of entrepreneurship and on the economic and social impact of entrepreneurial action.

REDI index studies the regional entrepreneurship ecosystem[3], on giving particular emphasis to the policies and initiatives offered by regional context.

Authors of the REDI index wrote: "The Systems of Entrepreneurship (SE) theory is based on the following core assumptions:

1. Economic growth is ultimately driven by a trial-and-error resource allocation process, under which entrepreneurs allocate resources towards productive uses;

2. This process is driven by individual-level decisions, but those decisions are conditioned by contextual factors;

3. Similarly, the outcomes of individual-level entrepreneurial decisions are conditioned by contextual factors;

4. Because of the multitude of interactions, country-level entrepreneurship is best thought of as a system, the components of which co-produce system performance"[4].

According to the following table[5] the REDI index has a multi-level structure: it is based on 3 sub-indexes (attitudes, abilities, aspirations); the sub-indexes are composed by 14 pillars. Each of the fourteen pillars consists of an institutional and an individual variable.

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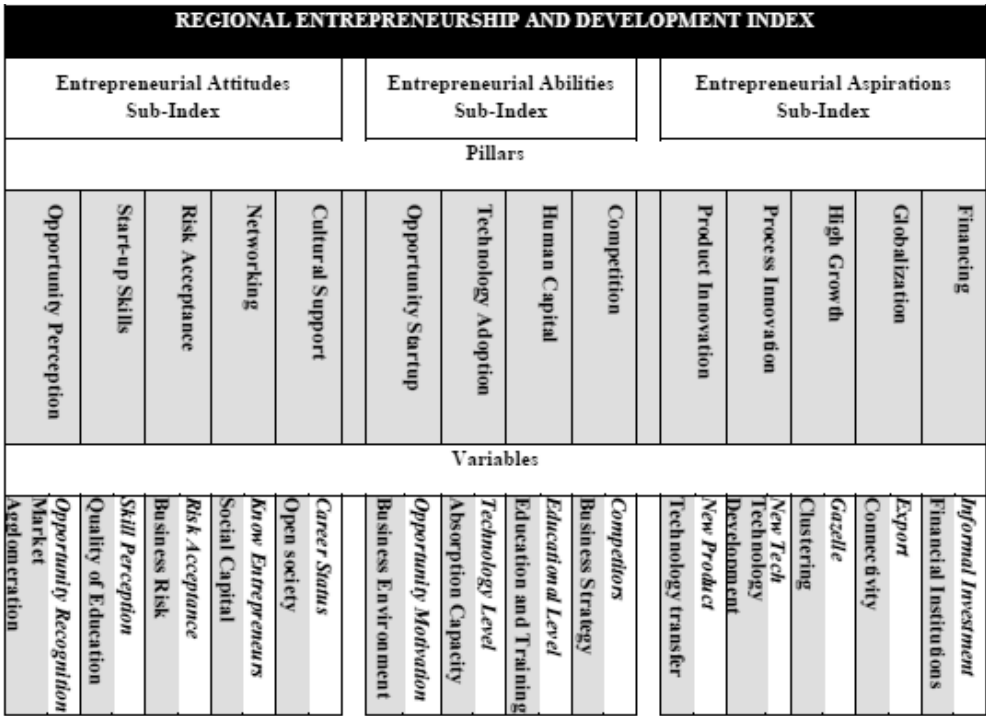
[2] REDI index is elaborated by Szerb Làszlò, Zoldan J. Acs, Erkko Autio, Raquel Ortega-Argilés, Éva Komlòsi. The report and the associated research are financed by the European Commission Directorate-General Regional and Urban Policy, European Union, Publications Office of the European Union, Luxembourg, 2014.

[3] *"A System of Entrepreneurship is the dynamic, institutionally embedded interaction between entrepreneurial attitudes, ability, and aspirations, by individuals, which drives the allocation of resources through the creation and operation of new ventures"* (Acs *et al.*, 2013)

[4] See: Szerb Làszlò, Zoldan J. Acs, Erkko Autio, Raquel Ortega-Argilés, Éva Komlòsi, *REDI: The Regional Entrepreneurship and Development Index –Measuring regional entrepreneurship*, European Union, Publications Office of the European Union, Luxembourg, 2014, page 30.

[5] Source: Szerb Làszlò, Zoldan J. Acs, Erkko Autio, Raquel Ortega-Argilés, Éva Komlòsi, *op. cit.*, page 36.



The choice of indicators to be utilized for describing/measuring any phenomenon represents a decision of scientific high responsibility. Always can be found an opinion able to confute or criticize any choice; always will be possible – especially ex post – identifying a different basket of indicators, maybe better.

Also for this research different indications might be proposed, but this is not the purpose of our paper. We intend to focus our attention on the comparison of REDI index in some EU territories; as consequence, we limit ourselves to receive either the structure of the REDI index proposed by the Authors, either the variables they assumed for measuring[6].

➢ The ***entrepreneurial attitude (ATT)*** sub-index aims to identify the attitudes of a region's population as they relate to entrepreneurship. It consists of five pillars.

Opportunity Perception for recognizing and exploring novel business opportunities. It combines the opportunity recognition of the population (individual variable) with the market agglomeration (institutional variable).

Startup Skills are necessary for exploiting opportunities. Skills depend on the populations' self-esteem about its ability to start successfully a business (individual variable) and on the quality of education (institutional variable).

[6] See: Szerb Làszlò, Zoldan J. Acs, Erkko Autio, Raquel Ortega-Argilés, Éva Komlòsi, *op.cit.*, pages 37–39.

Risk Acceptance concerns the fear of failure in the business. The magnitude of risk acceptance of the population (individual variable) is combined to the business disclosure rate of the country (institutional variable).

Networking is vital for successful startups. The personal network of entrepreneur (individual variable) is mixed together with the levels of social capital and technological readiness (institutional variable).

Cultural Support concerns the opinion about successful entrepreneurs. The view of the population about the carrier status of entrepreneurs (individual variable) is combined with open society (institutional variable).

- The ***entrepreneurial abilities (ABT)*** sub-index is principally concerned with measuring some important characteristics of entrepreneur and startup with high growth potential.

Opportunity Startup is an important aspect of high growth potential; it is the drive for startups. It mixes the opportunity motivation of the population (individual variable) with the favorability of the business environment (institutional variable).

Technology Adoption highlights the role of technology and creative sectors. The percentage of the young and nascent businesses belonging to technology-intensive or creative sectors (individual variable) is associated to the technological readiness of the firms in a country and the regional level of employment in knowledge intensive and high technology firms (institutional variable).

Human Capital for exploring people who received some training to have an updated knowledge. The share of early phase entrepreneurs who have over secondary level of education (individual variable) is merged together with the involvement of the region's population in training and life-long learning (institutional variable).

Competition: businesses that face a low level of competition could grow faster than businesses with many competitors. The number of competitors benchmarks those ventures that have not too many competitors (individual variable). Business strategy (institutional variable) is assumed for measuring the country's nature of competitive advantage and the regional level of sophistication in businesses.

- The ***entrepreneurial aspiration (ASP)*** sub-index refers to the distinctive, qualitative, strategy-related nature of entrepreneurial activity. It is particularly important to identify the most relevant institutional and other quality-related interaction variables.

Product Innovation reflects not only to the newness of the product (individual variable) but also the level of technology transfer and ability of the businesses in the region to create such products (institutional variable).

Process Innovation has following components: the technology innovation potential of the businesses (individual variable) and the technology development as the percentage of R&D in the regional gross domestic product (institutional variable).

High Growth includes the percentage of "gazelle" with high growth ambitions (individual variable) and a clustering situation where businesses are supported by other cluster members (institutional variable).

Globalization concerns the capability of high growth potential businesses to internationalize. It combines together the export potential (individual variable) and the connectivity of the region, that is the density of railways, highways and the frequency of air flight (institutional variable).

Financing is frequently viewed as the most important aspect of exploiting high growth potential. The measure of informal financing possibilities provided by friends, relatives or business angels (individual variable) is combined with the measuring of access to financial services and different capital and depth markets (institutional variable).

2. REDI index in European Union macro regions

After having structured the REDI index, the Authors classified EU macro regions according to the criteria of the *Nomenclature of Territorial Units for Statistics* (*NUTS*). NUTS European system is structured on the following characteristics:

Level	Characteristics	Minimum population	Maximum population
NUTS 1	Major socio-economic regions	3 million	7 million
NUTS 2	Basic regions for the application of regional policies	800000	3 million
NUTS 3	Small regions for specific diagnoses	150000	800000

NUTS 1-2 were examined by the Authors of the survey on utilizing 28 variables (two variable for each pillar). Individual variables are based on indicators from the 2007–2011 GEM Adult Population Survey dataset, except two innovation indicators that are from the European Union data collection. The institutional variables are obtained from various sources[7].

The result of their work is in the following tables: the REDI scores are calculated for 24 Member States of EU (except Bulgaria, Cyprus, Luxembourg, Malta).

[7] For additional details about the sources of indicators, see: Szerb Làszlò, Zoldan J. Acs, Erkko Autio, Raquel Ortega-Argilés, Éva Komlòsi, *op. cit.*, Appendices.

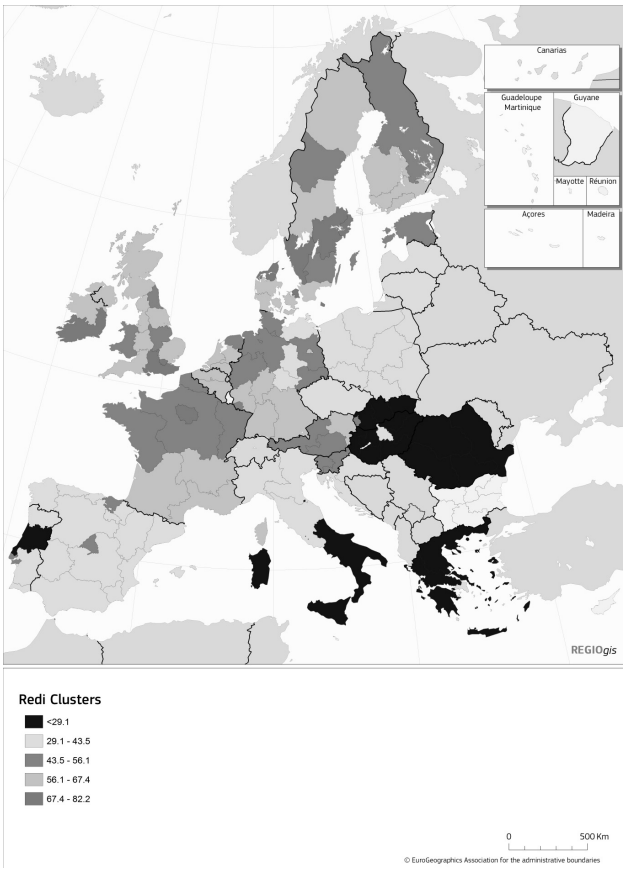
Rank	Code	Region	REDI
1	DK01	Hovedstaden	82.2
2	UKI	London	79.9
3	FR1	Île de France	79.2
4	SE11	Stockholm	73.8
5	SE12	Östra Mellansverige	72.7
6	SE23	Vastsverige	72.2
7-8	IE02	Southern and Eastern	72.0
7-8	DK05	Nordjylland	72.0
9	UKJ	South East (UK)	69.5
10	SE22	Sydsverige	67.3
11	DE3	Berlin	67.2
12	DK03	Syddanmark	65.1
13	BE1	Région de Bruxelles-Capitale	64.9
14	SE33	Övre Norrland	64.7
15	NL3	West-Nederland	64.4
16	DK04	Midtjylland	64.3
17	FR7	Centre-Est (FR)	64.2
18	IE01	Border. Midland and Western	63.4
19	DE7	Hessen	63.3
20	FI1B	Helsinki-Uusimaa	62.2
21	BE2	Vlaams Gewest	62.1
22	UKH	East of England	61.5
23-25	DK02	Sjalland	60.7
23-25	UKK	South West (UK)	60.7
23-25	AT1	Ostösterreich	60.7
26	BE3	Région wallonne	60.1
27	FR8	Méditerranée	59.4
28-29	UKD	North West (UK)	59.0
28-29	UKM	Scotland	59.0
30-31	FI1C	Etelä-Suomi	58.9
30-31	FR6	Sud-Ouest (FR)	58.9
32	FI19	Länsi-Suomi	58.7
33	UKG	West Midlands (UK)	58.6
34	DE1	Baden-Württemberg	58.1
35	UKN	Northern Ireland (UK)	58.0
36	SE31	Norra Mellansverige	57.7
37	DE2	Bayern	57.3
38	NL4	Zuid-Nederland	57.0
39	NL2	Oost-Nederland	56.5
40	UKE	Yorkshire and The Humber	56.4
41	DEB	Rheinland-Pfalz	56.2

Rank	Code	Region	REDI
42	UKF	East Midlands (UK)	55.3
43	DEA	Nordrhein-Westfalen	55.0
44	DEC	Saarland	54.9
45-46	UKL	Wales	54.7
45-46	ES30	Comunidad de Madrid	54.7
47	DE6	Hamburg	54.3
48	AT2	Südösterreich	52.0
49	FR5	Ouest (FR)	51.8
50	DE9	Niedersachsen	51.6
51	SI02	Zahodna Slovenija	51.3
52	FI1D	Pohjois- ja Ita-Suomi	51.2
53	NL1	Noord-Nederland	51.1
54	FR2	Bassin Parisien	50.9
55	AT3	Westösterreich	50.3
56	DED	Sachsen	50.0
57	SE21	Smaland med öarna	49.9
58	FR4	Est (FR)	49.7
59	UKC	North East (UK)	48.9
60	FR3	Nord - Pas-de-Calais	48.8
61	DE4	Brandenburg	48.5
62	DE5	Bremen	48.4
63	SE32	Mellersta Norrland	48.2
64	EE	Estonia	45.9
65	ES21	País Vasco	45.6
66	SI01	Vzhodna Slovenija	45.3
67	PT17	Lisboa	44.6
68	SK01	Bratislavsky kraj	44.0
69	DEF	Schleswig-Holstein	43.6
70-72	ES12	Principado de Asturias	42.3
70-72	ES51	Cataluna	42.3
70-72	DEE	Sachsen-Anhalt	41.3
73	ITC	Nord-Ovest	40.4
74	ES22	Comunidad Foral de Navarra	39.0
75	ES52	Comunidad Valenciana	38.1
76	ES53	Illes Balears	37.7
77	ES23	La Rioja	37.6
78	DEG	Thüringen	37.2
79	ES61	Andalucía	37.1
80	CZ	Czech Republic	37.0
81-82	ITI	Centro (IT)	36.9
81-82	ES11	Galicia	36.9

Rank	Code	Region	REDI
83	ES41	Castilla y León	36.8
84	ES62	Región de Murcia	36.7
85	ES13	Cantabria	36.5
86-88	ITH	Nord-Est	36.1
86-88	PL5	Region Poludniowo-Zachodni	36.1
86-88	PL1	Region Centralny	36.1
89	DE8	Mecklenburg-Vorpommern	35.6
90	ES70	Canarias (ES)	35.5
91	LT	Lithuania	35.2
92	PL2	Region Poludniowy	34.1
93	LV	Latvia	33.8
94	PL6	Region Pólnocny	33.2
95	ES24	Aragón	32.6
96	PL4	Region Pólnocno-Zachodni	32.3
97	ES42	Castilla-la Mancha	32.1
98	HR03	Jadranska Hrvatska (Adriatic Croatia)	32.0
99	HU10	Közép-Magyarország	31.4
100	EL3	Attiki	31.3
101	PT15	Algarve	30.9
102	ES43	Extremadura	30.3
103	HR04	Kontinentalna Hrvatska (Continental Croatia)	29.9
104	PT18	Alentejo	29.4
105-106	PL3	Region Wschodni	29.2
105-106	PT11	Norte	29.2
107-108	PT16	Centro (PT)	27.6
107-108	ITG	Isole	27.6
109	ITF	Sud	27.3
110	SK02	Západné Slovensko	25.8
111	SK03	Stredné Slovensko	24.9
112	SK04	Vychodné Slovensko	24.5
113	HU23	Dél-Dunántúl	23.8
114	EL1	Voreia Ellada	22.7
115	HU31	Észak-Magyarország	22.4
116	RO3	Macroregiunea trei	22.1
117	HU21	Közép-Dunántúl	22.0
118	HU22	Nyugat-Dunántúl	21.5
119-120	HU32	Észak-Alföld	21.4
119-120	EL4	Nisia Aigaiou. Kriti	21.4
121	HU33	Dél-Alföld	21.0
122	RO4	Macroregiunea patru	19.7
123	EL2	Kentriki Ellada	19.5
124-125	RO1	Macroregiunea unu	19.4
124-125	RO2	Macroregiunea doi	18.4

The authors elaborated the following map in colors, for capturing the main differences among macro regions: they compacted 125 regions (only NUTS-1 and NUTS-2 regions) in five clusters according to the REDI scores[8]:

- *from* the least entrepreneurial group (less than 29,1 points);
- *to* the most entrepreneurial group (67,4 – 82,2 points).



[8] The authors describe that the map "…. shows the cluster membership of all the 125 regions. Nine regions from 82.2 to 69.5 REDI points belong to the best cohort. These are mainly Nordic country regions. 32 regions, from the 10th to the 41st place, constitute the second group of regions. Their REDI scores range from 67.3 to 56.2. Besides the remaining of the Nordic country regions, United Kingdom, Belgian, Dutch and some French as well as the best German regions can be found here. The following 28 regions the UK East Midlands (55.3 REDI points, 42nd place) to the German Schleswig-Holstein (43.6 REDI points, 69th place) form the third group. Most Austrian, German and French regions form this cluster together with the best Central and South European regions. The most populous is the fourth group with 37 regions ranging from the 70–72nd place to the 105–106th place. Their REDI scores are much lower, 42.3–29.2 REDI scores. Mainly former East German, Spanish, Italian, Polish and Croatian regions make up this cluster. The last group of regions is mainly from Greece, Hungary, Portugal Slovakia and Romania together with two Italian regions. They occupy the 107–125th places with 27.6–18.4 REDI scores" (See: Szerb Làszlò, Zoldan J. Acs, Erkko Autio, Raquel Ortega-Argilés, Éva Komlòsi, *op. cit.*, page 55).

3. The REDI score in Regions of Italy: comparative quantitative analysis

Observing the map, it is possible to note that Italy is decidedly divided in two parts.

The REDI index for South and Isles (Sicily and Sardinia) is at the lowest level in the scale elaborated by the Authors. Also North and Centre are not in good condition, being positioned at the penultimate level.

Our task is to operate a double comparison:

- Analyzing the main differences among the Italian Regions;
- Comparing the situation of Italian regions with other European regions.

3.1. *Comparison among Italian Regions*

The classification elaborated by the Authors is the following:

Italian regions	REDI index	RANK
ITC – North-West	40.4	73
ITI – Centre	36.9	81–82
ITH – North-East	36.1	86–88
ITG – Isle	27.6	107–108
ITF – South	27.3	109

It is possible to evidence:

- The substantial homogeneity of the first three regions (the maximum deviation is into the range of 4.3 points) and the equality of the last two regions (only 0.3 points);
- The big fracture (about 10 points and more) between North/Centre and South/Isles.
- These data confirm the existence of "*two Italy-s*": North and Centre of Italy separated by South and Isles. Actually, the different level of development of South and Isles (named "*questione meridionale*") represents one unsolved social and economic question[9].

We intend to individualize the factors that characterize the fracture between the "*two Italy-s*", on utilizing the 3 sub-indexes (attitudes, abilities, aspirations) composing the REDI index.

[9] Luca Ricolfi (2014) write that Robert Putman individualized the main raison of South-Italian regions underdevelopment in the inadequacy of social capital. The paper that Putman wrote in 1993 stimulated several analysis finalized to connect the themes of growth with the presence and quality of social capital. Italian Author L. Guiso wrote in 2011 that social capital is composed by: confidence in others, participation, relationship networking.

Code	Region	ATT	ABT	ASP
ITC	North-West	38.5	35.8	46.8
ITI	Centre	37	31.9	42
ITH	North-East	37.5	34.7	36.3
ITG	Isle	29.5	22.2	31.1
ITF	South	29.4	20.3	32.2

The comparison of the sub-indexes in Italian regions shows that the entrepreneurial gap concerns all the aspects (attitudes, abilities, aspirations), so confirming the big fracture existing between the macro-areas of North/Centre and South/Isles. This fact inducts us to restrict the comparison to the internal of each macro-area.

Comparison into the macro-area North/Centre

We just noted that the maximum deviation of the REDI index among the three regions is restricted into the range of 4.3 points. Nevertheless this deviation assumes different values on analyzing each sub-index.

Under the profile of ***attitudes*** the maximum deviation is reduced to 1.5 points in favour of North-West; besides North-East is only 0.5 points better than Centre. The similarity of scores shows that entrepreneurial attitudes are substantially homogeneous into the macro-area.

Higher deviation is observed in ***abilities***: Centre is 3.9 points less than North-West, while North-East is no far (1.1 points).

The maximum deviation among the regions concerns ***aspirations***: North-East is 10.5 points lower than North-West and Centro is 4.6 points far.

According to the notes of authors, *abilities* and *aspirations* concern entrepreneurship related to nascent and start-up business activities; while the third sub-index aims to identify the *attitudes* of a region's population as they relate to entrepreneurship. The higher deviations in *aspirations* and *abilities* put in evidence the different capacity of regions in creating and starting new enterprises, in spite of a substantial adjustment of entrepreneurial *attitudes* of regional populations.

As consequence, we can deduct that entrepreneurial performances are not conditioned by the characteristics of North/Centre populations, than by the policy adopted by territorial institutions. They have the duty and the responsibility to correct and better their issues, in order to support and increase new enterprises, especially innovative ones.

Comparison into the macro-area South/Isles

The substantial adjustment of all sub-indexes in two regions put in evidence an homogeneity in low entrepreneurship concerning as characteristics of population

as performances of institutions. This is an additional demonstration that South and Isles need a structural and strong frame-project in order to reduce the distance to the "other" Italy.

Comparison of 5 Italian regions on the values of pillars

Additional investigation is possible on comparing pillars. Following table shows 14 pillar scores for Italian Regions[10].

In green color are the pillar values higher than REDI index (more than 4 points).

In red color are the pillar values lower than REDI index (more than 4 points).

The table underlines:

– On vertical line the pillars with higher values (green color) and lower values (red color): they represent the strong and weak points of each regional system respectively;

– On horizontal line the pillars having typologies of values that are common or prevalent in Italian regions

	North-West	Centre	North-East	Isle	South
REDI index	**40,4**	**36,9**	**36,1**	**27,6**	**27,3**
PILLAR VALUES:					
Opportunity Perception	50	42	42	33	41
Startup Skills	39	40	35	35	39
Risk Acceptance	54	55	55	49	52
Networking	25	27	29	25	25
Cultural Support	37	33	40	25	19
Opportunity Startup	27	19	33	05	01
Technology Adoption	56	41	43	27	38
Human Capital	20	24	27	22	20
Competition	50	51	44	45	36
Product Innovation	36	42	50	31	48
Process Innovation	44	75	47	58	63
High Growth	58	31	17	30	29
Globalization	57	37	24	29	22
Financing	63	47	63	30	35

[10] Table shows the values of non-penalized pillars; that is the values before the statistical penalizing procedure that produced a difference between the original and the after-penalty pillar values. This statistical procedure was adopted by the Authors in order to increase the coherence of their analysis. As consequence, the original average value of single pillars does not exactly correspond to the value of the after penalization sub-index. We decided to examine non-penalized values of pillars, because of they reflect the original situations observed in regions.

Relevant characteristics of the regional systems

North-West is the most entrepreneurial region: it has 7 strong points (on the total of 14 pillars). The strongest pillars concern Financing, High Growth, Globalization and Technology Adoption (other three factors have minor impact). This is a winning basket, enabling to conduct the region towards an higher rank. Nevertheless it is necessary to better the most heavy deficiencies, concerning Human Capital, Networking, Opportunity Startup.

Centro totalizes 6 green factors (on 14 pillars). Value of Process Innovation is relevant. It is evident that the strategy to adopt can be in favor of additional benefits for reduction of costs and optimization of processes; an additional demonstration is done by the high value of Competition. Also for Centro are elevate points in Financing, Product Innovation, Opportunity Perception and Risk Acceptance. The most important deficiencies concern Opportunity Startup, Human Capital, Networking and High Growth.

North-West totalizes 7 strong points (on 14 pillars). Relevant are: Financing, Product and Process Innovation, Competition, Technology Adoption; also Opportunity Perception and Risk Acceptance have significant values. Low values concern High Growth and Globalization; even human factors are low: Human Capital and Networking.

Isle are pointed on 5 strong factors. Optimum values of Process Innovation and Competition; they are followed by Risk Acceptance, Startup Skills, Opportunity Perception. The higher weaknesses are in two factors: very heavy is the low value of Opportunity Startup, followed by Human Capital. For this region is possible to observe the prevalence of factors that are equal/similar to the global value of REDI index: 7 on the total of 14 pillars.

South is the region having more factors higher than its average: 8 pillars on the total of 14; this is an additional prove of the contradictions existing in this territory. High points for Process and Product Innovation, associated to good Competition and Technology Adoption. Also Financing is higher than the average, as well as Risk Acceptance, Startup Skills, Opportunity Perception. Negative are 4 factors under the average: Opportunity Startup, Cultural Support, Human Capital, Globalization.

Relevant characteristics of Italian System

Over the aspects of the single regions, it is important to individualize the characteristics that are common in all or mostly all Italian regions.

The most frequent strong points are Risk Acceptance and Opportunity Perception: they are present in all 5 regions. Competition, Process Innovation and Financing are strong in 4 regions. Finally Technology Adoption and Product Innovation reinforce 3 regions.

On the contrary, the most frequent weak point is Human Capital: it is present in all 5 regions. Opportunity startup is weak in 4 regions and Networking in 3 regions.

Looking for the common factors, it is possible to observe that:

- All regions of Italian System are reinforced by 3 factors (Risk Acceptance, Opportunity Perception, Competition); on the contrary they are weak owing to the same factor: Human Capital. This factor must be pushed and increased by stakeholders on adopting a finalized policy and adequate cultural infrastructures.
- Four regions are reinforced by Process Innovation and Financing, while the weakness is in Opportunity Startup. Italy is not able to offer real opportunities for innovative and high-potential start-ups, even if the factor Financing is not so penalizing. On the contrary Technology Adoption and Product Innovation are penalizing.

Following is the text that authors wrote about Italy:

"It is difficult to describe the entrepreneurial profile of such a large country as Italy according to its limited number, five, NUTS1 regions. While the two top performing Italian regions, North-West and Centre are perform similarly to Spanish and the former Eastern German regions, Isle and South rank just ahead of some Slovakian and Hungarian regions. While the differences in the level of entrepreneurship are significant – between 40.4 and 27.3 – the pillar profiles of the regions are very similar. Although the population's *Opportunity perception* and *Risk perception* are on a relatively acceptable level, *Opportunity startup* appears the most binding pillar for four regions. Besides *Opportunity startup, Human capital, Networking* and *Cultural support* all appear to require national action. *Globalization* and *High growth*, problematic for four regions more, are categorized as top regional policy priorities. *Product innovation* is flagged a binding constraint only for North-West. Finally, *Startup skills* pillar is relatively low in three regions, constituting a low level regional policy priority"[11].

3.2. *Comparison among Italian regions and other European regions*

We intend to compare the scores of the worst Italian region (South) to the worst Romanian region (*Macroregiunea doi*); in addition to compare the best Italian region (North-West) and Romanian region (*Macroregiunea trei*) to the best European region (Hovedstaden, Denmark).

Between the two regions exists a deviation (see Tot) of 8.9 points in REDI index. The deviation increases until 10 (about) for attitudes and abilities, while decreases to 7 for aspirations.

[11] See: Szerb Làszlò, Zoldan J. Acs, Erkko Autio, Raquel Ortega-Argilés, Éva Komlòsi, *op. cit.*, pages 107–108.

Comparison of the lowest scores in Italy South (Sud) and Romania (Macroregiunea doi)[12]

RANK	CODE	REGION	INDEXES
109	ITF	Sud	Tot 27,3
			Att 29,4
			Abt 20,3
			Asp 32,2
124–125	RO2	Macroregiunea doi	Tot 18,4
			Att 19,7
			Abt 10,3
			Asp 25,2

The comparison among 14 pillars can increase the comprehension. Taking in account that the total deviation is about 9 points, we will comment the differences higher than 9 points: in yellow if they are in favor of South and in cyclamen if they are in favor of *Macroregiunea doi*.

PILLARS	Sud (Italy)	Macroregiunea doi (Romania)
Opportunity Perception	41	33
Start-up Skills	39	3
Risk Acceptance	52	80
Networking	25	6
Cultural Support	19	5
Opportunity Startup	1	1
Technology Adoption	38	9
Human Capital	20	15
Competition	36	18
Product Innovation	48	15
Process Innovation	63	34
High Growth29	22	
Globalization22	49	
Financing	35	26

Between the two regions, South of Italy is exceeding in several pillars. Nevertheless Romanian region is better in two pillars:

[12] Macroregion two-RO2 (*Macroregiunea doi*) concerns: RO21 North-East (Bacău County, Botoşani County, Iaşi County,Neamț County, Suceava County, Vaslui County) and RO22 Sud-Est (Brăila County, Buzău County, Constanța County, Galați County, Tulcea County, Vrancea County)

– Risk Acceptance (+28 points);
– Globalization (+27 points).

Following is the text that authors wrote about Romania:

"Romania has four NUTS1 regions with very similar, low-level entrepreneurial performance together with some Greek and Hungarian regions. The entrepreneurial profile of the regions is very similar. The REDI scores of the Romanian regions range from 22.1 to 18.4. There are five pillars that do not appear as priorities, relatively speaking: *Opportunity perception, Risk perception, Process innovation, High growth* and *Globalization*. For most of the bottleneck pillars, national-level policy actions appear necessary. These are the cases in the *Opportunity startup, Startup skills, Networking, Product innovation*, and *Cultural support* pillars. *Financing* appears a minor problem for three regions (medium level regional policy priority). *Human capital* appears marginally problematic (from the perspective of bottleneck alleviation) only for *Macroregiunea doi* (minor regional policy priority)"[13].

Comparison among the best scores in Denmark, Italy, Romania

RANK	CODE	REGION	INDEXES
1	DK01	Hovedstaden	Tot. 82,2
			Att 79,7
			Abt 89,6
			Asp 77,2
73	ITC	North-West	Tot. 40,4
			Att 38,5
			Abt 35,8
			Asp 46,8
16	RO3	Macroregiunea trei	Tot. 22,1
			Att 21,1
			Abt 16,1
			Asp 29,1

At the level of pillars it is possible to observe that Hovedstaden is superior in almost all pillars; except two values (within brackets) concerning: Risk Perception (*Macroregiunea trei* is better: 77 points) and Globalization (North-West is better: 57 points).

[13] See: Szerb Làszlò, Zoldan J. Acs, Erkko Autio, Raquel Ortega-Argilés, Éva Komlòsi, *op. cit.*, page 109.

PILLARS	Hovedstaden (DK)	Nord Ovest (IT)	Macroregiunea trei (RO)
Opportunity Perception	98	50	43
Start-up Skills	70	39	4
Risk Acceptance	(62)	54	77
Networking	100	25	9
Cultural Support	100	37	3
Opportunity Startup	98	27	1
Technology Adoption	100	56	19
Human Capital	100	20	36
Competition	100	50	18
Product Innovation	100	36	9
Process Innovation	98	44	55
High Growth	100	58	57
Globalization	(51)	57	48
Financing	68	63	13

Apart the best performing EU region (Hovedstaden), comparison between Italian and Romanian regions shows the prevalence of pillars in favour of North-West (yellow colour, with a deviation of almost 18 points). Nevertheless *Macroregiunea trei* is prevailing in three pillars (cyclamen colour):

– Risk Acceptance (+23 points);

– Human Capital (+16 points);

– Process Innovation (+11 points).

We just underlined the higher presence of Risk Acceptance (and Globalization) in *Macroregiunea doi* compared to South of Italy.

Now we have to added that Italian North-West is weaker than *Macroregiunea trei* in Human Capital and Process Innovation.

Next paragraph is dedicated to these subjects, focusing on Italian situation.

4. Innovation and Human capital in Italian enterprises

Results of REDI index and comparisons we operated confirm that entrepreneurial Italian park needs to be implemented and reinforced, principally on increasing the number of new and young entrepreneurs, enabling to create and start-up innovative businesses.

We intend to investigate the theme of innovation in Italian enterprises; it is tightly linked to the quality of Human Capital, concerning either entrepreneurs either employees and specialized workers.

Determinants of economic development change in long period: relevance of tangible assets decreases, on opening the way to intangible assets like innovation, technical progress, productivity (Schumpeter at first and Solow later)[14].

Nowadays principal competitive advantages are based on "the capacity of enterprise, of economic system, of society to learn continuously; dynamism, endogen creativity, pleasure of intellectual and entrepreneurial challenge. In which way can a country supply with these talents? In the case that historical evolution favoured the country, they are found in its culture, in its behaviour. Other ways it is necessary the effort of politic actions, for stimulating creativity of inventors and entrepreneurs"[15].

Question concerning Italy: this country is it naturally endowed by innovative entrepreneurial talents, or – on the contrary – it asks a specific political project for stimulating the diffusive innovation in enterprises?

Salvatore Rossi, General Manager of Banca d'Italia, writes[16] that during the period 1950–1980 the progress of Italy was positively influenced by two fundamental situations: (i) millions of persons left agriculture towards industry, which reached a large availability of workers; (ii) enterprises increased in innovation and efficiency thanks the international technological transfer combined with Italian ability in imitating, reengineering and adapting foreigner experiences.

Actually, in Italy is more present incremental innovation, rather than original innovation based on Research and Development (R&D). Demonstration is given by the fewer Italian patents in comparison with other developed countries; for instance Germany: this country counts patents at the United States Patent and Trademark Office seven times more; five times at the European Patent Office[17].

One of the greatest causes of Italian scarcer innovativeness is given by the low investment in Human Capital[18], especially in scientific areas. For instance, the number of students in engineering is progressively decreasing; the same for middle technicians, in number and skills.

According to the diagnosis of Salvatore Rossi, the Italian low investment in Human Capital is influenced by low demand of qualified employees and workers,

[14] Schumpeter, since 1911, clarified that enterprise innovation is one fundamental factor for economic development. Several Authors developed this area of studies. Robert Solow, in the "second model" dated 1957, indicated in technical progress the factor that can explain growth accelerations in economic systems.

[15] Salvatore Rossi, *L'innovazione nelle imprese italiane***,** paper for Fondazione Luigi Einaudi onlus, Torino, October the 15th 2014, www.bancaditalia.it.

[16] Salvatore Rossi, *op. cit.*

[17] The situation is better in industrial designs, models, trademarks.

[18] Several empiric researches put in evidence the fundamental role of Human Capital for growth and development of countries. See: Luca Ricolfi, *L'enigma della crescita*, Mondadori, Milano, 2014. We were engaged in modeling the role of Human Capital and other intangible assets (Organizing Capital and Relational Capital) for measuring enterprise performances; see: Mario Pagliacci-Pamela Terenziani, *Valutazione delle imprese knowledge-based e Basilea 2,* Amministrazione & Finanza ORO, IPSOA, Milano, 2007.

owing to the prevalence of micro and small enterprises, operating with a low level of innovation, internationalization and networking[19]; as consequence, this Author conclude that their cycle of life is destined to remain static.

Nevertheless, the main problem is not the small and statically size, but principally the characteristic of Italian SMEs: the majority of them are familiar enterprises, owned and managed by members of the family. As consequence, decisions and actions concerning the enterprise are directly and exclusively influenced by quality and training of family members. Typical situation is when the old founder of the enterprise – sometime tired and often culturally obsolete – does not accept to share or to leave the control of the business; at a certain moment, owing to his unexpected inability, his sons or relatives are pushed to assume the direction of the business, without experience and training. Salvatore Rossi writes: "Managing family enterprise, combined with an elderly entrepreneurial class, create the conditions of scarcer organization, innovation, internationalisation. When the enterprise is familiar and small one, it is more difficult to receive banking loans or accessing to capitals in the market; especially for financing innovations, because they are more risky and confidential. Considering the high asymmetries, internal financial sources are generally utilised for R&D; but this source depends on the economic cycle and is not available for *start-ups*"[20].

The lack of R&S and the scarcer demand of highest skills generate Italian low investment in Human Capital; in fact as enterprises as single young people consider not convenient to be engaged in expensive and long time superior schools.

This severe diagnosis imposes any effort in order to better understand Italian situation.

At first are determinant the levels that can be moved by public institutions. According to Salvatore Rossi (*op. cit.*) three themes are urgent: (i) market regulation for products and labor; (ii) scientific research and educational system; (iii) policy for stimulating innovation in enterprises.

In addition, it is important investigating on the orientation of people in creating their own enterprise[21]. Actually the positive propensity – especially of young people – could contribute to renew and modernize Italian entrepreneurial park.

The research we intend summarize[22] was conducted on a sample of 688 Italian students and 818 French students of Universities in Perugia and Grenoble. The greater part of students attended human and social sciences (59.4%); 19.72% attended

[19] The diagnosis of S. Rossi is in accordance with REDI index analysis. They put in evidence that some important Italian defaults concern networking and globalization.

[20] Salvatore Rossi, *op.cit.*

[21] According to studies at EU level "only 37% of Europeans would like to be self-employed, compared to 51% of people in the US and China" (see http://ec.europa.eu/growth/smes/promoting-entrepreneurship/index_en.htm).

[22] See: Jean Pierre Biossin, Annette Casagrande, Alessandro Montrone, Mario Pagliacci, *Gli studenti universitari e l'imprenditorialità.Uno studio comparativo Italia-Francia*, AUR&S-Quadrimestrale Agenzia Umbria Ricerche 1–2/09, Perugia, 2009.

scientific faculties and 20.53% other disciplines. A schedule was administered in order to know if they consider probable to create their own enterprise in future, taking in account their capacities. Similar investigation is in accordance to Authors of REDI index; in fact they assume *Startup Skills* as a necessary factor for exploiting opportunities. Skills depend on the populations'self-esteem about its ability to start a business successfully (individual variable) (*op. cit.*).

The greater part of students (71.21%) consider attractive the idea of creating their own enterprise, but 45.60% only declare to be confident in own capacity. The percentage decreases to 30,01% concerning students that consider probable the creation of their own enterprise in the future.

About comparison between Italian and French students:

– considering attractive the idea of creating own enterprise: 81.22% Italy; 61.36% France;

– self-esteeming in capacities of creating own enterprise: 54.99% Italy; 46.41% France;

– esteeming probable of creating own enterprise in the future: 41.46% Italy; 19.22% France.

The results of this research confirm another previous survey[23], concerning as Romanian as Italian and French students, attending at Universities of Iasi, Perugia and Grenoble. Italian students are more interested than French ones in entrepreneurial activity (83.2% versus 74.3%); but are Romanian students most attracted by entrepreneurialism (96%).

In addition, it is very important to observe that this triangular survey anticipated some tendencies evidenced by the authors of REDI index. Both the surveys conclude that:

- Risk Perception and Acceptance is higher in Romania than Italy;
- Opportunity Perception is lower in Romania than Italy.

It is possible to conclude that the higher entrepreneurial attraction expressed by Romanian students is living despite of the major perception of entrepreneurial risk and the minor perception of opportunities offered by this activity. The analysis conducted in 2006 explained that "… *l'augmentation de l'impulsion entrepreneuriale réduit la motivation de 'profiter de l'opportunité', pour laisser place à une meilleure perception du risque. Cette observation confirme l'approche de Paul Reynolds, selon lequel les entrepreneurs peuvent être classés en deux catégories: les entrepreneurs motivés par l'opportunité et les entrepreneurs motivés par la nécessité. Dans notre cas, la relation directe entre la capacité entrepreneuriale et la perception du risque nous détermine à conclure que les étudiants seraient orientés vers la création et la gestion d'une entreprise propre, non tant pour la motivation de saisir des opportunités, que par la nécessité de trouver un marché de masse, professionnel et*

[23] See: Claude Benoit, Ewa Bogalska-Martin, Paola Matrigali, Mario G.R. Pagliacci, Gabriela Boldureanu, Ina Croitoru, *Orientation entrepreneuriale des étudiants et rôle de l'Université*, Réseau PGV EDITIONS, Grenoble, 2006.

en concordance avec leurs études, satisfaisant du point de vue des attentes sociales et financières"[24].

Coming back to Italian situation, it is possible to observe that Italian students have a strong attraction for entrepreneurialism; they are generally confident in their capacities and consider probable the engagement in their own business. Obviously it does not means that the future flow of new entrepreneurialism will be so high; nevertheless we can hope for the future in good entrepreneurial spirit given by new enters in the competitive arena. Only few people will became new entrepreneurs, but the auspicious is that also the people working for the account of enterprises and organizations will operate aimed by similar spirit of creativity and tasting of success[25].

Future new people entering in competitive arena are asked to express their best capacities in creativity and innovativeness.

We refer about a research conducted by Laboratorio Athena[26] investigating on the perception of creativity and innovation in a sample of students in Economics; they were compared to the needs declared by a panel of enterprises. The main purpose was in verifying if the students – as future managers – and the managers of enterprises have common opinions about creativity skills and innovativeness, so evidencing a kind of balancing in labour market between offer and demand of creative jobs[27].

Concerning Italian students, a questionaire was made among 108 students attending the Faculty of Economics in the Seats of Terni and Assisi. Another questioner was administrated to 37 enterprises, operating in sectors where the needs of innovation are relevant. All enterprises were localized in the Centre of Italy (territories of Perugia, Terni, Rieti).

The research concluded that the students of the sample "have a creative personality … in order to conceive, to defend and to encourage innovative projects. Among the students is emerging a particular creative class, able to accept challenges and to face complexity of globalization … they are able in utilizing transversal competences i.e. working in group, relational and critique capacities, flexibility and responsibility … Enterprises have the task … to utilize and valorise

[24] Claude Benoit, Ewa Bogalska-Martin, Paola Matrigali, Mario G.R. Pagliacci, Gabriela Boldureanu, Ina Croitoru, *op. cit.*, page 164.

[25] In Italian language we use the world "*imprenditorialità*" (for entrepreneurs) and "*imprenditività*" (for the best employees and workers).

[26] See: Alessandro Montrone, Mario G.R. Pagliacci, Valeria Ferretti, Francesca Martini, Annalisa Presilla, *Il potenziale creativo negli studenti e il fabbisogno innovativo nelle imprese*, AUR&S – Quadrimestrale Agenzia Umbria Ricerche 3–4/10, Perugia, 2010.

[27] The research concerned as Italian as Romanian students. The results of the comparative analysis of the two groups of students are available in: Elisabeta Jaba, Mihai Daniel Roman, Mario Pagliacci, Dana Serban, Christiana Brigitte Balan, Mircea Asandului, *Statistical Evaluation of the Students' Perception of Creativity,* International Conference on Education, Research and Innovation, ICERI 2008 Proceedings, Madrid, January, 15 2009.

in the best way these characteristics, addressing them towards the most useful business goals"[28].

The research concluded that the majority of enterprises recognize that innovation is a fundamental factor for growth; technical and commercial jobs are considered the most important for analysis and development of new products and their marketing. These activities are considered fundamental for innovation, taking in account that 73% of interviewees declare "… strong connection between innovation and competitiveness …"[29].

The research put in evidence the existence of a potential matching between creative skills of students (as future managers) and innovative needs of enterprises. Nevertheless some obstacles operate against the effectiveness of the matching: "… internal and external factors can hinder or limit innovative processes. Author Quinn (1985) synthesizes the main internal problems hindering creativity in enterprise organization: *isolation of management, intolerance towards fanatics (enthusiastic people), horizon of short term, accounting (procedures of costs imputation to innovative projects), excess of budgeting and autocracy, insufficient incentives.*

Additional factors exist … half of enterprises and more declare that a great obstacle for innovation is caused by insufficient financial sources; about 1/3 interviewers underline limits in culture of employees and in structure of organization …"[30].

We can observe that similar questions are emerging by the REDI index survey, especially about the quality of Human Capital.

In addition it is important to underline that the research conducted by Laboratorio Athena – localized in the Center of Italy – evidenced that *"a great obstacle for innovation is caused by insufficient financial sources"*; actually also the REDI index investigation shows that Centre of Italy obtains low points in Financing, in comparison to the other most performing Italian regions: North-West and North-East.

Finally, it is reasonable to affirm that financial factors are influent in developing innovative projects, but they are not determinant. At least, they are not more determinant than quality of human capital and capacity to built and activate good collaborative networking; in fact these two factors play a strategic role as for valorizing the characteristics of the single enterprise, as for the development of the whole economic and social system.

According to this perception, it is necessary that financial operators address their financial support towards the enterprises, taking in account assets and

[28] Alessandro Montrone, Mario G.R. Pagliacci, Valeria Ferretti, Francesca Martini, Annalisa Presilla, *op. cit*, pages 489–490.

[29] Alessandro Montrone, Mario G.R. Pagliacci, Valeria Ferretti, Francesca Martini, Annalisa Presilla, *op. cit*, pages 500–501.

[30] Alessandro Montrone, Mario G.R. Pagliacci, Valeria Ferretti, Francesca Martini, Annalisa Presilla, *op. cit*, page 502.

investments in Human Capital and Networking especially[31]. Financial system *must* became able to achieve the capacity of analyzing merit of credit on the basis of significant characteristics of enterprises (especially intangible assets) rather than tangible assets only[32].

Banks and other financial operators (especially venture capitalist and investment funds) suffer for scarcer cultural and organizing assets dedicated to the assessment of enterprise's merit of credit, especially in case of SMEs and start-ups. It is a lack of business intelligence as well as a resistance of financial operators in accepting to cooperate together enterprises on field, rather than to close in the niche of sophisticated formal models, for calculating a lot of ratios on the basis of the balance sheet.

Problematic of Process and Product Innovation, as well as quality of Human Capital concerns as enterprises as banks and it needs conclusive strategies assumed by entrepreneurial and institutional stakeholders.

Final conclusion

Authors of REDI index elaborated a complex pyramidal system for measuring entrepreneurship in territories. As well as any other measuring procedure, it is not without gaps; nevertheless the survey about 125 European regions represents an useful theme of meditation.

We utilized the survey for reflecting about Italian entrepreneurial situation, in comparison with some European regions.

The survey based on REDI index, as well as other analysis, put in evidence that Italian-System (concerning entrepreneurship and new enterprise creation) is positioned near the last places in the ranking of European regions. Nevertheless, some on field researches indicate that good potentialities exist in population, especially in young people, and they ***are waiting*** for being valorised.

BUT, this is the crucial point! Good potentialities ***are waiting****. They are waiting* ***for what****? Are waiting for someone or something coming outside?*

Unfortunately this is the most grave and pernicious constraint: Italian people is waiting for a redeemer[33], who is not coming and it is better he will not come, because – otherwise – he will be a new master or a new tyrant, as in the past.

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[31] As well as additional factors analyzed by REDI index.

[32] The architecture of an original model for evaluating knowledge-based enterprises on the basis of intangible and tangible assets is presented in: Mario Pagliacci-Pamela Terenziani, *Valutazione delle imprese knowledge-based e Basilea 2*, Amministrazione & Finanza ORO, IPSOA, Milano, 2007.

[33] Luca Ricolfi writes: "… we, Italians, got the conviction that external world is the key of anything. … Today we have the idea that not only our problems, but our safety too can come exclusively outside". Ricolfi declares that his opinion was inspired by the book of L. Barzini jr., *Gli italiani*, Mondadori, Milano, 1965.

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CRISTINA MONTESI[1]

CIVIL COMPANY AND FAMILY – WORK HARMONIZATION

Abstract: *The problem of family-work harmonization is increasingly being debated at political, social, economic level because it is strategic for the future of both family and company. In fact from working conditions depends the ability to provide adequate household income, along with a good quality of life for all its members (even though family economic well-being is not very often associated to family happiness).*

The benefits of happy families are reflected in turn also on the growth of a given territory, because families (primary social capital) contribute to collective social capital (secondary social capital), which is strategical for the development of an area.

Then it is important that companies undertake, in a way consistent with their own financial and organizational resources, the creation of corporate welfare, serving as a bridge between business and family and helping the harmonization of the two spheres and the recomposition of their complicated relationship.

Keywords: family-work harmonization, corporate welfare, civil company.

1. The family-work harmonization policies as policies of common good

The problem of family-work harmonization is increasingly being debated at political, social, economic level because it is strategic for the future of both family and company. In fact from working conditions depends the ability to provide adequate household income, along with a good quality of life for all its members (even though family economic well-being is not very often associated to family happiness). Working conditions should, in theory, put family's social capital in condition to be generated and re-created and to be able to feed the social capital of the other communities of reference (especially since the family is one of the places of apprenticeship of values, of respect for difference and diversity, of intergenerational solidarity, of ethos of citizenship). But it is equally true that from serene and balanced family relations springs, in part, a company's competitiveness and the competitive advantage of a local economic system. A cohesive family's social capital has in fact a positive effect on the economy at micro, meso and macro economic level. People happy and pleased with themselves and with their family ménage are indeed more motivated, more productive, more collaborative, more faithful in the company[2]. The benefits of happy families are reflected in turn also on the growth of a given territory, because families (primary social capital) contribute to collective

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[2] See Melasecche, Montesi and Terenziani (2010).

social capital (secondary social capital), which is strategical for the development of an area.

Then it is important that companies undertake, in a way consistent with their own financial and organizational resources, the creation of *corporate welfare*, serving as a bridge between business and family and helping the harmonization of the two spheres and the recomposition of their complicated relationship[3].

Many studies have long emphasized the benefits (some of which are not always accurately quantifiable as they fall within the so-called *intangibles*) of corporate welfare for both companies and workers. These studies, however, seem more obsessed by the need of the demonstration of a plausible *instrumental* use of corporate welfare by enterprises, rather than driven by the analysis of its *intrinsic* value (at least according to the so-called *Civil companies*[4]). For workers corporate welfare means a reduction of stress and fatigue, a decrease of family's renouncement due to work, liberation of time, the recovery of a greater ability to listen to children together with more diligence of behaviour towards them, the recovery of quantity/quality of time to spend with spouse/husband or with a partner[5]. For companies, in general, corporate welfare reduces absenteeism, limits employees' turnover, attracts the best workers by acquiring a good reputation, facilitates the procedures for personnel's selection and hiring, increases workers' productivity, improves organizational climate, can get public facilities of different kinds. On one side corporate welfare, through the trust and mutual loyalty between employer and employees which normally originates from it, cures the typical market failures reported by the economic theory of organizations (opportunism, hidden action, hidden information), but on the other side corporate welfare causes not only direct costs (such as start-up costs and costs of application of family-work conciliation

[3] Five main models can describe the relationship between work and family. The *spill-over theory* tells us that what a person lives at work is then poured on the family; the *compensation theory* tells us that people seek/offset in an area what is not located in, or is not in balance in the other area; the *segmentation theory* argues that family and work are two completely separate compartments: the first is the place of affections, relations and cooperation, the second is the place of impersonality, individualism and competition; the *instrumental theory* states that an area is the tool to achieve results even in the other; the *conflict theory* advocates that the successes achieved in one area can only be achieved at the expense of the other. See Faldetta (2008), p. 25.

[4] The results of these studies, yet quantitatively limited, are not all univocal. They depend also on the *person who was interviewed* by the researcher (if the manager or the employee), on the *variety of business environments and cultures*, on the *macroeconomic context* (increasing the benefits of reconciliation policies when unemployment is low), on *management's time horizon* (if the assessment of these policies takes place in the short term or in the medium term). See Faldetta (2008), pp. 37–38.

[5] The belief in the goodness of work-family harmonization policies and in the opportunities they offer is more pronounced at entrepreneurs/managers level rather than at workers' level. The latter fear infact, through their use, bad impact on career, conflicts with colleagues who have to bear higher workloads, the acquisition of the label of being less productive workers and the acquisition of a bad reputation. All these caveats suggest that these policies should be illuminated by the principle of *fairness* among workers.

measures), but also indirect costs (such as, for instance, the loss of control on the effective work's hours performed in a telework scheme, etc.).

The main types of corporate welfare instruments are: *tools that reduce or otherwise articulate working time* (part-time, company's hours-bank, flexibility of working hours, paid or unpaid leave for family's emergencies, etc.); *tools that free time* (leave of various kinds: parental or maternal, etc.); *tools which support care work or domestic work* (company's kindergarten, care vouchers, household services, etc.); *tools that form a different culture of time* (information on the opportunities offered by company's work-family conciliation policies, training on time-management, personal or family counselling, etc.); *tools for professional support* (training and retraining after a maternal or parental leave, etc.); *tools that give extra-wage benefits* (various allowances related to the family)[6]. The diffusion and the typologies of corporate welfare are different according to political, economic, social and cultural contexts of each country, which can create a more or less favourable environment to them[7]. The corporate welfare systems may vary depending on company's size, on transnational or national character of the firm, on the legal nature of the firm, being more frequent, differentiated and rich in resources among large enterprises, among multinational corporations, among quoted companies. Small and medium-sized enterprises certainly have more financial, structural, cultural constraints in adopting work-family conciliation policies[8]. But beyond all their possible articulation and differentiation, one of the most important qualitative characteristic is that *family-work conciliation policies are policies of Common Good in a double sense*: *because they are not corporative neither labouristic.* Infact *they are not directed only to women, but to the whole community* (the company's community and the community that resides in the territory where the company is located), and *they are not aimed to increase or guard only women's employment*. Their purpose is to twist work and life for a *full development of the person* (who is not a monad, but an individual who is always in relation to others within the familiar and professional context). They are intended to pursue *a good life for all*[9]: a life in which the scarcest resource we have today, time[10], can be used in a balanced way between different spheres of life and of activities of persons *for the well-being of everybody and of each individual*, *alias for the Common Good*. The work-family conciliation policies, particularly when they are arranged at *territorial scale* involving so many different policy makers (far more numerous than when they are implemented within a single enterprise), *are policies of the Common Good for another motivation*. *They satisfy most of the requirements that characterize*

[6] See Donati (2009a), pp. 33–41.

[7] See Faldetta (2008), pp. 27–35.

[8] See Macchioni (2009).

[9] "To live a good life" can be considered a *substantial* meaning of *common good*, beyond the many meanings to which one can arrive through a dialogic and democratic process (not only representative, but also deliberative). See Montesi (2010a), p. 140.

[10] See Zimbardo and Boyd (2009).

a policy of Common Good[11]. Some good practices[12], which are already in act in some Italian regions[13] and in some enterprises of our country (multinational[14], large[15], small and medium-sized[16]), if analyzed in their modalities of construction and mode of governance, can be carried as proof of this, but they also reflects the fact that work-family harmonization policies are *policies which are built together and enjoyed together*.

2. Work-family harmonization policies as policies of civil companies

Work-family conciliation policies are generally adopted primarily by *Civil companies*[17] or, more generally, by all those companies that are able to "*build a corporate citizenship without destroying the social tissue within which the company operates*"[18].

The Civil company can be conceived as a *social community* because its work is the result of *cooperative* activities between people inside and outside the company (employees, customers, suppliers, etc.), which should operate in accordance with other communities that are outside its boundaries: the families of its employees and the local community. From this particular conception of the company follows that *company's good does not exhaust itself only in profit* (which anyway still requires unity of purpose between employer and employees and so forth *cooperative and trustful social relationships* that cement, through all those *virtues that promote sociability*[19] and through *relational gifts* made in the name of reciprocity[20], the

[11] These requirements can be summarized as: *multidimensional attention to the individual*; *integration*, *sharing of objectives*, *coordination among policy makers*; *subsidiarity* (*horizontal*, *vertical*, *circular*); *relational rationality*; *regulation geared primarily to the paradigm of reciprocity*; *coexistence of different principles of regulation*; *production of relational goods*; *coexistence of different ethics* (*ethics of intentions*, *ethics of responsibility*, *ethics of care*, *ethics of virtue*). See Grasselli (2009), pp. 34–35 and Montesi (2010a), pp. 142–150.

[12] A good practice is "an intervention that reaches a certain goal better than the existing interventions. The concept of "better" can be operationalized in various ways, with regard to parameters of effectiveness, efficiency, equity, or other" (Donati, 2009a, pp. 28–29).

[13] See for example in Italy the experience of the Province of Bologna, the Province of Modena, the Province of Pisa, the Province of Mantua, the Autonomous Province of Trento, in the implementation of the National Law 53/2000 (Article 9). See Department for Family Affairs (2008).

[14] See, for example, the case-study of Nokia in Italy. See Bordoni (2007).

[15] See for example the experience of the pharmaceutical company Bracco in Italy.

[16] Cfr.Macchioni (2009).

[17] On *Civil Economics* see Bruni and Zamagni (2004), Bruni and Zamagni (2009), Bruni (2009), Bruni (2010).

[18] See Montesi (2009b), p.122.

[19] All those giving virtues (such as the virtues of hospitality, brotherhood, kindness, friendship, integrity, honesty, gentleness) are essential to *civil life* within the community, but reinforce also working relationships, teamwork, and the civil market. See Montesi (2009b), pp. 122–127.

[20] On the role of gifts in the enterprise that are at work within its human, organizational, relational capital, affecting also the competitive advantage of the company see Montesi (2008), pp. 95–99.

business community), but includes the well-being of its employees which can only be achieved through the recomposition of the artificial separation between business and society. *Company's good* (*conceived in a more holistic way*) *is then not separated from common good*.

So it is easy to understand why the conciliation policies are particularly preferred by Civil companies, alias by those companies that are oriented to *Common Good*[21], before being addicted to profit. Civil companies are oriented to a *civil responsabilty*, a mission that goes beyond enterprise's *social* responsibility, enterprise's *paternalism*, enterprise's *mercantilism*, enterprise's *philanthropy*. For Civil companies profit is not the end of the business itself, but it is only the constraint that firms must respect to continue to stay in market and to conduct their industrial activity, which is instead the real purpose of the company, allowing all those who are (directly or indirectly) involved in it, to live a good life[22]. *So is civil the company that carries out an industrial project*, *under the constraints of efficiency*, *without separating economic life from civil life* (*led in the family and society*). If there is no gap between economy and society, *company's responsibility towards others* (alias to take care of the needs of civil society and to take into account the interests of other company's stakeholders) is therefore closely linked to industrial activity and then *it is an end in itself*. If there is no dichotomy, gift and reciprocity (that characterize the functioning of family and society), pervade also the functioning of the market, making economics become *civil*[23]. Reciprocity and gift then must operate within the normal activity of the market, neither in its lateral side (as in the case of non-profit sector which is considered like an exception to the market), nor later in time (downstream of the creation of wealth by the market to correct, through *philanthropy*, inequalities together with the redistributive action of the Welfare State)[24]. This is a very different perspective from the view of neoclassical economics, which advocates that profit is the true end of business (business activity is merely a tool to achieve it), that profit should be pursued in the market (which is an area *clearly separated from the company* characterized by self-interest and anonymous relations[25]), that it must be sought regardless of ethical

[21] Among Civil companies can be included not only non-profit companies (social cooperatives) and cooperative enterprises that, given their peculiar institutional nature, do not pursue their goals through the principle of exchange of equivalents, but through a series of participatory principles and mechanisms of reciprocity and democracy, but also all the *profit* companies with an attitude for the common good. Among the civil companies is worth remembering, as particularly emblematic for their attempt to humanize the economy, the *Economy of Communion* enterprises and *Fair Trade* companies.

[22] See Bruni (2009), pp. 123–128.

[23] See Montesi (2008), pp. 90–95.

[24] See Montesi (2010b) and Montesi (2010c).

[25] It should be said that the existence in the market of *contractual* relations which are impersonal, anaffective and weak, but also free and equal respect to community's contexts (such as clan, slave, feudal, rural societies), where *social* strong relation are in act, full of identity and of feelings of benevolence, but with the characteristic of not being freely chosen by individuals, of being

considerations (profit is therefore independent from the Common Good that is involuntary and unknowable a priori[26]) or it must be achieved under the constraint of compliance with minimum social standards and ethical principles, which are observed with impatience by the company because they are experienced only as a source of costs. In this context *company's social responsibility is only a constraint to the achievement of profit*.

But there is another difference between civil and corporate social responsibility. Civil responsibility is based on *mutual acknowledgment between company and stakeholders*. On one side the company recognizes that without the contribution of individuals, their families, the local community, it can neither exist nor flourish, on the other side individuals and families are aware of the role played by the company as an employer, promoter of the development of the territory, a midwife of their capabilities. The relation is now bi-directional and is tinged with the ethical aspect of *mutual acknowledgment of the Other*, who not only has his own intrinsic value, but is also essential for the very existence of the subject and the construction of his identity. The relation turns into ethics also for the *mutual attention to the good of the Other* (the Other is to feel good because one can flourish). *Social responsibility* of enterprise, according to some interpretations, is instead based on a *social contract* concluded, like in Rawls' view, under a "veil of ignorance", between company and various stakeholders (primarily shareholders and employees and then other stakeholder such as customers, suppliers, local community, etc.)[27]. The company incorporates, through this *contract*, in its strategy the interests and concerns of others throwing, in this way, a bridge to society[28], but this assumption is not due so much to the acknowledgment of the intrinsic value of the Other and of its indispensability to the relationship (alias in a *relational* perspective)[29], but is due to compliance with laws or to external pressure coming from the "voice" of

usually biased in favor of a party, and from which you can not easily get out because of loyalty's constraints in force, however, represent an achievement of civilization in order to meet people's needs. See Bruni (2007), p. 63 and Montesi (2010b).

[26] "In this theoretical framework the common good is reduced to be the unintended result of individual actions, each aimed at achieving the best for themselves (the "invisible hand" of Adam Smith). The common good is not known, is the result of the action of competition seen as a *discovery procedures*" (Montesi, 2009b, pp. 118–119).

[27] See Sacconi (2005).

[28] In this sense social responsibility becomes a *enlarged model of governance* of company, under which those who govern the company have responsibilities that extend from the observance of fiduciary duties in respect of the property to similar fiduciary duties with respect, in general, of *all* stakeholders (see Sacconi, 2005, p. 112, emphasis added). With the *social contract* a là Rawls, *a typical instrument of the market*, the company comes to terms, on a basis of equality, with many stakeholders, but *without any gain of sociability*. Contract remains impersonal with the advantage to anesthetize the pain that can come from the *personal* relationships with others which are so blessed, but which can also hurt, given the fragility of relational goods. See Bruni (2007), p. 72.

[29] In this sense the Other is both an end in itself and a means of entrepreneurial activity.

responsible consumers or to economic convenience or to marketing and reputation reasons[30] (in a view that remains *individualistic* –company does not create *personal* relation because the *contractual* relationship is anonymous, anaffective and based on *self-interest* because it is only instrumental). The harmonization between business and society is only an illusion, actually the company remains impermeable to the relationship with the Other, as in the neoclassical view that depicts it as a "black box". So companies that embrace *social responsibility* are very different from those who practice the *civil responsibility*, but they are all preferable to *irresponsible* companies[31]. But civil and social responsibility companies are also different from *paternalistic* or *philanthropic companies*. These last two kind of companies are not taking care of Others on the basis of intrinsic motivation that contaminates the market (like in the case of "civil companies") or on the basis of a social contract (like in the case of "social responsibility companies"), but according to *individual ethics* of the entrepreneur, which can only be practised out of the business (alias in the *social* field, which remains the only place of possible exercise of virtue) and only after the business has produced wealth (to redistribute benevolently a part of it), being the market and the society considered as two separate spheres and having the entrepreneur only the worry of making profits in the market. It can therefore be drawn up, based on some variables, a distinction between different business archetypes[32] (*paternalistic*, *mercantilistic*, *civil*, *philanthropist*), with their more or less marked tendency to be familiar responsible, through different policies of family-work harmonization (Fig. 1).

The ideal type for the grade and quality of assumption of family responsibility is certainly the civil entrepreneur followed by the paternalistic, while both the philanthropist and the mercantilist avoid entirely work-family conciliation.

The family-work harmonization policies are usually included in social responsibility practices that, as noted above, is different from *civil* responsibility. They are generally certified by Social Balance or may even have their own certification system[33] or they can simply be acted without adopting an official statement. With regard to this latter mode it can be interesting to investigate the problems and the potentialities that even small and medium-sized enterprises may face in the areas of harmonization, from a survey made on a consortium of metalmechanical firms in the province of Terni (District of Umbria-Italy).

[30] So in companies which practise social responsibility there is not uniformity, but there are different groups of firms that have *very different motivations* at the basis of their practices. From these motivations depend the initiatives (more or less spontaneous) to take, the way in which they are conducted, the persistence of same practices. See Bruni (2006), pp. 69–72.

[31] See Grasselli (2005), pp. 119–132.

[32] The delineation of this comparison was inspired, albeit with different nuances and introducing other elements of classification, by the division's in three business profiles (*paternal*, *civic*, *mercantilist*) developed by Martignani (2009), pp. 180–194.

[33] There are infact special certification like the Audit "Family and Work". See Tarroni (2007).

Figure 1

Business Archetypes and Corporate Responsibility

Business Archetypes	**Paternalistic Entrepreneur**	**Mercantilist Entrepreneur**	**Civil Entrepreneur**	**Philanthropist Entrepreneur**
Mission: profit versus common good?	The business end is profit under the constraint of assuming a responsibility which, however, is very limited because it is addressed primarily to the workers	The business end is corporate's profits regardless of any responsibility to anyone	The business end is conducting a certain industrial or service activity, under the constraint of the pursuit of profit, without separating the economic activity from life	The business end is profit under the constraint of assuming a wider responsibility to various stakeholders, also outside the enterprise, which takes the guise of philanthropy
Type of responsibility acted by the company	*Individual Ethical Responsibility* in addition to the observance of economic and legal responsibility	*Economic Responsibility* (Be profitable); *Legal Responsibility* (To be law-observant)	*Civil Responsibility*	*Individual Ethical Responsibility* in addition to the observance of economic and legal responsibility
Business ethic most ingrained in entrepreneurial profile	Intentions ethics of Kantian matrix	Ethics of the consequences of Utilitarian matrix	Ethics of virtue of Aristotelian matrix	Ethics of the consequences of Utilitarian matrix
Consideration of employees from the entrepreneur's point of view based on the business ethic that most characterizes him	Employees are an end in themselves, they must be respected in their dignity, they are treated by the entrepreneur as children in a relationship of authority, based on the exemplary nature of his role and his strong sense of duty	Employees are only a means to achieve the profit	Employees are both end and means of industrial activity	Employees are only a means to achieve the profit; only the others, the anonymous outside the company, are an end in themselves; the "categories" of philanthropy's recipients are chosen arbitrarily by the entrepreneur
Entrepreneur's attitude towards conciling family and work which can be deduced by the attitude shown towards employees	Familiarly responsible	Familiarly irresponsible	Familiarly responsible	Familiarly irresponsible
Types of work-family conciliation policies adopted	Extemporary and informal measures, granted ad personam by the entrepreneur in a discretionary, flexible, customized form to the emergence of individual need	No measurement. If adopted, it is only to comply with the dictates of the law or in an instrumental horizon, because they are cost-effective, generating more profit	Structured and codified measures that give a good reputation and consolidate trust relation	No measurement. If adopted, it is only to comply with the dictates of the law or ta act in an instrumental horizon, because they are cost-effective, generating more profit

Figure 1 (continued)

Business Archetypes	**Paternalistic Entrepreneur**	**Mercantilist Entrepreneur**	**Civil Entrepreneur**	**Philanthropist Entrepreneur**
Virtue more characteristic of the entrepreneurial profile	Magnanimity: the entrepreneur makes *unilateral* gifts to employees, or *personal* gift to those who are close to him and in confidence with him	Parsimony, Justice (commutative and distributive), Prudence	Generosity: the entrepreneur makes *relational* gifts that, due to reciprocity, strengthen social and personal ties within and outside the company; Justice (commutative and distributive); Other cooperatives virtues: Brotherhood	Charity: the entrepreneur makes *unilateral* gifts to strangers
Vices at increased risk of event in the entrepreneurial profile	Pride	Greed	Communitarianism	Vanity
Time orientation of the entrepreneur	Oriented to the past, linked to the respect for traditional values	Present-oriented, short-terminism which consists in short-term profit maximization	Future-oriented, research of long-term economic, social, environmental sustainability and of inter-generational equity	Present-oriented in terms of production (short-terminism), future-oriented in terms of personal fame (need to be remembered by posterity for the charity carried out)
Type of welfare compatible with the entrepreneurial profile	Welfare State: state intervention to remedy the distortions present in the market after the market has produced wealth	Welfare State: state intervention to remedy the distortions present in the market after the market has produced wealth	Plural, Communitarian, Subsidiary Welfare: State, market companies, households, civil society, non profit sector, work together in a synergic, balanced and integrated way for the well-being of people	No Welfare: philanthropy replaces completely state intervention or joins to Welfare State in a complementary manner in the redistributive function
Relationship with the territory	The company makes more community inside than with the territory	The company is separate from the territory	The company builds citizenship and is rooted in the territory	The company makes things for the territory, but not with the territory
Type of rationality	Instrumental rationality tempered by rationality according to values	Instrumental rationality	Relational rationality	Instrumental rationality

3. The practices of family-work conciliation in a group of manufacturing companies in the province of Terni (Italy)

3.1. *Premise*

In order to substantiate the existence of major constraints to the implementation of family-work conciliation policies, especially by small and medium-sized enterprises, a special investigation was conducted on a group of companies in the province of Terni, in Umbria district of Italy, which exactly belong to that category. This group is infact composed by 25 artisan companies operating in the field of engineering, mechanics, carpentry and installations, electrical and electronics, industrial automation, assembly, service and maintenance mechanics, non destructive testing on various materials, belonging to the consortium Con. Ar. T. (Ternana Artisans Consortium), a consortium founded in 2004 with limited liability[34]. The consortium aims to design, construction, installation, testing, maintenance of equipment for various industries. Although in most of these companies, because of their membership to capital-intensive, high technology and knowledge-based sectors, female employment is low relative to the total number of employees[35] and mainly concentrated in white-collar functions claiming shifts less rigid than tradesmen (characteristics that would seem to assume that the problem of *work-life balance* is less urgent within these companies), it was decided to investigate them all the same for several reasons.

First, because they belong to metalmechanical sector that, even today, is one of the branches of marked specialization of the industry in the province of Terni, in continuity with the glorious industrial history of the area[36]. For this reason the "best practices" of family-work harmonization that are already in act within them or that cold be undertaken voluntarily as a result of the research, could more easily spread all over the manufacturing environment.

Secondly, the sector of metalmechanics in the province of Terni shows, as ever, a strong attitude to cooperation between enterprises in various forms (agreements, consortia, subcontracting, business networks, etc.).[37] This means an overcoming of

[34] The 22 companies that have actively participated in the research were the following: Bisonni F.lli srl, Bottaro snc Canalicchio F.lli spa, CISIA Ltd, CO.I.MONT snc, COS. MI Ltd., Electro Marine Ltd, Erresse Construction Ltd, Itec Ltd, Le.Al., Mascio Engineering Ltd, mythical Ltd., M.M.C. srl, Monza snc Movi.mat Ltd, Nannini & C. snc PREXISO spa, Rosati F.lli snc, Rossi Brothers Ltd, SET Ltd., R.U.M.I.L. snc, Ternana Impianti srl. For a more detailed overview of the consortium see www.consorzioconart.it.

[35] For a brief overview of the theories of horizontal segregation of women's work see Montesi (2005), pp. 18-25 and Montesi (2009a), pp. 51–54.

[36] "At the time of birth (March 10, 1884) of the Company SAFFAT (Society of blast furnaces, foundries and steelworks Terni), Terni could indeed already proudly boast a tradition of production not only in the steel industry, but also in other sectors" (Montesi, 2002a, p. 209). For a discussion about the signs of the presence in Terni of an *endogenous* steel industry development prior to the emergence of a *polarized* and *exogenous* development driven by the large steel industry that still affects the economic, social and environmental fate of the area, see Montesi (2002a).

[37] See Montesi (2002b).

self-interested and individualistic perspective (instrumental rationality) for a more relational approach (team rationality), and thus is a guarantee of a greater sensitivity and openness to the common good.

Third, the metalmechanical industry has always been in Italy an outpost of advanced industrial relations even after rough and tight negotiations between unions (more or less open to change) and business representatives (more or less enlightened). So this sector has enriched national and decentralized bargaining of economic and social innovation and has always been the pioneer industry of new ways of organizing work and of advanced forms of share economy[38]. From all these elements, at least according to what has been observed in the past, this sector can show a greater receptivity of the problem of conciliating family and work. This sector has been historically an expression of many *Civil* entrepreneurs[39] (think of Adriano Olivetti, who, in the case of reconciling family and work, was ahead of his times[40]). So the membership of the companies to the metalmechanical field, though this sector has not a high density of working women, has for the reasons above illustrated stimulated scientific curiosity, in addition to the character of *artisan* companies which make them more open to Common Good and therefore to the introduction of family-work conciliation policies that are, as discussed above, policies of Common Good. The craftsmens infact do not work exclusively for profit (extrinsic motivation), but also for the pleasure of doing their jobs well and running it well *for others* (intrinsic motivation)[41]. And *work as an expression of love for others* is another of the requirements of the so-called *Civil companies*[42].

Finally, although women are underrepresented in the companies considered, it should be noted that the problem of conciliation involves all (men and women), and attempts at its resolution can contribute to the humanization of life and work of both genders.

3.2. *The methodology of the research*

The research was carried out on almost all the companies of the consortium Con. Ar. T. (22 out of 25) through a questionnaire (to the entrepreneur or to human

[38] Cfr. Montesi (1993) and Molesti (2006).

[39] For the definition of *civil* enterprise see Bruni (2009).

[40] We recall in this respect the steps taken by Adriano Olivetti in favour of motherhood and childhood. They began in 1934 with the establishment, inside his factory, of a nursery and of a children health service. Since 1941 comes into force in the factory a new regulation: the "Female Employment Assistance Olivetti" through which pregnant employees are entitled to enjoy a salary even higher than the salary required by the current laws (almost full salary payment for nine months). The corporate kindergarten, designed with functional and aesthetic criteria of efficiency, it was not just a "baby parking", but an educational organization run by properly trained and highly qualified teachers. See Gallino (2001).

[41] On intrinsic motivation see Frey (2005). As regards the possible conciliation of extrinsic and intrinsic motivation in market's activity see Bruni (2010), pp. 189–197.

[42] See Bruni (2009), p. 152.

resources' manager) that allows to evaluate how much the company is a family responsible company (according to IFR model)[43].

The model is based on four different, but interdependent, elements: 1) *conciliation policies*; 2) *facilitators of these policies*; 3) *conciliation culture* (restraints/ impulses); 4) *results.*

Conciliation policies can in turn articulate in: *policies for working flexibility; professional support policies*; *policies of family services*, *policies that provide extra-wage benefits*.

Facilitators may arise in relation to four areas: a) *freedom climate, understanding and confidence conducive to conciliation*, b) *strategy*, c) *responsibility*, d) *communication.*

Culture refers to maturation of beliefs or practices already established in the company about *time*, *career mode*, *assessment of personal* more or less favourable to conciliation[44].

Results are the amalgam of the three items above and allow the assessment of the status quo with regard to family-oriented business style and permit to outline possible paths of development.

The model aims to achieve the following objectives for each of the four elements mentioned (conciliation policies, facilitators, culture, results).

Element	***Objective***
Conciliation policies	Establish the existence in the company of work-family conciliation policies in four areas related to: flexible working, professional support, family services, extra-wage benefits;
Facilitators	Identify how the management / entrepreneur and the trade-union (if any) put into practice or intend to adopt conciliation policies: 1) creating a climate of freedom, understanding and confidence conducive to them (UNDERSTANDING and TRUST); 2) incorporating, in a structured and codified way, in the company's mission the strategy of conciliation (STRATEGY); 3) making all the staff be responsible for the conciliation strategy (RESPONSIBILITY); 4) communicating inside and outside the company the strategy of conciliation (COMMUNICATION);
Culture	Attest the presence of beliefs or business practices that hinder or encourage the strategy of conciliation;
Results	Measure the impact of the three elements deducing from them the existing corporate style respect to conciliation and the possible evolutionary trajectories.

Source: Sorrenti (2009).

[43] The IFR model has been developed since 1999 by IESE (International Center of Work and Family) of the Business School in Barcelona. For the purposes of this survey, the basic version that has given Sorrenti (2009) was used, making, however, some additions/modifications in an original review of the method.

[44] A corporate culture of long working hours, of physical "presence", of internal competitiveness does not favour the adoption of these policies.

3.3. *Results of the Research*

About the finding of conciliation policies implemented by firms, the survey found that all companies in the group investigated, at least, apply to some measures, but the overwhelming majority of them behave in a sudden, uncodified, unplanned manner in spite of companies' complain about the *difficulties in finding professionals for key roles* (70%), about the *lack of initiative of employees* (20%), the *difficulties in balancing work and family* (10%), the *absenteeism* (10%), the *lack of employee engagement* (10%). These are problems that could find solution through conciliation policies that, in building a corporate reputation, could improve firm's ability to attract and retain the best professional talents, and that rise, with the improvement of family's happiness, productivity and employees' morale and decrease absenteeism. Compared to the wide range of possible policies, companies prefer those that are inherent the *working flexibility* (90%), followed by the *extra-wage benefits* (60%), by *family services* (40%), by *support to professional development* (30%). The strong preference for working flexibility is due to lower cost of the measures of this area with respect to the higher costs of services of other areas. As part of the extra-wage benefits companies focus mainly only on one instrument: the *meal coupons* (60%)[45]. In the area of family services policies are a bit more different, but of modest extent (20%), considering only two tools: *information about school and about after-school activities* and *prevention plan for family health*[46]. Similarly in the case of the support for professional development, where the policies are concentrated only on *training on time management* (30%) and on *career counselling* (20%)[47]. Very articulated is the use, in the area of working flexibility, of a number of instruments that are in order: *leave in case of family emergencies* (90%), *flexible holiday program* (70%), *part-time* (70%), *maintenance* of *the same benefits after long absence from work* (60%), *flexible working hours* (60%), *effort to reintegrate staff after long absence* (40%), *replacement of staff in case of prolonged absence* (40%), *maternity leave beyond statutory minimum* (20%), *possibility of working at home* (20%), *reduced working hours* (20%)[48].

The exam of the role of facilitators reveals that there was not trade union support (because of the dimensional constraints of companies). As for the contribution offered by the entrepreneur or by the management (if any) to the creation of a business-friendly climate of conciliation policies, 60% declared to be *sensitive to the problem of finding*

[45] No trace of the following benefits that could be added, in a complementary way, to Welfare State protection: *life insurance, accident insurance, retirement plan, outplacement services.*

[46] Entirely absent *corporate nursery, the availability of support services, the information about facilities for the elderly and for the handicapped.*

[47] No *actions of personal/familiar counselling, no training on familiar topics, on different working styles between men and women, on possible methods for the conciliation work and private life.*

[48] Almost all of the flexible working options have been exploited by companies. Only these following measures have not been choosen at all: *temporary retirement beyond the legal minimum, leave to cure relatives, half-day off in exchange of a longer working hours in the remaining days of the week.* The non-recourse to the parental leave by fathers is perfectly in line with its low prevalence in Italy.

a balance between work and private life, starting from himself (60% said *that he is a good example of work-family balanced conduct*).

With regard to the formulation of a codified "strategy" of conciliation[49], this has *started* in only 20% of the companies, with the prevision only by 10% of them of an appropriate budget, of a responsible person of the function of work-family balance and of a plan for internal and external communication of the policies.

Corporate culture (beliefs and practices consolidated) seems more open to conciliation in the short than in the medium term. The career of the employee, which is built in an extended time horizon, seems to be affected by the family conditioning occurred. Only a small proportion of companies (30%) states that: "*denial of a promotion or of a transfer by an employee for family reasons does not affect people's careers*". In the short term however, companies are more elastic, they do not make claims that clash with the needs of family members (50% of them say: "*employees are encouraged to go home after a certain time*" and assert that "*employees are not expected to bring work home*"). Corporate culture, as regards the assessment of efforts made by the employees, reveals that 70% of companies "*understand when employees give priority to their families*", while only 20% of firms seems to develop a prejudice considering "*little involved in company's destiny an employee who, for family reasons, has obtained a leave or a reduction of working hours*".

So companies have made various actions of conciliation, mainly in the direction of more working flexibility, which is the area where the instruments of conciliation are more differentiated, though not yet in a strategic horizon. Entrepreneurs seem to be aware of the importance of the problem and willing to face it in a less episodic and more rational way. Only in a minority of companies this awareness has already converted in "strategy" (because of the dimensions of the companies that put constraints, in general, to the introduction also of instruments of corporate social responsibility[50]), strategy that could culminate with the acquisition of a certificate

[49] The strategy should articulate in different next steps: involvement of top management; establishment of an interdepartmental coordination committee composed of directors and employees and places of confrontation between unions and company; determination of needs through a questionnaire administered to employees; processing a strategy that includes policies to be adopted and the tasks of the facilitators (also with allocation of financial resources, accountability and provision of training); development of the manual for the implementation of policies; internal and external application of policies; monitoring, evaluation, improving of the policies according to the results obtained and to the new emergencies.

[50] See Lucchini and Molteni (2004), pp. 89–91. The small size is infact related to the lack of financial resources to invest, the inability to devote staff with specific expertise in corporate social responsibility, the scarcity of time due to the total absorption by the operative management, the regime of subcontracting which does not give an immediate external visibility and therefore does not motivate companies to have social engagement, the bureaucratic burden required by the introduction of formal instruments of social certification in familiar contexts characterized by a low degree of formalization and structuring of activities, the coincidence between ownership and management that makes it difficult to distinguish between individual ethics and company's ethics with the risk that the actions are more the result of *paternalism* or *philanthropy* rather than the result of a conscious strategic choice of the enterprise.

(through the Audit "Family & Work"). The corporate culture has, however, still some small margin of ambiguity, which can act as a brake especially for career development that is perceived in trade-off with a balanced life.

Leading to synthesis all the findings that emerged from the amount, type and degree of differentiation of conciliation policies adopted; from the state of progress, degree of formalization and organizational and financial support given to a more structured "strategy" of conciliation; from the corporate culture stratified in the company more or less inclined to encourage conciliation, four styles of corporate conciliation management can be found.

One can define:

- Style *familiarly irresponsible* the company that fails to take, even occasionally, conciliation policies in any of the possible areas of intervention (flexible working, non-wage benefits, family services, support and career development), where no facilitator is at work, where the culture company is hostile to conciliation;
- Style *familiarly aware* the company that adopts, in large measure, but in extemporary way, conciliation policies, predominantly in one area (working flexibility), with the use in this area of many instruments, where the facilitators show openness and play their role effectively even if limited to a generic promotion of conciliation, where corporate culture is oriented, in principle, to conciliation with a little margin of residual resilience;
- Style *familiarly responsible at embryonic level* the company that is at start-up phase of adoption, in a codified and structured way, of a "strategy", consisting of a variety of conciliation policies in several areas of intervention with the use of numerous instruments, and where, thanks to the facilitators, conciliation is embedded in the corporate mission and corporate culture;
- Style *familiarly responsible mature* the company that has been adopting for a long time a "strategy" of conciliation, with the characteristics described above, which is certified, firmly institutionalized and deeply rooted in the company.

According to this classification we see that 80% of companies can be linked to the style *familiarly aware* and the remaining 20% to the style *familiarly responsible at embryonic level*. No company is part of the style *familiarly irresponsible.* Yet no company is in style *familiarly responsible mature*. The physiological development should see the gradual shift of 80% of companies from the "aware" familiar style to the "responsible at embryonic level" and the transit of 20% of "embryonic" style companies to the "responsible mature" style. This migration may be accompanied and supported financially by public institutions. It should be noted, however, that only 5% of companies are aware of national or regional measures of work-family conciliation.

This evolutionary hypothesis becomes more credible if we look at the responses of the firms, those not yet involved in codified practices, which stated,

with a percentage of 30%, that they want in the future to introduce a "strategy" of conciliation (while 70% said that they are still thinking). Factors that may hinder this intention are in order: excessive financial investments (50%), resistance to organizational change (25%), difficulty of assessing the return on investment (20%), other (5%). These worries so concentrated on money aspects reveal that companies brood an utilitaristic interpretation of corporate welfare.

Since companies widely use tools concerning working flexibility (which could be reconfirmed in the future "strategy"), it is important to investigate the companies' orientation about the implementation of family services and, more specifically, the realization of childhood services, which are usually more in the heart of employees because they are the most difficult to be found in the territory, but they are also the more expensive to be implemented and run by companies even at inter-corporation scale[51].

In this regard, only a quarter of businesses are in favour (25%). Companies that are positively oriented think they could create a kindergarten through an agreement made by the consortium (95%) for the purchase of these services by a non-profit service organization (95%) rather than by a private organization (5%). The companies refuse the possibility of creating the nursery on their own and exclude the possibility of providing a care voucher to their employees.

The form chosen allows to overtake the difficulties and the costs of a direct management of a kindergarten. The governance chosen (an agreement between the consortium and a non-profit) is in line with a pluralistic and subsidiary welfare. In this project, the companies expect more help from: industrial associations (70%), municipality (20%), province (5%), region (5%). From these indication transpires some difficulties in dialogue with public institutions, but they are fundamental.

3.4. *Conclusions*

Conciliation, as keenly realized by the companies interviewed in their request for a strong collaboration among private, public and non profit sector to create childcare services, requires the integration, through practices of concertation, of a *great number of complex systems*: the *companies* that regulate timing, intensity and forms of work organization; the *families* within which time, forms and procedures of housework and childcare-sharing are agreed; the *central government* that, in addition to the implementation of family policies and adoption of laws that reduce or otherwise articulate the working time (part-time) or allow people to have more free time devoted to work (maternal and parental leave), can transpose EU directives on conciliation, provide funding for the promotion of conciliation measures[52], promote social responsibility and certification systems of family's

[51] See Landuzzi (2007).
[52] See Italian Act No. 53 of 2000, Article 9.

responsibility[53], grant benefits to certified companies; the *local government* in its various articulation which sets times, forms, rates, diffusion of social services[54] and of other services[55] and has the function of promoting, supporting, regulating social protagonism in the direction of conciliation; the *trade-unions* and *industrial associations* which, together with enterprises, may arrange territorial or company bargaining with innovative social contents (like for instance the "relational contracts"[56]); the *non profit sector* and the *private operators* who can offer, for various reasons, services (including innovative initiatives) to people; the *social networks* (associations for families or associations of groups of families, time-banks, mutual aid associations, consumers' associations, neighborhood organizations, etc.) that can support families in care services. Only a *systemic* action carried out with a *relational rationality*, in the perspective of *Common Good*, is likely to have significant effects as the German experience of Local Alliances for the family shows us[57]. The experiences of good practice in Italy are still numerically small, geographically concentrated to the Northern and Central Italy, limited to the conciliation of subordinate work in "normal" families rather than oriented to the conciliation of atypical work or autonomous work[58] in "troubled" families[59]. The best examples are confined only in certain worlds, moreover separated from each other (in the private corporate welfare or in the public organizations' welfare or in the non-profit company's welfare marked by practices of dialogue that anyway take place more *intra moenia* than *extra moenia*), aimed predominantly at women, with the almost exclusive use of labouristic instruments (like part-time) rather than of genuine conciliation instruments. Even with these limitations, however, these practices are encouraging signs that, if reconfigured in a more airy perspective of

[53] For an illustration of German and Austrian *Audit Beruf & Familie* and its spread even in the Autonomous Province of Bolzano cfr. Tarroni (2007), pp. 228–242.

[54] For the growing importance of *local* welfare see Maretti (2008) and Montesi and Menegon (2011).

[55] Local government can act in the riorganization of the city (think of the times of entry and the opening of kindergartens, schools, public offices, public services, etc.) or in the improvement of public transport services especially at certain times or in the rationalization of the traffic to avoid congestion or in changes in zoning. For the consultation of shop opening hours is also essential to the contribution of *Chambers of Commerce* and of the *Associations of entrepreneurs.*

[56] The idea of *relational contracts* is to include, in contracts of employment, the variable "family time". These contracts include everything related to the problem of time, from the perspective of conciliation of family-time and work-time, with the possibility of switching money for time to devote to family or for real services supplied by the company to the family. See Donati (2009b), pp. 317–318.

[57] See Tarroni (2007), pp. 230–231.

[58] "The self-employed is characterized by longer working hours and more difficult to be absent, the dependent worker is characterized by more rigid working hours and greater uncertainties about the professional placement and the career's development" (see Pruna 2009, p. 117).

[59] The problem of conciliation is actually more acute for women workers with unstable jobs, for female-headed single parent families due to separation, divorce, bereavement, and for migrant women who can not rely on chains of intergenerational solidarity.

territory, they can go in the direction of a more harmonious development of local communities under the banner of a relational economy inspired to Common Good[60].

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[60] See Zamagni (2007).

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GABRIELA BOLDUREANU[1]

INNOVATIVE ACTIVITIES OF TRAVEL COMPANIES

Abstract: *The development of tourism was done predominantly through product innovation, process innovation, marketing and organizational innovations, new practices of human resources, new approaches to the tourist.*

Following inductive and deductive approach on innovative activities in tourism we concluded that regional, local and tourism companies in Romania must be oriented to the innovative products and services, which will attract new tourists and they will improve the economic performance of enterprises.

Keywords: *innovation, innovation activities, tourism.*

JEL: O310, L83, M130.

Introduction

The innovation phenomenon manifests itself differently depending on the type of activity of the companies or the region within the European Union where they are located. (ADR Vest 2009). In recent years, innovation in the Central and Eastern European countries was modest compared to the developed EU countries and this trend continues to be maintained (CE 2014).

Innovation in a region cannot be reduced only to the introduction of novelty because the access to novelty is favored by political, social and cultural aspects, at the regional level. Thus, the regions must provide an environment that has the most efficient structure, institutions and policies that encourage innovation among the economic operators (Stroie, Bala and Ciocănel 2013). This means that businesses depend largely on the environment in which they operate. Certain regions support innovation more than others creating an environment that facilitates the innovation of the economic operators.

Through a process of investigation and critical interpretation of certain studies developed at a national and international level, and of domestic and international databases, we have analyzed the innovation in tourism. We chose the analysis of the innovation in tourism because the activity sector is highly tendered due to its economic implications, spectacular developments but also its visual and experiential impact (Gabor and Oltean 2015).

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Innovation in travel companies

In a study[2] conducted by the National Council of Small and Medium Enterprises in Romania (CNIPMMR) concerning the Romanian SMEs (Nicolescu, Isaic Maniu 2014 *et al.*), the distribution of SMEs that were part of the investigation, according to activity sectors in 2013 was as follows: trade (34.35%), construction (4.27%), industry (20.08%), services (36.25%), transport (2.74%), tourism (2.29%). We note that the share of SMEs that operate in the tourism sector is 2.29% – the lowest share of all enterprises that were part of the study. Most SMEs operate in the field of services.

Table 1

Distribution of SMEs according to activity sectors in 2013

No.	Activity sector	Share
1	Trade	34.35%
2	Construction	4.27%
3	Industry	20.08%
4	Services	36.27%
5	Transport	2.74%
6	Tourism	2.29%

Source: CNIPMMR, The White Book of SMEs, 2014.

The innovative activities undertaken by the surveyed companies relate to new products, new technologies, new management and marketing approaches, the modernization of the computerization system and the human resources training.

Table 2

Innovative activities of SMEs

No.	Innovative activities	2012	2013
1	New products	37.21%	40.22%
2	New technologies	16.45%	22.94%
3	New management and marketing approaches	19.51%	22.37%
4	The modernization of the computerization system	7.60%	4.97%
5	Human resources training	4.75%	4.97%
6	N/A	37.65%	26.39%

Source: CNIPMMR, The White Book of SMEs, 2014.

[2] The National Council of Private Small and Medium Enterprises in Romania conducted a field research based upon a questionnaire applied to a number of 1569 SMEs from all industries. The sample is considered representative for the Romanian SMEs. This investigation has aimed at achieving the White Book of SMEs for the year 2014 and contains the latest analysis and forecasts on the SME sector in Romania.

On the first place there is the introduction of new products,[3] with 40.22% increase compared to the year 2012 when their share was 37.21%. The new technologies are next, alongside the new management and marketing approaches.

According to the size of the enterprises, most product and processes innovations were implemented in middle-size enterprises while the marketing and management innovations could be found mainly in micro enterprises. The middle size enterprises were concerned about the modernization of the computerization system and training of human resources.

Table 3

Grouping innovative activities in SMEs by the enterprise sizes

No.	Innovative activities	Enterprise sizes		
		micro	small	middle size
1	New products	38.28%	45.56%	55.07%
2	New technologies	19.10%	34.75%	47.83%
3	New management and marketing approaches	23.21%	20.85%	13.04%
4	Modernization of computerization system	4.43%	6.56%	8.70%
5	Human resource training	4.27%	7.34%	8.70%
6	N/A	28.77%	19.31%	10.14%

Source: CNIPMMR, The White Book of SMEs, 2014.

According to the activity sectors the most numerous product innovations are found in the trade sector (48.42%), process innovations in the construction sector (28.36%), marketing and organizational innovations in the tourism sector (47.22%); in the industry sector the most numerous SMEs have focused on the modernization of the computerization system and the tourism sector was most concerned in the human resources training.

Table 4

Grouping innovative activities in SMEs per sector of activity

No.	Innovative activities	Activity sectors					
		Industry	Construction	Trade	Tourism	Transport	Services
1	New products	40.32%	37.31%	48.42%	27.78%	23.25%	34.80%
2	New technologies	24.76%	28.36%	20.59%	13.89%	13.95%	24.78%
3	New management and marketing approaches	17.14%	22.39%	21.34%	47.22%	18.50%	24.96%
4	Modernizing the computerization system	7.62%	4.48%	2.78%	2.78%	2.33%	5.98%
5	Human resources training	6.67%	4.48%	2.97%	8.33%	6.98%	5.62%
6	N/A	25.40%	29.85%	27.27%	22.22%	46.51%	24.43%

Source: CNIPMMR, The White Book of SMEs, 2014.

[3] The study does not specify whether the products are new to the company or to the market.

We note that in the tourism sector the most numerous innovations were organizational and marketing in nature (47.22%), followed by the product innovations (27.78%) and the process innovations (13.89%). A percentage of 8.33% of the SMEs in the tourism sector have implemented new methods of training human resources and the modernization of the computerization system is found in 2.78% of the SMEs.

In the tourism sector there is a percentage of 22.22% of the SMEs where no innovative activity was carried out.

Table 5

The share of the income form innovative products per activity sectors of SMEs

No.	The share of income from innovative products	**Activity sectors**					
		Industry	Construction	Trade	Tourism	Transport	Services
1	0%	42.49%	38.81%	39.33%	41.67%	45.51%	34.34%
2	1–5%	24.76%	16.42%	19.85%	11.11%	18.60%	17.93%
3	6–10%	8.89%	17.91%	12.43%	16.67%	4.65%	9.67%
4	11–20%	12.06%	17.91%	16.88%	25.00%	13.95%	17.22%
5	21–50%	8.57%	5.97%	7.05%	0.00%	6.98%	6.85%
6	51–75%	2.22%	1.49%	3.53%	2.78%	4.65%	2.64%
7	Peste 75%	0.00%	1.49%	0.93%	2.78%	4.65%	0.35

Source: CNIPMMR, The White Book of SMEs, 2014.

If according to the numerical share of the SMEs which have implemented new products we can notice some progress, things are different when it comes to the share of revenues obtained from innovative products per SMEs's activity sectors.

If the innovative products were implemented in SMEs in percentages ranging from 23.25–48.42%, we can notice that between 35–45% of the SMEs had zero results from the product innovations. Only 4.65% of the SMEs operating in the transport branch have reported a share over 75% of revenues from innovative products.

In the domain of *tourism* if 27.78% of the SMEs stated they have implemented in their companies product innovations, 41.67% of them have earned zero income from innovative activities 11.11% of them have earned income between 1–5%, a percentage of 16.67% of SMEs have earned income between 6–10%. The most numerous travel companies (25%) have earned income from product innovations between 11–20% and no company earned income between 21–50%. An equal percentage of 2.78% of SMEs have earned income either between 51–75%, or above 75%.

These results are not encouraging, therefore the local and regional authorities and the travel companies should be oriented towards innovative and experiential

products and services which will attract new tourists and will improve the economic performances of enterprises.

To achieve this, it is absolutely necessary: on the one hand to redefine the current offers/products/services of Romanian tourism areas/companies and to transform them according to the requirements of the tourism market; on the other hand, the implementation of innovative and experiential products and services to attract new tourists (Unione Appennino e Verde 2013).

Remodeling existing offers

Nature and environment

The "nature" element refers to anything that the tourist area can provide: excursions, visits, active holidays that bring benefits to tourists (physical, psychological and spiritual benefits). In order to value the natural environment, the tourism companies should consider the following:

- correctly addressing the natural environment;
- to guarantee that tourists visit beautiful places with relaxing landscapes;
- to ensure tourists that they can access a mix of services: from the opportunity to practice sports, to enjoy cultural visits to child-specific travel services;
- to ensure tourists experience genuine local traditions that allow them to discover historical centers providing a strong suggestive and emotional experience;
- the accommodation structures should provide a series of innovative services: from e-biking to photography courses; from backcountry hiking to wolf watching, etc.

Active holidays

The active holidays means more than a mere opportunity provided by a particular tourism area, a series of sports that can attract tourists by geographical areas: from cycling to trekking, from mountain bike to hydro speed, from alpinism, paragliding to cannoning.

The tourism product development includes:

– creating conditions to pursue a sporting activity (e.g., the presence/ construction of bike lanes);
– travel service management, the collaboration between all factors that can lead to the implementation of the tourism service: sports associations, local and county administrations, specialized tour operators, NPOs, by organizing events and competitions and so on.

Valuing local and regional enogastronomy

The quality of the Romanian wine and local traditional culinary products is well known. Therefore the innovative aspect must be *experiential.* A novelty element for valuing the oenology and the local and regional gastronomy is the restructuring of the offer: from the consumption of genuine traditional products to cooking classes lead by chefs, to collecting mushrooms and berries, from visiting companies and tasting products and wines to attending enogastronomic events. This will generate unique experiences to each tourist.

Culture value

Culture means the history, tradition and identity of a people and the cultural services should be experiential. Tourists should experience new historical and cultural locations. The local and regional cultural value and its transformation into an innovative tourism product does not require large investments but rather involves the valuing of that specific areas so that the experiences provided to tourists by visiting monasteries, historical locations and their interactions with the locals are unique.

Local handicraft items

The local handicraft items are those sophisticated and unique factors that are related to the traditions of an area and which appeal highly to the tourists who are in search of memorable experiences (discovering ancient crafts and related products).

In this context the important element is related to the opportunity to live experience through the direct contact with the "artisan tradition bearers" which means not only visiting handicraft workshops for production or marketing but also living peculiar experiences by listening to historical stories specific to that site and the making of artisan products (under direct observation/monitoring of craftsmen). This formula is of utmost tourist attraction and can be filled with gourmet and cultural items specific to that area.

SPA tourist services

It refers to a mix between the SPA services of a tourism company and in addition the experiences a specific tourism area has to offer. In other words, the tourist should find in those services the things he cannot experience in his daily life: a different natural scenery, unique landscapes, and so on.

Experiential tourism services

The most important industry that generates great experiences is the tourism industry. Tourists today are seeking meaningful and memorable experiences. An experience created by a unique event increases the chance to turn tourists into loyal tourists that wish to repeat experiences (Niculescu 2014).

Joseph de Pine and James H. Gilmore (1999) in the work *Experience Economy* argue that people are more willing to spend their money not on consumer goods but on services that enable them to enrich their memorable experiences.

The concept of "waiting for experiences" (Niculescu 2010) has a high affinity to what the entertainment and leisure industry offers to its clients. In theme parks workers are called "actors", the visitors are called "guests" and the park is the "scene" for visitors to live their experiences. The travel companies should focus strongly on improving the experience of visitors and tourists and value the tourism potential in new ways which involve the visitors and tourists themselves.

The tourism and leisure sector is an important part of the "experience economy". Whatever the motivation for a holyday or a family day, everyone is looking for good, unforgettable experiences.

Conclusions

The analysis indicated that Romania is a modest innovator, as shown by the studies and documents prepared by the European Commission.

In order to promote coherent innovation policies, the *National Strategy for Sustainable Development Horizons 2013-2020-2030* provides a series of measures which will reduce current gaps compared to the EU average in the field of SMEs innovation, namely:

- introducing a system of cross-coordination of innovation at national level;
- creating a portal for businesses, especially SMEs;
- launching partially subsidized programs for training and management in the sector of innovation and the development of technology transfer units (from patent to product, service or process) within schools and reserach units as a prerequisite for the formation of scientific and innovation clusters.

The investigation of the tourism sector and tourism companies highlights a discrepancy between implemented innovative activities and the performances of these activities.

To revive the tourism sector the local and regional authorities alongside tourism companies should be oriented towards innovative, experiential products and services that will attract new tourists and will lead to an improvement of the economic performance of enterprises.

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PROJECTS IN HERITAGE TOURISM DEVELOPMENT – AN INTEGRATIVE APPROACH

Abstract: It is not new that cultural tourism, based on heritage elements, represents a strategic orientation for the economies of many countries, including the emerging ones. The problem that prevalently occurs is the operationalization of this strategic direction and finding the most appropriate ways to generate sustainable initiatives in this field. For the touristic valorisation of the cultural heritage, extremely diverse projects are being initiated and supported. The success of these projects, seen in the light of the approach sustainability, is decisively determined by a series of correlated factors that can be customized for each project. Our approach is integrator and is based on the following information: the use of a multi-player model with the identification of the role and types of actions specific to each party involved; sequentiality, by taking into consideration the on-going stages of the project, the catalysts and their constraints; vertical integration, by analyzing in tandem the strategic, tactical and operational factors; the temporal comparative analysis by highlighting the evolution in time of the strategic pillars, the constraints and problems specific to the cultural tourism. Our study, based on a qualitative research, aims to highlight the catalysts and the main constraints in the operationalization of the development strategies of the cultural heritage tourism and the formulation of actions intended to support this process. The paper is structured as follows: highlighting in a comparative manner the strategic directions related to development of tourism sector, and especially for one of its branches – the cultural heritage, the main types of projects that sustain the development in this area, the analysis of relevant impact factors and the presentation of specific recommendations. The conclusions show the importance of a long-term, participative regulation framework in the touristic valorisation of heritage resources.

Keywords: strategies, projects, resources, heritage tourism.

JEL: L83, M14, O22, Q01.

1. Introduction

The explosive development of touristic activity significantly highlighted the importance of territory planning and landscaping; governments and governmental agencies in the field of tourism did not miss the chance to decide on the aspects related to touristic development. There are few countries that nowadays do not have a national plan of territory landscaping and that did not transfer in tourism their planning and landscaping concepts. The planning of tourism development at national, regional and local level was generalised in the second half of the XXth century (Hall, 2008, p. 51), when it was obvious that tourism was about to become a first-rate

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socio-economic activity, which could provide both benefits and severe problems. Taking into account the area's peculiarities – long-term orientation and impact, multi-sectorial approach, extreme fragmentation of actors involved (Edgell, Allen, Smith, Swanson, 2008, p. 19), complexity – the planning level considered the most adequate was the strategic, national one. For the operationalisation of these strategic directions, the organisational initiatives or the project-based partnerships were essential. Tourism based on natural and cultural heritage, which is so diverse and arborescent, is a main pillar of strategic approaches; the integration of the extended framework, of the multiple facets involved, was also performed at conceptual level when Jafari defined tourism with reference to the impact produced: tourism is not seen anymore in light of the industry and actors responding to the different needs of the tourists, but through the impact of tourists and industry on the complex environment of touristic destination. (Smith, 2010, p. 2). For the touristic valorisation of the natural and cultural heritage, extremely diverse projects are being initiated and supported. The success of these projects, seen in the light of the sustainability approach, is decisively determined by a series of correlated factors that can be customised for each project.

1.1. *The benefits of planning in the touristic development*

In order to optimise the benefits of tourism and to prevent or at least mitigate the problems that might arise from the mass tourism, good planning and careful management are essential. Tourism planning is needed at least for the following reasons:

- Orientation/support of development in the long run: providing guidelines for the development of this sector, in the areas where tourism is a relatively new field; modernization and rebirth of existing touristic areas which are in decay or inadequately developed; new touristic areas may as well be planned enabling subsequently flexibility in development.
- Sustainability/social responsibility: correlating the tourists and products' markets through the planning process without compromising the environmental or the socio-cultural objectives; optimising the benefits and preventing or diminishing the socio-cultural problems, using the tourism as a means of performing the cultural preservation goals; determining the optimal level of tourism which will not result in environment degradation and using tourism as a means to attain the environment protection objectives; guaranteeing that the cultural and natural resources for tourism are perpetually preserved and are not destroyed or degraded in the development process.
- Integration/functionality: an integrated development in order to serve tourism and general needs, taking into account that tourism is a complex, multisectorial, fragmented activity, involving other sectors such as agriculture, fishery and production, elements belonging to the historical heritage and leisure spaces, various facilities, community and transport services as well as other infrastructure elements; optimisation of various direct and indirect economic benefits provided by tourism by means of

careful and integrated planing; correlation of touristic development with human resources, owners of skills and specific competences; in order to ensure these human resources, education and proper training are needed, performed within specialized training facilities; integration and insurance of coherence of the network formed of special organisational structures, marketing strategies and promotional programs, legal framework and regulations as well as fiscal measures; providing a rational basis for sequencing the development, which is important both for the public and private sector, being used in planning their investments.

Basically, planning provides flexibility to the new areas and contributes to the rebirth of traditional destinations found on a decay slope. Through planning and appealing to the imagination and action possibilities of the multiple partners interested in touristic development, older touristic destinations have been maintained and sometimes revigorated while the current planning approaches are oriented towards the maintenance of continuous vitality of the newly developed destinations. In fact, the evolution of touristic destinations may be anticipated and through planning and creative resource management they do not have to witness decline. Experience has proved that regions, communities and countries substantially benefit from a corresponding planning of tourism and this trend will be maintained. In a world characterised by a highly competitive tourism, which is also preoccupied by keeping its touristic resources, the most successful touristic destinations from the point of view of tourist satisfaction and substantial benefits with minimal disturbance of local economy, environment and society will be those which have the best planning of tourism development.

1.2. *Analysis of the strategies of touristic development*

Tourism represents a priority orientation in many regional, national and international development strategies. Derived from the organisational management theory, the touristic development is declined by the following three strategies (Erdeli, Istrate, 1996, p. 14):

- the flexibility strategy or that of evolutionary structures, which implies a permanent adjustment to the tourists' requirements, the touristic area being landscaped in a polyfunctional manner; it characterises especially the areas with reduced touristic potential, which can spend small amounts of money on tourism investments; the main development guideline is given by infrastructure which needs to be at an adequate level, with effects in the increase of valorisation efficiency and development of touristic offer;
- the difference strategy focuses on originality in touristic buildings (namely the architectural ones), in the products and services offered; it is a strategy specific to marketing; in the field of landscaping, the direct influences reside in the sizing and placing the touristic suprastructure according to the key-element of the area; generally it is accepted that the central element of development needs to have at least one regional recognition;

- the diversification strategy, specific especially to the area where we can speak about a tourism industry; it focuses on the amplification of equipments and devices connected to additional services; it implies attractions and diverse leisure forms, the existence of diverse access roads, the existence of luxury accommodation and restaurants etc.

The visions resorting from these strategies are extremely rich, aiming to obtain a place on the international tourism market through the persuation of potential tourists of the security of touristic destination: for instance, the vision of touristic development of Albania focuses directly on the concept of "safe destination", as well as on the sustainable approach of development (ecological and social), starting from the variety of cultural and natural attractions and from the easy access of European markets providing tourists (Strategy and Action Plan for the Development of the Albanian Tourism Sector Based on Cultural and Environmental Tourism, December 2005, p. 4) as well as consolidation positions of the dominant place on the international tourism market: Turkey has as strategic goal being one of the first 5 countries in the world from the viewpoint of gains obtained from tourism and number of tourists until the year 2023, counting on the consolidation of its brand as a top world touristic destination (Tourism Strategy of Turkey – 2023, p. 4).

The strategic options for achieving these visions are in their turn, diverse. They differ from one country to another, according to the differentiating position adopted, but they also differ from one stage to another even though the long-term orientation in tourism is an essential feature of success. What they have in common is the clear orientation towards the valorisation of the tourism cultural component and the sustainable approach of development. From the strategic documents in the tourism field at the level of European Union, we may clearly notice the passage from the prioritization of information networks and stakeholders' involvement (2001) to a position centered on cultural and natural patrimony (2010). Thus, the main element and the central issue of preoccupations in the European touristic development for the year 2001 is represented by the fragmentation of the parties involved in the field and the possibility of correlation and coordination of their efforts: the EU strategic documents directly assert the importance of tourism from an economic and social point of view, given the multitude of involved stakeholders in the public, private and civic society sector as well as a high level of decentralization until the level of local authorities (Commission Communication to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions, Brussels, 2001, p. 3). From this perspective, we believe that the action of continuing and improving the running projects in tourism, at European level, represent an economic and social priority.

The first strategic orientation falls into this key-element: the approach through the knowledge management, efficient use of available information, know-how transfer, sharing and use of best practices in the field and the development of new, innovative products, adapted to target-markets. It is obvious that the effort of knowing the actors and stakeholders relevant for the touristic industry remains highly necessary (Commission Communication to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions, Brussels, 2001, p. 9). In the

following years, the strategic focus moved gradually towards the sustainable approach of development, reaching in 2010 the highlight of the natural and cultural heritage in the building of the European touristic model: tourism is perceived as a model capable of proving in a clear manner the success of the sustainable approach and as an efficient instrument of designing at global level the European value system, based on hundreds of years of intense cultural exchanges, of encouraging diversity and creativity (Commission Communication to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions, Brussels, 2010, p. 2). Thus, according to a new, modern, sustainable-oriented vision, tourism will become the sector in which the actions and preoccupations of ethical, cultural type as well as those promoting the heritage values will harmoniously blend into the economic ones.

In their turn, priorities are adapted to this vision: the increase in competitiveness of the European tourism, the promotion of a sustainable, high quality tourism, the strengthening and develoment of a coherent image of Europe as a destination with multiple attractions poles; the facilitation of development and implementation in an efficient manner of EU policies and mechanisms in the field of tourism (Commission Communication to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions, Brussels, 2010, p. 7). In the strategic plans at national levele, we notice the same preoccupations to valorise the specific touristic heritage and to include sustainable aspects. For example, a strategic, multi-faceted plan for French tourism was drawn up in 2008. The strategic choices are: to conquer growth segments; to increase tourist expenditure; to develop sustainable tourism which respects the balance of nature and the French living environment; to make tourism a priority for everyone. (France Tourism Report, 2008). Even when some strategic plans, starting from major deficiencies registered in the tourism systems, lose their strategic concentration and aim at extremely various goals, the first ones which are aimed at are those related to the patrimony valorisation and sustainable development. For instance, the Master Plan for National Tourism Development 2007–2026 in Romania includes 25 objectives, of which the second one stipulates: “Insurance of a sustainable development of tourism in a way that it’s environmental, cultural and heritage richness’s should be equally appreciated nowadays and preserved for the future generations” (Master Plan for National Tourism Development 2007–2026 from Romania, p. 163). Due to the justified increase in the interest in cultural and environmental degradation resulted from different practices, the sustainable development approach starts to be accepted by the private sector and is included in the organisational development projects.

2. Analysis of the development projects of heritage tourism

The concrete initiatives in the development of tourism heritage, materialised in projects, can be analysed according to several criteria. We chose a constructive approach, oriented towards the criteria that may lead us directly to the identification of success factors and the problematic ones in the running of projects as well as to

shaping recommendations for future projects. Our qualitative research uses various methods and instruments: documentation based on progress reports and presentation documents of over 40 projects; participative observation through direct involvement of authors, as experts, in 5 projects aiming, directly or indirectly, at actions specific to the development of heritage tourism; focus-groups and workshops with specialists in the field of tourism on the issue of project efficiency and sustainability.

2.1. *Presentation and classification of heritage tourism development projects*

At the level of the European Union several important initiatives in the development of heritage tourism have been proposed and implemented, under the form of unitary, multi-annual projects, which supported in their turn specific projects. We will detail in what follows the most significant initiatives of this type.

- **Cultural Routes programme** of the Council of Europe – comprises 29 certified Routes that cover 70 countries. The most important projects included in this programme belong to France, Italy and Spain (each with over 8% of the approved projects from the programme), Portugal, Germany and Great Britain (each with over 5%). The other European countries make up the 3 groups with percentages comprised within 0.6 and 2.6% each, having a significant potential to develop new routes in this programme, individually or by groups of countries with cultural similarities. Routes developed around some key, defining cultural identity elements are appreciated and they may be the basis of a differentiating strategy at global level. The cultural paths constitute the umbrella which can host the initiatives of conservation and promotion of relevant cultural objectives at regional and local level, which, without this support, would face serious difficulties in finding financing resources. The projects financed in the last 2 years include diverse themes and multiple partners as it can be observed in Table 1.
- **European Destinations of Excellence –** a project oriented towards the support of sustainable, multiple initiatives at European level. The project is based on a yearly selection at the level of each participating country, of excellence destinations which will be later on promoted in a centralised manner at the project level. The topic established for each year is different even though the main criterion is that of non-traditional destination (concept also defined through a reduced number of visitors in that area in relation to the national average). Other criteria taken into consideration refer to proving the sustainable feature of the destination, the existence of an extended partnership between local public authorities and all other private actors involved in supporting the destination, the existence of a clear strategic orientation of that respective destination, supported by means of a formal managerial structure and presenting a sustainable focus. The themes specific to the last years, the criteria pursued in the selection and the rewarded destinations are presented in Table 1.

Table 1

Projects in the framework of Cultural Routes Programme

Project title	**Initiator / number of partners**	**Objectives and actions**
The European Route of Cooperative Culture (COOPROUTE)	CECOP-CICOPA Europe (Belgium); 17 partners	– to diversify the offer of tourism products and services in Europe by benefiting from and giving value to a shared cultural heritage, namely the European Cooperative Culture – to have a significant contribution to the creation of jobs, especially for the declining industrial areas and appeal to extended and long-term partnership initiatives at regional or national level.
Cultural routes in the Middle and Lower Danube Region	Danube Competence Center (Serbia); 7 partners	– to contribute to the diversification of the tourism offer in the Middle and Lower Danube region by promoting cultural tourism and cultural routes equally putting into perspective common but unique European heritage of the Roman period and wine culture
European Astro-Tourism Route	Spet Turismo de Tenerife (Spain); 7 partners	– to draw a route of astronomical sites in Europe giving value to our Astronomy Heritage – binding new expectations of active leisure and the infrastructure that Europe has in the field of astronomy
Liberation Route Europe Experience the diversity and unification of Europe through the WWII Cultural Heritage Landscape	Arnhem Nijmegen City Region (The Netherlands); 7 partners	– give new meaning to the Second World War as part of our common European history and as the start of a new form of European cooperation, in an age where personal memory of the war is turning into history. – link the locations which are currently much visited as places of remembrance to places that are much less known to the larger public – and thus to enable to experience the series of events that took place across Europe in 1944-1945 as individual parts of one encompassing European history.
TECH-TOUR Technology and tourism: augmented reality for the promotion of the Roman and Byzantine itineraries"	Unioncamere del Veneto – Eurosportello Veneto; 11 partners	– promoting two EU trans-national routes by applying ICT technology (Augmented Reality) – promoting the EU trans-national routes based on cultural and historical common heritage by strengthening EU identity and favouring intercultural dialog especially including old, new, candidate and potential candidate countries (Italy, Slovenia, Croatia and Serbia).

Source: Adapted from http://ec.europa.eu/enterprise/sectors/tourism/cultural-routes/index_en.htm.

As it can be noticed from the information presented in Table 1, the projects run within the Cultural Route Programme cover various and multiple interest areas which, although apparently independent from the standpoint of a sustainability analysis, are complementary. We also notice the great number of partners involved in these projects, coming from different countries and this is a new proof of the importance of international cooperation in tourism, fact which attracts the motion and the balanced and fair development of touristic sector through the valorisation of heritage and cultural elements of each country.

Table 2

The rewarded types of destinations for "European Destinations of Excellence"

Year / specific theme	Criteria	Examples of rewarded destinations
2007 / Best Emerging European Rural Destination of Excellence	Destinations that have supported the development of rural tourism offer by valuing their heritage, creating and offering new products and services and improve the dissemination of visitors to seasons.	11 rewarded destinations, from different countries (for example Austria – Pielachtal, Cyprus – Troodos, Latvia – Kuldiga, Malta – Nadur, Romania – Buzău Land).
2008 / Tourism and local intangible heritage	Destinations that have inherited traditions kept over time were, able to bring people closer to the communities they live providing them with a sense of identity and continuity (culinary traditions, handicrafts, local arts and rural life).	20 rewarded destinations, from different countries (Bulgaria – Belogradchik Estonia – Viljandi; France – Route des vins du Jura; Grevena (Greece); Hungary – Hortobágy; Romania – Horezu Depression).
2009 / Tourism and protected areas	Destinations as natural parks and another protected areas and their adjacent areas where economically viable tourism product has been developed using the protected area as a valuable asset, all while respecting the protected environment and accommodating the needs by local residents and guests	22 rewarded destinations, from different countries (Belgium – Viroinval / Viroin-Hermeton Nature Park, Czech Republic – Bohemian Switzerland, Ireland – Sheep's Head peninsula, Italy – Marine Protected Area "Penisola del Sinis - Isola di Mal di Ventre", Luxembourg – Recreation area and nature reserve "Haff Réimech", Commune of Schengen, Poland – The Bird Republic in the Warta Mouth, Romania – Apuseni Nature Park).
2010 / Aquatic Tourism	Destinations that promote innovative approaches for their aquatic tourism offer in order to solve the seasonality problems, to increase the quality of environment and to rebalance the tourist flows from the most famous and crowed tourist destinations (tourist coastal, lake and riverside destinations).	25 rewarded destinations, from different countries (Croatia Nin, Finland – Saimaa Holiday, Germany – Western Pomeranian River District, Greece – Prefecture of Serres, Iceland – The Westfjords region, Poland – The Biebrza Valley and Wetlands – Wildlife Sanctuary, Romania – Geoagiu Băi, Slovenia – River Kolpa).
2011 / Tourism and Regeneration of physical sites	Destinations which have realized the regeneration of a physical place of their local heritage, have created a special tourism product and turned into a tourist attraction to get a multiplier effect by using resources obtained in other regeneration projects.	22 rewarded destinations, from different countries (Belgium – Marche-en-Famenne, Estonia – Lahemaa National Park Manors, France – Roubaix, Hungary – Mecsek, Italy – Montevecchio, Municipality of Guspini, Malta – Għarb, Netherlands – Veenhuizen, Portugal – Faial Nature Park, Romania – Alba Iulia, Spain – Trasmiera Ecopark).
2013 / Accessible tourism	Destinations that are a barrier-free locations (holding developed infrastructure and facilities), that are accessible by transport means appropriate for all users; services are of high quality and well trained staff is involved; events are intended for broad categories of guests; information about destinations are accessible to all users.	19 rewarded destinations, from different countries (Austria – Tiroler Oberland – Kaunertal, Czech Republic – Lipno, Ireland – Cavan Town and Environs, Italy – Pistoia and Province, Romania – Jurilovca, Slovenia – Lasko, Turkey – Taraklı District).

Source: Adapted from http://ec.europa.eu/enterprise/sectors/tourism/eden/index_en.htm.

Many other projects aiming tourism development, heritage tourism in particular, can be highlighted at national level. The information synthetically presented and systematized in Table 2 highlights the level and quality of assessments for the most relevant specific activities performed within certain touristic topics focused on varied and attractive fields (heritage elements, protected areas, aquatic tourism etc.). Thus, one can observe the diversity and large geographical spread of touristic destinations which have been of interest and therefore awarded according to the criteria established by the European Destinations of Excellence. Romania has been recognized as an excellence touristic destination, namely for its natural, historical and ethnographic heritage starting with the year 2007 until 2013 inclusively.

2.2. *Success factors in the performance of the development projects of heritage tourism*

When analyzing the parameters of the successful projects presented, following up the progress reports of the projects and programs and classifying the factors identified by workshop and focus-group participants as being determinant for the success of the projects, we selected and analysed the following items correlated with project efficiency and sustainability.

- *The quality of the partnership*. Not only the simple existence of a partnership or the complementarities of the actors involved in the project, their relevant experience regarding the project goals and actions, the potential previous mutual initiatives of the partners are the features indicated as essential in the successful implementation of the project. The partnership becomes critical in relation to other fields due to the offer complexity and fragmentation. The key-actors in tourism may be grouped in the following categories (Mason, 2008, p. 113–114): the tourists; the population welcoming the tourists; the travel and tourism industry; governmental entities and agencies (from local, regional, national and international level). The tourism industry in its turn can be structured in several homogeneous components; one of the most comprehensive typologies (Middleton, 2001, p. 11) including the sectors: accommodation, attraction, transport, travel organizers, destination organizations. The partnerships in major projects including actors in the 3 basic sectors (public, private and non-profit) must overcome organisational and national cultural barriers and benefit from a real “communicational athletism”. The obstacles perceived by the partners are connected with reduced organisational and financial capacity for public authorities, lack of continuity and credibility for NGOs, narrow, niched orientation for SMEs. An additional issue is represented by the abidance of partners’ role in the projects, in compliance with the competences and support possibilities after the end of the project. Thus, at governmental level certain projects were proposed for touristic tours with a high level of attractiveness at international level (Dracula Circuit, The Red/Communist Circuit, Danube cruises,

the Circuit of fortresses from the capital etc.) but all of them remained only proposals. The private environment underlines that the authorities can help with the implementation of some touristic circuits in their promotion and infrastructure but the final decision belongs to the private environment which subsequently supports the touristic offer.

- *Promotion of authenticity*. The authenticity of a touristic event or a product remains an extremely important problem when we define and implement the touristic development projects. Authenticity is a feature appreciated in the touristic products, represented by the construction and design elements, food and beverage, music and dance, arts and crafts (Jafari, 2008, p. 5). The specific conditions where projects are planned and run – a relatively short period of time for the offer making, limited budget, constraints from financers – lead to pressures on this feature.
- *Orientation to the stakeholders' priorities*. Another important aspect is the project direct orientation towards the strategic priorities of programs; sustainability is much more easily supported when these priorities coincide with those of the stakeholders, who will be anyway involved in subsequent activities. For instance, in the touristic landscaping of urban centers, the residents's requirements may be harmonized with those of tourists by paying increased attention to detail elements. Thus, the human size of cities becomes a central preoccupation of urban planning (Gehl, 2012, p. 4), contributing to the consolidation of a memorable, complete experience for the visitor. The tendency to "miss out the stages" and the correlation only with the program priorities and not with those of communities led in the rural environment to projects with poor sustainability and non-adequate investments (parks, bike tracks).
- *The promotion of interaction in the touristic offer*. Although the cultural essence of the touristic attraction – the need to preserve unaltered the traditions and the prevalence of the conservation principle for architectural sights – arises problems in the process of merchandising the cultural touristic products, the tendency to involve tourists in activities and events is motivated by their increased interest in this type of actions, by the active profile of most tourists and by their contribution to the creation of long-lasting memory on the touristic destination having as an effect the wish to come back. The involvement can be superficial – the tourist is spectator to parades, reconstruction of historical events, open air plays on historical or cultural topics or it can be profound – the tourist becomes a part of the reconstruction of the historical or cultural moment through his direct involvement in actions specific to times of yore or to the representative culture for the destination visited.

3. Conclusions

The initiatives of project-type tourism development ensure the much needed changes in this sector characterised by dynamism and permanent adjustment to the

tourists' requirements. The short-term orientation of projects is the feature that calls for the most important threats for project success, opposing the long-term orientation specific to the touristic field. The performance of project consortia within permanent structures such as networks, the insurance of a participative framework needed to identify the community's priorities and preserving and promoting the authenticity are among the recommendations that may ensure the long-term success of a project.

There is a very fragile balance between economic success of a touristic destination initiative and its sustainable side – ecological and social. When the support of project-type initiatives is performed by means of a complex umbrella of medium and long-term European financed programmes, substantiated through studies mixing very diverse and sometimes opposed points of view of the stakeholders which are relevant in the touristic field from the public, private and civil society sector, the success of the projects is guaranteed. A successful project in any field is defined as having met the essential parameters: it reaches the planned outcomes in the forecasted timeframe and without exceeding the allocated budget. The European Union promotes on its pages dedicated to financing the successful projects as being defined by more than that: their sustainable feature and the mandatory impact on the development of the community are the elements at the basis of their inclusion in this category. The projects financed through European programmes in the field of tourism are to a considerable degree in the list of successful projects namely due to these very important features in the sustainable development at different levels.

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ION ANTONESCU[1]

PREMISES FOR CREATING THE DATABASE AND KNOWLEDGE BASE OF AN EXPERT SYSTEM FOR DYNAMIC MANAGEMENT OF RENEWABLE ENERGY RESOURCES UNDER UNCERTAINTY CONDITIONS

Abstract: *The paper presents the concepts and methods for the design and generation of the database and knowledge base of an expert system aimed to help the manager to trigger optimal decisions to economic and technical problems in the field of renewable energy under uncertainty and risk conditions. The database structure, the necessary fields and the data sources for renewable and non-renewable energy sources and generators are presented. The structure of the knowledge base and some decision methods and techniques used by the inference engine in order to connect the database and the knowledge base for generation of an optimal decision are also depicted.*

Keywords: *renewable energy, database, knowledge base, expert system, dynamic management.*

1. General concepts on energy, dynamic management and expert systems

Human kind uses two types of energy: intra metabolic energy originating from food and allowing the body to operate, and extra metabolic energy, allowing deployment work in most sectors of human activity: transport, water supply, agriculture, industry, construction, trade, etc. and having a significant impact on various social issues such as: environmental protection, health, national security, poverty, education and standard of living.

Energy management can have different meanings. From the economic point of view, the most general definition of energy management is judicious and efficient use of energy to maximize profit (or minimize cost) and enhances the competitiveness of a company.

There are two main objective of a energy management system (Warnier, van Sinderen and Brazier, 2010):

- The system should minimize the total energy consumption;
- The system should minimize the energy fluctuations.

These two objectives can be in conflict. Energy providers can prioritize one over the other by providing incentives.

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The energy management system's objectives provide the following system's requirements:

1. The system should be flexible enough to optimize either of the two objectives; minimize the energy consumption or minimize the fluctuations in energy consumption;

2. The system should be able to adapt its behaviour at runtime and change the main objective, depending on feedback from the environment;

3. The users should be able to customize the system to their specific needs, setting limits to the adaptive behaviour of the system.

The global resources of classic fuels are depleting and have non-uniform distribution. The use of classical fuels is also associated with various risks such as pollution and global warming. It emerges the necessity of partial or total replacement of conventional energy systems with systems that use renewable energy sources. The scientific research in the field of renewable energy is growing faster, fact proved by the great number of patents, which have also an impact to the classical energy sources based on fossil fuels (Noailly and Shestalova, 2013).

In this context arises the need for a management of renewable energy sources.

Since the use of both renewable and classical energy sources is a process with a high degree of uncertainty and risk, energy management should be a dynamic management.

Dynamic management is a kind of management that takes in account uncertainty and risk and enables the change of its objectives accordingly to them. It can provide fast responses in case of critical situations, according to real-time adaptation processes executed by direct owners having access to knowledge of their enterprises.

Implementation of dynamic management without the help of computers is hard to achieve since it requires a large amount of work to meet the objectives of the current processes in real time. There are two classes of applications that can help the implementation of a dynamic management:

- Decision Support Systems or DSS;
- Expert Systems or Knowledge-Based Systems.

Decision support systems (DSS) are computer-based information systems that provide decision-making support activities in economic or organizational. A DSS system can serve management and planning services of an organization to help make decisions, to solve problems whose data can change quickly and are not specified in advance (unstructured decision problems and semi-structured).

Expert systems are computer programs that can reproduce the behavior and decision-making mode of a human expert to solve specific problems of a particular domain. They are specific generation computers will. In expert systems interconnections between data processed are made to meet a set of rules contained in a knowledge base of the system.

The most important component of an expert system is the knowledge (Tripathi, 2011). The power of an expert system resides in the specific, high-quality knowledge it contains about the task domain. In expert systems, knowledge is separated from its processing, i.e., the knowledge base and the inference engine

come apart. A conventional program is a mixture of knowledge and the control structure to process this knowledge. This mixing leads to difficulties in understanding and reviewing the program code, as any change to the code affects both the knowledge and its processing.

Expert system contains a knowledge base having accumulated experience and a set of rules for applying the knowledge base to each particular situation that is described to the program. Sophisticated expert systems can be enhanced with additions to the knowledge base or to the set of rules.

The collective knowledge in any organization is an asset (Allen, 2010), and should be recorded and maintained like any other. A knowledge base is a specialized database for collecting, storing and retrieving that knowledge as individual articles. It's a repository of related experiences – problems and solutions, causes and fixes.

Knowledge Management can be described as giving relevant information to the right people at the right time and place (Rahman, 2011). It mainly concerns the using, spreading, sharing, representing and storing of knowledge. Knowledge is categorized into three types, explicit, tacit and embedded:

Explicit knowledge involves the people accessing the information they need. Periodically it is reviewed, updated, or discarded. Only the knowledge which is relevant and important is stored.

Tacit knowledge is internal knowledge that is context dependent, personal in nature, hard to define and mainly experience based. It may include cultural belief, values, attitudes, mental models.

Embedded knowledge is locked in processes, products and structures. It is difficult to understand and change.

Another important component of an expert system is the database.

A database (Robbins, 1995) is a persistent, logically coherent collection of inherently meaningful data, relevant to some aspects of the real world. The data is organized especially for rapid search and retrieval. The portion of the real world relevant to the database is referred as the universe of discourse.

Another feature that an expert system should have is the ability to work with uncertain or incomplete data. For this an expert systems use fuzzy logic (Siler and Buckley, 2005) and fuzzy numbers (Alecu, 2012) that enables intelligent representation of imprecise concepts, simulating human perception and facilitating the effective analysis of processed data.

Developing o an expert system dynamic for energy management would require the following steps:

- Creation of a knowledge acquisition module;
- Forming of a specific database on renewable and non-renewable energy sources and structuring it in a quantifiable form;
- Creation of a knowledge base on renewable and non-renewable energy sources and its structuring it in an algorithmic form;

- Developing of a meta-knowledgebase on risk and uncertainty factors in energy and structuring it in an algorithmic form;
- Creation of an inference engine organizing the relationships between the database, the knowledge base and the meta-knowledgebase;
- Development of an intuitive explanatory interface allowing the manager to communicate with the expert system.

The architecture of such an expert system is depicted in Fig. 1.

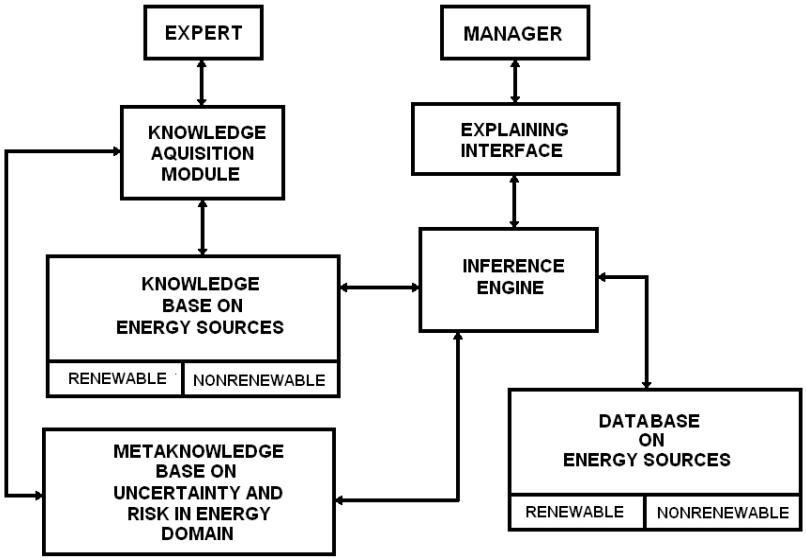

Figure 1. Architecture of an expert system for dynamic energy management.

2. Structure of a database and a knowledge base of an expert system for dynamic management of renewable energy resources

A database for an expert system for dynamic management of renewable energy should contain the values of technical and economical indicators for each type of renewable energy generator that would allow the optimisation of the price / performance ratio as function of the goal followed by the manager. We have established the following indicators as fields of the database (see table 1): specific power per surface unit [W/m^2], specific price per power unit [Euro/W] and specific price on surface unit [$Euro/m^2$].

Other fields contain energy production estimations calculated using renewable energy data retrieved from international database such as Retscreen International (Retscreen, 2015): annual energy production [KWh/m^2] annual benefit [$Euro/m^2$] and investment payback time [Years]. In table 1 we present the fields of the database for comparing tree types of photovoltaic cell panels.

Table 1

Structure of the database for renewable energy sources

Generator Type	**Specific Mean Power [W/m^2]**	**Specific Mean Price [Euro/W]**	**Specific Mean Price [Euro/m^2]**	**Annual Energy Production [KWh/m^2]**	**Annual Benefit [Euro/m^2]**	**Payback time [Years]**
Monocrystalline cell	146.64	1.67	247.03	266.3589	245.48	9.06
Polycrystalline cell	139.05	1.21	168.64	252.5713	232.77	6.52
Amorphous cell	87.33	0.86	69.84	158.6286	146.19	4.30

Table 2

Knowledge base as a decision matrix

$V_i \backslash C_j$	**C_1 Specific mean power on m^2**	**C_2 Specific mean price on Watt**	**C_3 Specific mean price on m^2**	**C_4 Annual Energy Production on m^2**	**C_5 Annual Benefit on m^2**	**C_6 Payback time**
V_1 Monocrystalline	1.0000	0.5165	0.2827	1.0000	1.0000	0.4748
V_2 Polycrystalline	0.9482	0.7122	0.4142	0.9482	0.9482	0.6594
V_3 Amorphous	0.5955	1.0000	1.0000	0.5955	0.5955	1.0000
weight	1	1	1	1	1	1

For the expert system to generate a decision the knowledge base must have the shape of an decision matrix containing the normalised values of the selection criteria calculated based on the values of the technical and economical indicators from the database for the three types of generators.

For the C_1, C_4 and C_5 criteria the normalised 1 value represents the maximum value and for C_2, C_3 and C_6 the minimum value.

For each criterion we have introduced a weightening factor allowing the manager to establish, based on its experience or using a fuzzy logic technique, the importance of each criterion according to the followed objective.

The inference engine can now take a decision in uncertainty conditions using one of the following techniques (Nicolescu and Verboncu, 1999):

Proportionality technique Bayes-Laplace:

$$V_{optimum} = Max_i \frac{1}{n} \sum_{j=1}^{n} R_{ij} \tag{1}$$

Using this technique the optimal variant is V_3 – Amorphous cell (see table 3).
Minimisation of regrets technique (L. Savage):
The matrix of regrets is determined:

$$r_{ij} = R_{ij} - Max_i\, R_{ij} \tag{2}$$

$$V_{optimum} = min_i\, Max_j\, (r_{ij}) \tag{3}$$

Using this technique the optimal variant is V_2 –Polycrystalline cell (see table 3).
The pessimistic decision technique:

$$V_{optimum} = Max_i\, min_j\, (R_{ij}) \tag{4}$$

Using this technique the optimal variant is V_3 – Amorphous cell (see table 3).
The optimistic decision technique:

$$V_{optimum} = Max_i\, Max_j\, (R_{ij}) \tag{5}$$

By using this technique both V_1 and V_3 are optimal.
Optimality Technique (Hurwicz):

$$H_i = \alpha \cdot A_i + (1 - \alpha) \cdot a_i \tag{6}$$

where:

α – optimism coefficient ($0 < \alpha < 1$);
A_i – the most favorable element of line i;
a_i – the less favorable element of line i;

$$V_{optim} = Max_i\, H_i \tag{7}$$

Using $\alpha = 0.7$ we obtain that V_3 is optimal.

Table 3

Decisional variants

Proportionality Bayes-Laplace	**Minimising Regrets Savage**	**$Max_i\, min_j\, R_{ij}$ Pessimistic**	**$Max_i\, Max_j\, R_{ij}$ Optimistic**	**Optimality Hurwitz H_i**
0.7123	0.0000	0.2827	1.0000	0.7848
0.7718	–0.0518	0.4142	0.9482	0.7880
0.7978	0.0000	0.5955	1.0000	0.8787
Optimum V_3 0.8652	**Optimum V_2 –0.0518**	**Optimum V_3 0.5955**	**Optimum V_1, V_3 1.0000**	**Optimum V_3 0.8787**

It is seen in medium conditions that the optimal variant indicated by the majority of techniques is V_3

The manager can develop what-if scenarios based on these techniques which should allow the decision making in the presence of risk and uncertainty. We have developed so far two scenarios:

A first scenario suposse what happens if the assurance of a minimal level of energy is neede the conditions of dimminishing of solar radiation with 50% due to climatic conditions. In this conditions we use the value 1 for the weightening factors of criteria C_1 , C_4 and C_5 which we consider representative for such a situation and a value of 0.5 for the other factors. In this case the decision techniques indicate both V_1 and V_2 as optimal variants.

A second scenario suppose the liberalisation of the electric energy price. For a decision in this case we use value 1 for the weightening factors of criteria C_3, C_5 and C_6 and a value of 0.5 for the other factors. In this case the decision techniques indicate both V_2 and V_3 as optimal variants.

3. Conclusions

The Management of renewable energy sources is a dynamic management requires decision making under uncertainty. To achieve its goals the management of renewable energy resources should use expert systems based on fuzzy logic. To make a comparison between different generators using renewable and nonrenewable energy, the database of the system should contain technical and economic indicators established to optimize the price/performance ratio of the objective function. To choose an optimal variant the knowledge base of the system should be a decision matrix containing normalized values of representative economic indicators with weighting factors assigned to prioritize them in the decision making, according to the experience of the manager or using fuzzy logic techniques. Thus various scenarios in uncertainty and risk conditions can be done.

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CARMEN CLAUDIA ARUŞTEI[1]

HR SYSTEMS WITHIN ROMANIAN CULTURAL CONTEXT

Abstract: *In order to prove the influence of human resource management on organizational performance the research in the field developed the construct of human resource system (HR system). Typologies have emerged as well as the questions like: which typology can predict best the organizational performance or which practices are implemented for each typology. This paper presents the most common HR systems and identifies the ones approached by two large organizations from Romania. The case study is focused on differentiation between employees' groups and industry. Some cultural aspects are also introduced.*

Keywords: HR systems, typology, case study, cultural context, Romania.

1. Introduction

The human resource systems (HR systems) topic was put under debate at the beginnings of 1990s, when research on strategic human resource management field start developing. The evolution was rapid, as both the practitioners and researchers asked for proves to obtaining organizational perfomance. At the beginning, the concept was defined as being build by "interrelated HR activities" (Lado and Wilson, 1994) or being composed of three main elements: philosophy, policies, processes (Becker and Gerhart, 1996). The next step was considering the employees groups, meaning that HR systems represents a bundle of practices that evolved in order to gain results for a certain employee group (Lepak and Snell, 1999). Later Arthur and Boyles (2007), after conducting a literature review found that HR system has five main components: HR principles, HR polices, HR programmes, HR practices and HR climate.

However, more recently a more operationalised definition was developed (Boxall and Purcell, 2011), which states that "HR systems are clusters of work and employment practices that have evolved to manage major hierarchical or occupational groups in the firm" (Boxall and Purcell, 2011, pp. 228–229). Same authors emphasised the importance of HR systems' fit within the internal and external environment, considering that the issue need to be approched at three levels: social, industrial and organizational. Because of that, and based on definitions mentioned before we can state that a diversity of HR systems could be found for the same organization, especially if the organization operates in different

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industries or has national coverage (Boxall *et al.*, 2011). Anyway, a thing is certain: the human resource management shouldn't be seen as a sum of different sub-function, but as a result of integrated components (Gong *et al.*, 2010).

The present paper seeks to briefly present the main HR system's typologies considered in the literature and then, using the case study technique, to present the way in which two organizations from NE region approach the typologies described. The employees groups and cultural insights are taken into consideration. In the end some conclusions and research limits are proposed.

2. HR system typologies

At first, research on HR system was oriented to discover which is the best system that helps organizations to achieve its goals (universalistic approach) (Beer *et al.*, 1984). Later on the focus was on measuring its efficacy (Huselid *et al.*, 1997), its internal and external fit (contingent approach) (e.g., Paauwe and Boselie, 2003), and its characteristics that make it be powerful (Bowen and Ostroff, 2004). Therefore studies identified some typologies developed considering different criteria: the results expected to be achieved, in terms of HRM outcomes (employees' commitment and loyalty, involvement in decision making, high performance and so on) (e.g. Lepak *et al.*, 2006); the value and uniqueness of the employees (Lepak and Snell, 2007); and the principles, goals and organizational context that stands behind (Boxall and Purcell, 2011). Obviously the first approach, of the existence of an universalistic HR system that can be used in order to obtain high performance, is not supported anymore because the context is really important and also a stakeholder perspective should be considered (Boxall and Purcell, 2011).

Considering the fact that HR system needs to be adapted according to different employees group Lepak and Snell (2007), after classifying employees by them strategic value and uniqueness, proposed four HR systems: commitment-based, for employees with high strategic value and uniqueness; productivity-based, for employees with high strategic value, but rather low uniqueness; collaborative system for employees with high uniqueness, but low strategic value at the time being (talents); and compliance system for employees with low strategic value and low uniqueness. Unfortunately, the authors did not proposed certain HR practices for each category. They only offered some basic directions. For example, commitment-based HR system is composed by practices that are oriented to employees' development, empowerment, and decision making participation (Lepak and Snell, 2007, p. 213).

However, most of the studies focused on HR system typologies considering its objectives (e.g. Lepak *et al.*, 2006; Toh *et al.*, 2008; Gong *et al.*, 2009). The most usual HR systems studied were: high performance work systems, high-commitment systems and high involvement systems. Studying the literature in the field Lepak *et al.* (2006) identifies other three systems: control system, HR system

for occupational safety and HR system for customer service. We will further present briefly the ones than were taken into consideration for our study.

The high performance work practice systems (HPWP) are sets of practices that raise employees' gains, empowerment, abilities and motivation (Gollan, 2005). Among the first researchers interested in this subject was Huselid (1995) that defined them and also tried to associate the use of these systems to organizational financial performance (Huselid, 1995). In his view, the HPWP can enhance retention of "quality employees" and encourage "non-performers to leave the firm" (Huselid, 1995, p. 635). Because of the lack of consensus for which practices are part of these systems (Becker and Gerhard, 1996) and because of its general definition, there were some authors arguing that these types of system encompasse elements of high commitment and high involvement approach (Zacharatos *et al.*, 2005) and also that the basic aim of each HR system is to become high performant (Boxall, 2013). This means that HPWS should be considered more like a HR system characteristics, than a category. We embraced this approach also, and that is why we did not consider the HPWP in our field research.

The high commitment (HC) HR systems developed as a shift to the control HR system (Walton, 1985 cited in Paauwe *et al.*, 2013), and its purpose is to encourage employees to identify with organization's goals (Whitener, 2001) and to become committed to those goals as employees are identifying with firms' culture (Boxall and Purcell, 2011). Some examples of HR practices that can sustain this approach are proposed by Lepak *et al.* (2006): intensive training and development, socialization, promotion from within the company, high level of compensation, selective staffing (Lepak *et al.*, 2006, p. 227). Even though it is considered that these systems are found more often into production industries, the term started to be used in all kind of industries.

Considering the high involvement (HI) system, its aim is to involve employees into decision making process by implementing HR practices oriented to skills development and motivation (Boxall and Purcell, 2011). Also the policies that promote respect, responsibility and mutual involvement are to be taken into consideration (Gollan, 2005) as well as considering practices referring to work design, incentives, work flexibility and training opportunities (Vandenberg *et al.*, 1999).

Regarding HR typologies that take into consideration also organizational context (e.g. firm's dimension, industry, the business model) beside its goals and principles, Boxall and Purcell (2011) identifie seven types: familial, informal, industrial, salaried, high-involvement, craft-professional and outsourcing (Boxal and Purcell, pp. 233-234). Because of their more operationalised approach we used this typology for our field research, offering explicit details for practitioners in order to help them identify the most representative one.

However it is worth mentioning that same practices can be used for each system typology, as the research proved that as long as the practices are positively

perceived by the employees they will have the desired effects (Nishii *et al.*, 2008). Other studies suggested that they will be efficient if a different importance is given for each practice of the system (Pfeffer, 1998) and if the industry and cultural differences are considered when implementing them (Ahmad and Schroeder, 2003), because the implementing process is not an easy task (Pfeffer, 1994).

Anyway, the main questions remain: which HR system determines the highest level of performance? Which combination of HR practices should be part of each HR typology? An answer to the first question is proposed by Bowen and Ostroff (2004) when building the concept of the "strength" of HR system. The authors emphasise the importance of constructing a consistent message (composed by distinctiveness, consistency and consensus features) for employees in order to describe the HR management objectives. They implicitly consider the existence of "an organizational climate" (Bowen and Ostroff, 2004, p. 214). As research proved the existence of different types of organizational climate (Schneider, 1990), the authors are aware that the consistent message should be for a certain HR system destined for a specific employee group and that the "content" and "strategic focus" features that describe the "strength" will be also different. However, if the HR system is wick (this means that if just one of the three feature is wick, the whole HR system is considered to be wick), the received message will be ambiguous, will be differently interpret and will determine different behaviours.

HR systems within Romanian organizations from North-East region

2.1. *Research design*

The present study is part of a larger research project that addresses the issue of the human resource management (HRM) – performance relationship within Romanian cultural context. However, because of the complexity of the issue we found it appropriately to present some preliminary results considering the first variable of the chain, the HRM variable, operationalised using HR systems. Therefore the main purpose of the paper is to identify the HR systems used by organizations with 100% Romanian capital from the North-Est (NE) region. Because of the exploratory nature of the research, a descriptive case study on two organizations was conducted. The firms chosen have branches all over the country, one of them being also international, but their quarter is in the NE region. They are also for more than fifteen years on the market and have more than 100 employees. Data were gathered using a semi-structured interview conducted with six informants (three for each organization). For each organization, one of the informant was the human resource manager and the other two were middle managers recommended by HR manager, (e.g. development manager, quality responsible, production manager) who know the HR strategy and management approach to it. The interview aimed at identifying the HR system typologies used for different employees groups and the

way in which the system is put into practice. Also some cultural aspects were of interest. The informants had to choose on a Likert scale (1 to 7) the degree in which a certain approach is used and to explain or describe the actions implemented. We took into consideration beside the seven HR systems proposed by Boxall and Purcell (2011) other six types like: result oriented, well-being oriented, control system, high commitment, high involvement, and client-oriented. Also we discussed about the way in which the HR actions are oriented to develop employees' ability, motivation and opportunity to perform (AMO theory). Because of the impossibility of clearly separate the HR systems, informants were encouraged to recognise traits of each system. In the next paragraph a brief description of the organizations will be presented, considering also some context variables that Boxall and Purcell (2011) proposed.

The first organization (Organization A) activates in service field (sales and distribution), it has 11 branches all over the country and the main employees groups are: sales & marketing, administrative, distribution. The firm is managed directly by the owners and hire employees through recommendations. Even though they do not consider themselves a family business, employees' relatives can be hired. The owner control the decision making process and there is a high level of trust in management. We consider that till now, the HRM did not approach a strategic view, but was guided by moral principles and philosophy.

The second organization (Organization B) activates in production field, even though it has its own distribution chains and also sales points. They activate also internationally, in Republic of Moldavia and Ukraine and they will soon extend their activity in Bulgaria, too. The organization is also managed by the owner and its main employees' group are: manufacturing, sales, distribution and administrative. The middle managers are involved in decision making and have a high level of empowerment, most of the HR initiatives are coming from them, as the HR manager is oriented more on employment practices. Lots of HR policies are written and they are into continuous improvements.

2.2. *Preliminary results*

The HR manager of the first organization consider that the HR system is oriented to both the economic results and employees' well-being (6 on a Likert scale from 1 to 7), considering that if they would not pursue profitability, the firm could not resist on the market. They declare also that people are one of their main values, as they are oriented to offering qualitative products and services with very high level of personalisation. That is why a careful attention to employees' needs (including personal) is offered. Even though they do not consider themselves as a family business they definitely have a family culture, where "dad" (general manager) and "mum" (HR manager) are very present, were employees' can get moral or even financial support for their personal issues. However, the organization

is obviously result oriented and if o goal is not completed it will affect all groups of employees at different levels. This was probably the reason why the other two informants (quality manager and development manager) consider that the organization is oriented to employees' well-being at 5 level (out of 7).

A very interesting approach was also defined for the next two HR system typologies. If HR manager consider that the HR system is more oriented to high involvement (6 out of 7) and less to high commitment (5 out of 7), the other two informants have other opinions. For example quality manager consider that as much as top management wants to involve employees in decision making and declare that the "general manager's door is always open" in order to make different proposals, that is not totally true. Actually the "door opened" is for employees to ask if they can and how to implement/do something. It was obvious that "the boss" makes all decision, including the ones of middle managers. The HR manager actually declared, at some point, that employees go directly to the general manager when they have a problem, skipping them direct supervisor. This can be interpreted as the high involvement HR system is desired, but the practices through which is implemented do not have the expected results. The development manager's opinion sustains this view as she says that decisions are made by the general manager who sometimes consults with two other people who work in the organization from the beginnings. The high involvement system may be more approached by the sales employees group, as they are empowered to answer the customers' needs.

On the other hand the two informants consider that the HR system is more oriented to high commitment (6 out of 7), due to the fact that the organization recruit and select people who have affiliation needs, they know employees' family issues and they offer advice in order to solve them and organise different socialization events (socialisation conditions are created also through creating a place where hot lunch is offered).

Differences are also made between employees hired in different regions of the country. Same practices are implemented, but the approach is slightly different. As the south region is considered to be rather "cold", the HR system is oriented more on high involvement and less to high commitment. The opposite is implemented in NE region were people are more sentimental and more affective. For the next two HR typologies all the informants had a consistent message: control system at level 4 and client oriented at level 7, doesn't matter the employees' group. Same agreement was found for HR practices' objectives considering the AMO theory, offering 4 points for ability (they encourage learning through experience), 7 for motivation and only 3 for opportunity. They all recognised that they need reconsider the work design as employees has lots of diverse tasks and the work is not properly organised, thing that makes the achievement of the individual objectives really hard, especially for administrative employees' group.

Considering the Boxall and Purcell typology, two of the informants (HR manager and quality manager) considered that the informal model suites the best,

as the organization is managed directly by the owners, the activities have a low degree of standardisation, there are very few HR policies and fewer written and the voice of the unions is rather inexistent (the unions exist only because of the law requirements). However, they consider that the wages and skill level are rather high and they don't have a high turnover. They also identify some traits of the familial model, the development manager considering that actually the one that defines better the HR system, such as: the trust level is high; there are employees who are family members. The development manager also declared that the decision making is controlled by the management. We think that another issue worth mentioning it. Even though the organization hires non-family members, they often become relatives. For the executive staff there is also a high level of specialisation, making the job rotation impossible to implement, feature that actually describes the professional model.

For the second organization even more differences in opinion have occurred. There is an objective reason for that: the work is very well organised and when the informants answered the questions they considered their personal area of execution, with certain employees' group. So, the HR manager described the HR systems most appropriate for administrative employees, development manager for sales employees and production manager for manufacturing ones. Considering the administrative staff, for the informant is obvious that the HR system is oriented to profitability, well-being, high involvement and client (in this case internal client), offering maximum ranking to these four system types. Considering the high involvement system we consider that more details should be provided. First, this system is supported by the fact that periodically, the president, which is also the general manager, organizes meetings in order to discuss the problems encountered and also the improvements that other managers proposed. The decision is always adopted after debating the problem, solutions coming very often from the managers. Second, the wages are higher than the market average and third, the learning actions are valued. Considering the high commitment HR system, the HR manager evaluates that there is a rather lower degree of manifestation (4 out of 7). The commitment is determined only by the fact that the organization is a large one, and offers very good work conditions. The control system reaches 6th level, as the HR system being oriented to work efficiency and to accomplish specific requirements and procedures, but not through controlling employees' wages. Considering the AMO perspective, the opportunity feature is the one most present (level 7), as the tasks are very well organised, everyone knows what is expected from them and they have enough time to put into practice what they learned. The informant choose the lowest level for motivational activities, but as we continue our discussion we think that she only thought of financial motivation, because other practices are implemented and there is a clear orientation to employees as humans.

Regarding the production area, the higher level is reached by the HR system oriented to control as it is very important the hygienic area because they product

foods and also not because they want to apply penalizations, but because quality is very important. The lowest level is represented by 5 point, for high commitment, high involvement and client oriented. We argue that the high commitment approach is implemented at a lower level because the activity is seasonal, meaning that the employees work only 6 to 8 months a year. Even though the organization pay the best employees for all the year, including the months in which they not produce, during this period the wages are very low so there are people that don't afford the living. For the general orientation of HR system, the 6 level was associated (profitability, well-being and AMO perspective).

Considering the sales employees the development manager used more caution in statements. She declared that the only HR system strikingly promoted is client oriented. Every single action the organization does for employees is in order to encourage them to respond to clients' needs (e.g. rigorous selection, intensive on-the-job training, pay for performance). The next two HR system orientations are control and high commitment with 5 point out of 7 followed by 3 point offered for high involvement. Regarding the AMO theory, the manager sustained that the organization wants to develop more HR practices in order to increase employees' motivation and ability during this year.

All the managers chose the informal HR system as the most representative for the organization, followed by salaried model from the Boxall and Purcell (2011) typology. The reasons are as follows: the employees are directly managed by the owner, in an informal manner; there is a high turnover especially at production and sales employees, and there is no career path (yet); there are rather few HR policies and even fewer written; the wages are attractive and oriented to individual merits, and managerial positions have a high decision authority, responsibility and safety.

Because the only staff hired from different regions of the country is on sales department, only the development manager for NE region, Republic of Moldavia and Ukraine could pronounce on the cultural differences appeared. So, she stated that the same HR system is pregnant, meaning the client oriented, all over the regions, but the practices through which is implemented differ. The differences came from the job flexibility, the benefits package, training delivery and performance evaluation.

Conclusion

The HR system typologies are still under debate considering that there are still some questions that remained unanswered like: "which typology is best for which context?"; "which HR practices better fit an HR system?". The HR systems typologies need further development, as there is a very thin line between them and as for practitioners was very hard to place their organization within one type or another. As argued by the researchers there are more HR systems that are being

implemented in the same organization, depending on the employees' groups. Even so, there were still difficulties in choosing one model against the other. If, for the first organization there were differences between each informant, even though they did not refer to separate employees' groups, for the second one the message was more consistent. We might make further investigation in order to verify if indeed the HR systems is "strength".

The limits of the research should also be mentioned. First, the information was gathered from only two organizations and cannot be generalised to the industry or region level. Also, the most HR system's terms and typologies were new to the practitioners and had to be explained into details. This might cause some misunderstanding. Another limit is that the results are generated by informants' statements and weren't checked among the employees. That is why there is the risk that the HR systems typologies to be desired, but not actually implemented. Because the HR manager recommended two persons that can speak with us, this may conduct to some bias errors.

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ARTAN HAZIRI

CHARACTERISTICS OF THE LABOUR MARKET IN KOSOVO AND EUROPE

Abstract: *The level of economic development of Kosovo is reflected in a delay of many economic parameters in place which results even in the strangulation of the labour market as the biggest challenge in Kosovo. Would not mind that the most worrying aspect of the labour market in Kosovo is the high unemployment rate which reflects the numerous problems in Kosovo society. The labour market in Kosovo was consistently followed by a different set of anomalies which have led to the raising concerns of the Kosovo population which are reflected not only by the unemployed, but also the active part of the population which in the absence of functioning of the collective contract, failure of unions, low average wage and a series of violations of workers' rights more and more is undergoing development gap in the labour market. Kosovo is the highest rate of unemployment in the region which is around 50%. And when we consider the composition of contingent labour, such as very young population which annually makes contingent labour increases in parallel with this also increases the rate of demand for labour and immigration as the feature itself, then the approach should become much more serious. The statistical data show that unemployment is the highest in young persons (16-24 years), this age includes about 40% of the total number of unemployed. Also, the unemployment rate appears too high even to women though are not very active. Viewing these data mean that unemployment in Kosovo is mostly a long term and it is estimated that about 80% of the unemployed are long-term unemployed for more than 12 months. This condition appears as unemployment will remain for a long time the main challenges of the economy and society in general.*

Keywords: *unemployment, employment policies, work force, labour market, SOK.*

1. Employment policies and macroeconomic framework needed

The results of this study and other analyses indicate that a high rate of unemployment and its structure reflect an important social problem, which should be addressed to policy makers and the Ministry of Labour and Social Welfare. After that unemployment in Kosovo is mainly a consequence of the level of economic development heritage. The main problem is the creation of sound macroeconomic policies that could provide the conditions for the functioning of the labour market in the country which is able to maintain the existing work places and especially for the creation of new jobs. Labour market policies cannot be developed successfully if not taken into account the situation of employment/ unemployment. Policies for job creation – which means increased opportunities for productive work Kosovars should be the target of economic and social development strategy. This strategy has not been developed and this is a serious obstacle for building more logical correlation between economic policy, employment policy and social policy. This could lead to an

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employment-friendly environment and trends in employment growth. Labour Market Policy aims to enhance individual employment opportunities and expand labour demand. Integration and coordination of activities of different actors and political dimensions are the main issues to be discussed and to be built especially by the Ministry of Labour and Social Welfare as well as various government agencies. The Republic of Kosovo is in the middle of Southeast Europe (SEE), which has a land area of 10,908 km^2 and approximately 1,739,825 inhabitants (Census, 2011) resident excluding the three municipalities in the north. The capital of Kosovo is Pristina with a population of about 200 thousand inhabitants. According to macroeconomic data Kosovo in comparison with many European countries Kosovo has suffered less from the economic crisis. Kosovo and Albania are the only countries in SEE, which have increased the GDP per capita in 2009. Kosovo remains the poorest economy in the region and face high levels of poverty, massive unemployment (which on average is estimated to be 45%, compared with 37% from Macedonia and Albania with 14%), heavy dependence on imports and the very small sector of export, and lack of energy. Gross domestic product (GDP) per capita is estimated to be $ 3.520, and thus Kosovo is ranked 93 in the world, behind Macedonia, Albania, Serbia and Bosnia and Herzegovina. The overall number of unemployed at the end of 2013 is 268,104. Due to the large size of the informal economy, registered unemployment figures may not fully reflect the situation of employment in the private sector. Kosovo financial sector remains in good shape, despite the global financial crisis.

In Kosovo currently operate seven commercial banks, nine insurance companies and two pension funds.The use of the euro as the official currency contributes to the stability of Kosovo's economy and keeps inflation in acceptable rate, thus providing a sound basis for monetary policy. Kosovo has weak employment results, where unemployment has reached 45 percent and the employment rate is extremely low, 26 percent. Poverty remains widespread in Kosovo where around 29 percent of the population lives in total poverty and 8 percent of the population lives in extreme poverty. Creating jobs is even more important for the fact that the population of Kosovo is young compared to other countries in the region. Nearly half the population is under 24 years old and only 6 percent of the population is over the age of 65[2]. Unemployment is the percentage of unemployed from the entire capacity of the workforce in a certain area within a country or across the country. So, this economic indicator shows the level of unused labourforce in the economic processes in a geographic area. According to the classification of the European Union unemployed are those members of the workforce who have not had a job during the week when the study was done, have actively sought for work during the week and are ready to start a job during the next two weeks. The unemployment rate is an indicator of overall economic welfare. A low level is indicative of a strong economy where job seekers can find it quickly, while a high level could indicate a weaker economy. On the other hand, employers can more easily find employees when unemployment is high. So, one of the issues of concern in society today is unemployment. Determination of unemployment

[2] Institute for Development Research "Riinvest" 2010 (Pristina, Kosovo).

notion is based on the definition given by the International Labour Organization (ILO). The unemployed are considered all persons of working age based on the measurement of the economically active population who during the reference period meet the requirements – are without work, available for work and seeking work.

2. What is unemployment?

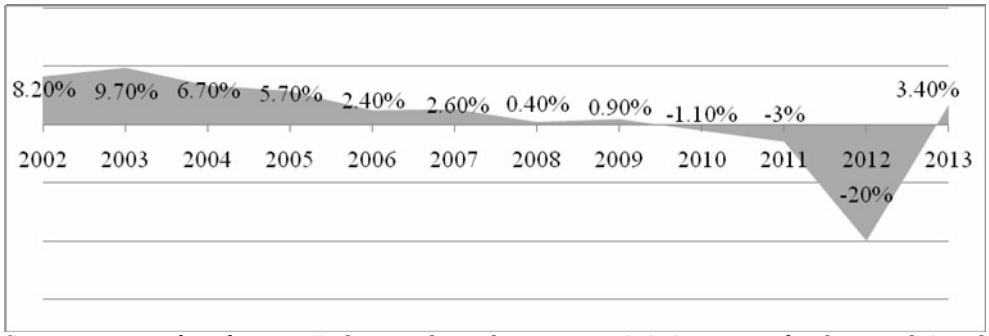
The answer to this question seems obvious: an unemployed person is someone who does not have a job. But as economists we need to be precise and careful in our definitions of economic categories. If you are in full time education, for example, you do not have a full time job in the ordinary sense of the word that is to say you are not a paid employment for full-time. And there is a good reason: you are studying. Hence it appears that you are not available for work. What if you were not a student, but you could suffer from any long-term illness, which means that you are unfit for work. Again, though you do not have a job, we would not say that you were unemployed because you were not ready (available) to work. From these two examples, it seems clear that we need to qualify our initial definition of an unemployed person "someone who does not have a job to "someone who does not have a job and is ready to work". But we still need to be clear what we mean by "ready to work". Assume that you were not employed full-time and you are looking for a job as an assistant studies for 50 euros a day. Would you choose it? If you do not ignore for a moment the complexity that economic studies are so interesting, that this is the reward of those, you probably would not accept the job because the salary level offered is too low. At the other extreme, suppose that you have earned so much money in the National Lottery that you decided to leave the university and to live with the money earned for the rest of your life. Would you be still unemployed? No, because you were not ready for the job yet, regardless of what level of salary was offered. So being unemployed depends if you are willing to work (if you are "available for work" to existing wage levels).[3] Now we are able to give a precise definition of what it means to be unemployed, the number of unemployed in an economy is the number of people of working age who are able and willing to work with existing levels of wages and who do not have a job.

3. Unemployment in Kosovo over the years

Kosovo after the war in 1999, has faced many life problems of all natures and such a problem is with employment as the majority of enterprises have been damaged by the war in different ways (burned, looted, damaged by bombing, etc.), and a large part of them that have survived these problems have lost their market and manufacturing technology which had in their possession and were not competitive in the regional market and could not afford a new system of market economy.

[3] Mankiw, N.G., Mark, P. – *Economics, South-Western, Centage Learning*, Taylor, UET Press, 2012.

As a result of all these problems that were noted above, employment has begun to appear as a problem and is creating a huge army of unemployed and the unemployment figures go higher. When to this is added the process of privatization which rather than generate new working places, this process was accompanied by many problems and do not affect the growth of jobs but, the same helped increase unemployment by closing many of working places as privatized enterprises changed business activity and the majority of them passed from production to trade or most of purchased lands were used as construction land.

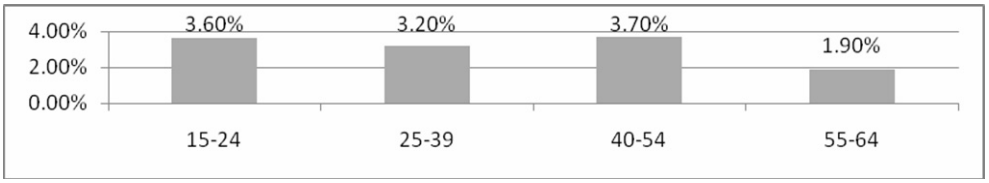


Source: Report of performance/Labour and Employment in 2013 (Ministry of Labour and Social Welfare).

Figure 1. Registrations growth rate.

4. Unemployment by age

Regarding the registered unemployment rate by age group, most of the unemployed (126,836) in accumulated figures still refer to the age of 25-39 years or 47%. However, a direct comparison of total figures by age suffers from different number of years in terms of coverage in any age group.



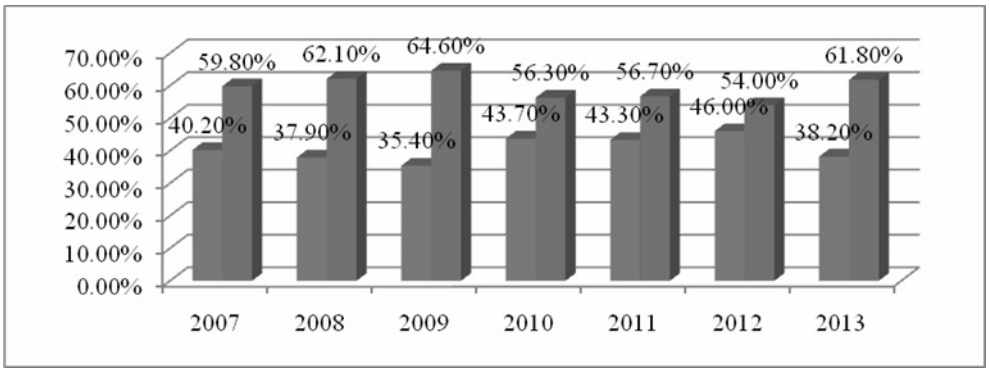
Source: Report of performance/Labour and Employment in 2013, (Ministry of Labour and Social Welfare).

Figure 2. The rising unemployment rate by age.

The highest pressure regarding to the unemployment rate is still the youngest group by age, particularly in terms of growth in enrolment by 3.6%, (see fig.). In general, according to the results of 2013, the unemployed aged 25–39 then 40–54 and 55–64 years show an increase in enrolment, which is (3.2%, 3.7% and 1.9%) in 2013.

5. Unemployment by gender

The total number of people registered as unemployed in the public employment services in Kosovo by the end of 2013, consisted of 124,369 women and 143,735 men. The number of female registrations increased by 4.2% during 2013, as well as the number of men registered as unemployed has increased by about 2.7%.



Source: Report of performance / Labour and Employment in 2013, MLSW.

Figure 3. Unemployment by gender in Kosovo.

However, the overall gender gap is significant value by 1.5 percentages to the growth rate. For more, regarding to unemployed women we can realize an increase in terms of exit from unemployment. Consequently, some of the women in the general output in 2013 increased to a level of more than 38.2% (see Fig. 5).Taking into account the relation of gender differences with "risk" youth groups (15–24) and unskilled unemployed, there is a negative development. Regarding the numbers of unemployed men of the same age group (15–24), seems an increase of 14.4% in last year to 3.1%. While unemployed women (15–24) in the new age, in 2013 show a growth rate of – 12.7% to 4.1% (Table 1).

Looking at levels of qualification by gender appears a gender gap reduction, which is based on a decreasing scale for women (see table.) where women have reduced the percentage of negative points – 27.7% in the previous year to – 17.1% in 2013, while unskilled men tend growing where in 2012 was – 18.6%, and now for 2013 is 28.7%. Regarding the unskilled unemployed women is worth mentioning again the procedures to apply for social assistance in Kosovo which was granted to more than 40,000 families. A basic requirement for this is to demonstrate thatthey do not receive other income. To do soit worth to register all family members of an adult family as unemployed. Although a detailed analysis of this data has shortcomings and little gaps, is quite convincing because refers to numerous recordings of women out of work, which are administratively "pushed" from the definition of personal status as "inactive economically" in status of "registered unemployed".

Table 1

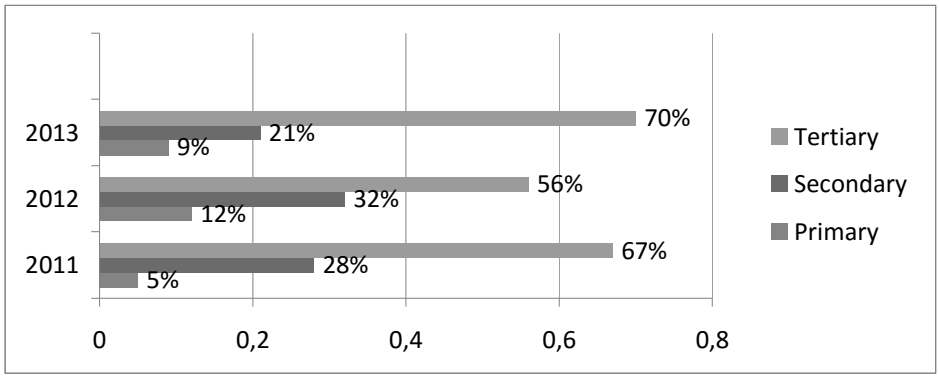
Unemployment by gender in Kosovo

	2011		2012		2013	
Description	Female	Male	Female	Male	Female	Male
Monthly rate of incomes	0.52%	0.48%	0.70%	0.83%	0.58%	0.55%
Monthly rate of outflow	0.67%	0.82%	329%	2.40%	0.24%	0.33%
12 monthly increase	–2934	–7065	–38548	–27372	4995	3768
12 monthly increase	–1.80%	–4.10%	–24.40%	–16.40%	4.20%	2.70%
Unemployment	157922	167339	119374	139967	124369	143735
Proportion	48.60%	51.40%	46.00%	54.00%	46.40%	53.60%
12 monthly increase of unqualified	–1.60%	–4.10%	–27.70%	–18.60%	–17.10%	28.70%
Registration of unqualified	113722	81672	82260	66489	68164	85557
Proportion of unqualified	58.20%	41.80%	55.30%	44.70%	44.30%	55.70%
12 monthly growth of 15-24	2.10%	0.60%	–12.70%	–14.40%	4.10%	3.10%
Registered 15-24	53172	53950	46423	46192	48338	47607
Proportion 15-24	49.60%	50.40%	50.10%	49.90%	50.40%	49.60%

Source: Report of performance / Labour and Employment in 2013, MLSW.

6. Employment by sector

During 2013, according to classification of economic sectors, as it was in previous years, most of offered vacancies refer to the tertiary sector (services, 70%), followed by the secondary sector (manufacturing, 21%) and the primary sector (agriculture, 9%). Tertiary sector shows a modest increase in the number of job vacancies reported during the reporting period from 56% in 2012 to 70% in 2013. While domestic sources in the secondary sector shows the decline value from 32% in 2012 to 21% during the year. Same primary sector shows a decrease of 12% in last year to 9% in 2013.



Source: Report of performance / Labour and Employment in 2013, MLSW.

Figure 4. Vacancies by sector in 12 months.

7. Unemployment rate in Kosovo in 2014

The unemployment rate in Kosovo is 35.3 percent. Statistical Agency of Kosovo (SAK) has published "The results of the Labour Force Survey 2014" in Kosovo[4]. This publication contains detailed data on employment and unemployment by age, gender, employment status, economic activities, occupations and other similar issues, dealing with the labour market. According to results stemming from the publication, the participation rate in the labour force is 41.6%. About one in five women of working age (21.4%) are active in the labour market, compared with three-fifths (61.8%) of men. The employment rate, according to results of the Labour Force Survey in 2014 is 26.9%. The employment rate among women of working age is only 12.5%, while the employment rate for men is 41.3%. Very low rate of unemployment among women stems from the combination of very low participation of their labour force and high unemployment. Women were employed mainly in the sectors of education, health and trade, with more than 55%. Men were mainly employed in the manufacturing, trade and construction, with about 44%. The unemployment rate in 2014 is 35.3%. The unemployment rate is much higher for women about 42%. Unemployment among young people is very high in Kosovo. Among persons aged 15-24 in the workforce, the unemployed rate is 61.0%. Unemployment is higher among young women with 71.7%, than in young men with 56.2%.

8. Unemployment rate in Europe (Germany and Italy)

Germany's economy and labour market have shaped up well in recent years. However, further improvements for groups like youth, long-term unemployed and women still need to be undertaken. The current labour market outlook opens many opportunities for people who had difficulties to find a jobbefore. In Germany, employment continues to grow and the employment rate is now among the highest in the OECD (73.4% in the first quarter of 2014). Consequently, unemployment has fallen to 51% (ILO definition) in the second quarter of 2014 – below the OECD average of 7.4% and less than half of the Euro area's average at 11.6%. According to the 2014O ECD Employment Outlook, the unemployment rate will decline further in 2015 and Germany looks set to join the small group of OECD countries with unemployment rates below 5%.[5] There are still about 1 million people who have been unemployed for one year or longer. Although the number has declined over the last years, long-term unemployed are still disadvantaged in the labourmarket. In many cases, integration in the labour market has not been successful due to a range of multipleplacement obstacles. Additionally to current methods and strategies of Federal Labour Ministry, it is preparing a programme to

[4] *The results of the Labour Force Survey 2014 in Kosovo*, visit: http://ask.rks-gov.net.
[5] http://www.oecd.org/germany/EMO-DEU-EN.pdf.

address this issue.[6] Italy's anaemic growth implies that unemployment is expected to remain high until end of 2015. According to the OECD's May 2014 projections, Italy's growth rate will remain sluggish in 2014 to pick up only a little in 2015. As a result, the unemployment rate has increased further to reach 12.6% in July 2014 – 2.4 percentage points above the EU average –and only 55.5% of the working-age population was in employment. Given the short-term growth projections, the unemployment rate is not expected to decrease significantly until the end of 2015.[7]

9. Conclusions

By analyzing all that was mentioned above about the labour market in Kosovo conclude that the high rate of unemployment is as a result of non-developed economy where largely non-utilization of available manpower remains. Kosovo should create favourable policies to attract foreign capital in order to use the advantages that are offered especially in the aspect of the young people. Strategic orientation of the Kosovar economy should be state policy of favouring the development of small and medium enterprises as generator of economic development on occasion will allow creation of new jobs, especially for young Kosovar. Also the budget management and its control is one of the substantial elements regarding for creation of new jobs, especially in lowering the costs in the social safety net focusing only on those who really need. Use of natural resources as significant potential in economic development, especially the fund of agricultural land is an important factor towards alleviating the level of unemployment as an acute illness in Kosovo that already absorbs the largest number of employees or better to say self-employed during these years. Having regarded the unemployment rate, which is correlates negatively with the level of education should take measure to an increased level of qualification for relevant professions that a dominant role will play professional schools in preparing young people for certain areas. This is in order to increase the productivity as well as the self-initiative to open the businesses and self-individual employment. So, the whole process requires a commitment of all fundamental actors operating in Kosovo starting from government, business representatives, groups of interest, in order to draft appropriate strategies to ensure healthy economic growth.

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DAN CONSTANTIN ŞUMOVSCHI[1]

USING FUZZY NUMBERS IN FACTOR EVALUATION DEVELOPMENT OF LIVESTOCK FARMS IN NORTH-EAST ROMANIA

Abstract: *The attention given to the cattle/ cow breeding and exploitation derives from the capacity of producing one of the most important and complex food: milk and dairy products.*

Generally, animal breeding and particularly, cattle breeding come with serious structural issues due to the excessive fragmentation of the property, low levels of productivity and last, but not least, to the high values recorded by the self-consumption within the farms.

All these difficulties were mirrored by the dramatic decrease in the livestock registered between 1990 and 2013, from 6.3 million to merely 2 million cattle. However the dynamics of milk production recorded values inversely proportional to the livestock dynamics as the medium production obtained increased from 2.063 l per cow fed in 1990 to 3.529 l per cow fed in 2013.

Keywords: livestock farms, North-East Region, PEST analysis, fuzzy number, uncertainty analysis, Global unit method, Maximax method, Wald method.

JEL: Q01; Q12; Q13.

Introduction

The attention given to the cattle/ cow breeding and exploitation derives from the capacity of producing one of the most important and complex food: milk and dairy products.

Cow's milk is a complete food, containing 20 amino acids, 16 fatty acids, 45 minerals, especially calcium and phosphorus, and 25 of the vitamin. Cow's milk has a high biological value, containing per liter on average 125g dry weight: 37g fat, 33g protein, 8g 47g lactose and minerals. (G. Georgescu, 2007)

We must not forget the fact that ending a cow's productive life does not happen in a farm but in a slaughter house, so the milk cows slaughtered for meat stand for 1/3 of the beef consummed by humans.

Due to this feature as well as to the rising adaptability they have proven so far, at a global level, the taurine livestock have been continually growing. It is true that they do not have an even distribution, but the most significant cattle livestock can be found in America (511 million cattle), Asia (520 million cattle) and Africa (301 million cattle).

[1] PhD Fellow, POSDRU/159/1.5/S/133675 Project, Romanian Academy – Iaşi Branch.

The dynamics of the cattle and milk production

According to FAO data recorded between 1990 and 2013, the most significant cattle increase was registerd in Africa (59.12%), followed by Asia (30.01%), Oceania (26.16%) and America (18.9%). The only continent that does not obey the general dynamics and where the cattle have decreased to almost half (–49.77%) the number registered in 1990 is Europe.

This may be caused by the reforms which took place in the former Eastern communist block of the Soviet Union, but also by a bigger concern about the improvement and refinement of the breeds. The second supposition originates from explaining the general trend as the cattle increase was mainly recorded in emergent countries from Africa, South America and Asia, and where the animal growth was encouraged to the detriment of individual performances.

About Romania, the animal increase, in general, and cattle increase, particularly, has major shortcomings related to unresolved structural issues caused by property splitting, low level of productivity and high levels of self-consumption within the farms.

The low level of performance is caused by the lessened level of labour productivity and deficit recorded by the agrifood balances. At the moment the zootechnical sector is going through a rough time marked by a series of transformations which have conveyed an uncertainty state of mind among the farmers.

In Romania, the downward trend of cattle livestock was partly caused by specific factors, among which we can name the following:

– the market monopolisation by several economic agents

– the low organizational training of the farmers

– the underfunding of the zootechnical sector due to the practically non-existent interest of the banks towards this branch of economy.

All these hardships have been reflected in the continuous dramatic decrease of cattle between 1990 and 2013, from 6.3 million to 2 million. Still the dynamics of the milk production showed significant progress as the ratio is in inverse proportion to the values of cattle dynamics (the medium production obtained increased from 2.063 l per cow fed in 1990 to 3.529 l per cow fed in 2013).

The natural environment of the North East region

The North-East region, a crucial part of the old historical area of Moldavia, is formed from the following counties: Bacău, Botoşani, Iaşi, Neamţ, Suceava and Vaslui. The area is of 36.850 km^2, covering 15.46% of the Romania's surface. Geographically, the region can be divided into 3 important zones: the mountain zone – The Carpathian Mountains in the west (28%), the Subcarpathian zone (12%) and the plateau zone – Moldavian Plateau in the southeast (60%).

Hydrographically, the region has 8 major water streams which cross it from north to south, all being part of the hydrographic basin of Prut and Siret rivers.

The pedographic coating is characterized by a multitude of categories and soil types due to the geomorphological, climatic conditions and geological sublayer.

In the Carpathian Mountains find the following types of soil: rendzinas, eutricambo soils districambosoluri, podzols and andisol.

In the Carpathian foothills and hill following soil types are present: regosols, luvisols, faeozems and vertisols.

In the lower areas, depressions and river meadows we can find two types of soil: alluvisols, chernozems, gleisols, solonetz and histosols.

Analysis of the factors of development of livestock farms in the North East Romania

In light of the development factors of the zootechnical farms from the North-East of Romania we shall analyze the zonal potential in relation to 4 factor categories: political background, economic environment, social and technological environments as well. To achieve this we have employed PEST analysis which is a vital instrument for understanding the rise and fall registered by a market and which also aims to outline the trend imprinted by the economic activity. To substantiate PEST analysis in the North-East region and identify the specific features of milk cow exploitations we have used the data given by ANARZ offices as well as data obtained by field trips to some farms acknowledged as representative for our study[2].

The political background, although it does not act directly upon the milk cow farms, affects considerably the market where these farms run their activity. Therefore the numerous political crises and repeated changes of the legal and institutional framework had a negative impacy upon the good running of the zootechnical sector. *The complex legislative and institutional framework, instable and ill-adjusted to the farmer's needs (F1)* has favoured the growing reticence of the farmers about the programmes made for relaunching the zoothechnical sector in Romania.

A major change occurred when the regulation OUG no. 3/2015 regarding subvention payment for 2015-2020 was approved. This readjusts the framework where the direct payments in agriculture will be made and thus achieving the transposition of the Commune Agricultural Policy of the European Union in the Romanian legislation. The most significant change is the introduction of redistributive payment which represents nothing else but a stimulative payment granted for achieving land pooling. The regulation enacts the definition of the active farmer for the purpose of avoiding

[2] PEST is an acronym derived from the name of the factors the andysis is made of politic, economic, social, tehnologic.

hilarious situations that occurred in the past, among which we would like to bring forward the example of the airports which received subventions for the lawns held in property. It can only be regarded as an active farmer that person or individual who proves beyond any doubt he runs an agricultural activity once he has applied for the subvention grant. (http://www.madr.ro/)

The amplification of the geopolitical and regional crises (F2), materialized by restraining the access to the Russian market at the same time with eliminating the milk quota resulted in a dramatic decline of the milk price. Practically, the efforts of the Romanian farmers are higher than any other European farmers which is also determined by the differences registered between the production per cow fed in Romania as compared to that achieved in EU.

A special attention requires the communication methods employed by the political environment: consultancy, internship programmes, training courses and professional development.

The excessive bureaucracy related to the obtaning of non-refundable financing (F3) resulted in placing Romania on the last position in the EU countries with an absortion degree of the non-refundable funds under 60% between 2007-2013. According to the press releases made by the chief of European Commission in Romania, Angela Filote, these facts can only be avoided if "the thicket of bureaucracy regarding the access procedures for the European funding" disappears and also, if "a change of the play rules while playing" emerges, things which were asked for by many of those who tried to access European funds.

The economic environment has an important impact upon the factors which develop on the dairy products market because it is in close connection with the purchasing power of the consummers. It is true that the market of agrifood products is not a flexible one but, when it comes to higher amounts of income, the clients will go for the products of superior quality and show an increasing interest in the goods purchased and consummed.

To present the actual state and the evolution of the economic indicatives that characterize the economic status of the region we have come up with the following indicatives: gross domestic income (GDI), gross domestic income per inhabitant, gross value added.

Table 1

The evolution of regional GDP, compared to the national GDP

Indicator	2005	2006	2007	2008	2009	2010	2011
Ro GDP, mln	288 954.6	344 654.6	416 006.8	514 700	501 139.4	523 693.3	557 348.2
Real GDP growth rate Ro	4.1%	7.9%	6%	7.1%	–7.1%	–1.3%	2.2%
Reg GDP, mln lei	33 265.8	38 429.9	45 990.1	55 021.9	54 408.4	55 669	57 082.7
Real GDP growth rate reg	0.73%	4.51%	5.1%	3.57%	–5.64%	–3.3%	–1.53%

Source: National Regional Accounts 2006–2012, INS, BNR.

As it is noticed in Table 1, the total growth rate of GDP (gross domestic product) between 2005 and 2011 was positive but had a value under the one recorded at national level. Also, the absolute value of the regional GDP has increased over 70% following the national trend.

This state of facts can only be explained by 2 factors: a work productivity at an inferior level compared to the one recorded at national level and a higher ponderance of the population working in agricultural sector as compared to the national ponderance.

The reticence towards the association concept (F4).

The economic development at regional level has occurred as a consequence of a few favourable circumstances that resulted in an increase of investments and exports.

The social environment is defined by the medium age, life style, cultural and educational level of the population under study. The particularity of the social environment is the one that can provide actual data regarding the system evolution as well as the future directions of its development. In the following table we can notice the evolution of population for 2005–2013.

Table 2

Population growth rate (%)

	2005	**2006/ 2005**	**2007/ 2006**	**2008/ 2007**	**2009/ 2008**	**2010/ 2009**	**2011/ 2010**	**2012/ 2011**	**2013/ 2012**
Romania	**21 623 849**	**–0.18**	**–0.21**	**–0.15**	**–0.16**	**–0.18**	**–0.35**	**–0.17**	**–0.23**
Urban	11 879 897	0.28	–0.30	–0.35	–0.09	–0.20	0.60	–0.41	–0.11
Rural	9 743 952	–0.75	–0.10	0.09	–0.23	–0.14	–0.05	0.10	–0.37
North East Region	**3 734 546**	**–0.05**	**–0.15**	**–0.20**	**–0.13**	**–0.17**	**–0.31**	**0.09**	**0.16**
Urban	1 620 437	0.54	–0.65	–0.63	–0.20	–0.36	–0.74	0.30	0.46
Rural	2 114 109	–0.50	0.22	0.12	–0.08	–0.02	0	–0.07	–0.07

Source: Romanian Statistical Yearbook, INS.

At a national level we can see a continuous decline of the total population. Except for 2006 when it was recorded an increase of the inhabitants' number at urban level, greatly due to the transformation of some communes into towns, on the whole, there is a downward trend related to the urban population. If we compare all these to the North-East region, the same downward trend is visible until 2012, when it is recorded a slight increase as a result of the coming back of some Romanian citizens who had worked and lived in other EU member states.

A major issue that challenges the well-being of the North-East region is the high unemployment rate which emerged as a problem once the market economy was adopted. This state of facts is caused by the lack of capital for investments, practically, born from the desperate attempt to increase the work

productivity by gradually laying off the personnel. In 2013 the monthly income of a household in the North-East region was in amount of 2303,47 lei, which means 2.5 times less than the one recorded by a household from Bucureşti Ilfov region. (www.insse.ro).

The low level degree of modernization of the road and railway network (F5) derives from the data provided by the National Institute of Statistics. So, 81% of the roads from the North-East region are represented by county and communal roads and their degree of modernization is of 16% only. Nevertheless, there are major differences registered regarding the level of modernization among counties, such as 3% in Neamț and up to 34% in Suceava (www.insse.ro)

This state of facts is also reflected by the alarming rise of the car accidents (+ 222%) during 2007–2011 in counties crossed by the road corridors. The only strong feature is represented by the modernized European highway E85, which crosses the region.

The lack of qualified work force (F6): As we can notice in Table 3, the graduates of agricultural, mountain agriculture and veterinary highschools of 1990 represented 23.5% of the total of highschool graduates, while in 2012 they represented merely 0.6%.

Table 3

Graduates of high schools in the North East

Training levels	1990	2000	2005	2006	2007	2008	2009	2010	2011	2012
Agricultural High Schools	20 190	835	310	274	289	349	291	429	283	330
Agro-mountain High Schools	–	82	62	44	53	23	–	–	–	19
Veterinary High Schools	–	190	200	87	24	49	194	127	194	116
TOTAL graduates	85 764	85 764	86 626	92 278	99 136	94 155	87 375	83 562	71 908	71 693

Source: Romanian Statistical Yearbook, INS.

The demographic decline and aging of the population mainly in the rural environment (F7) is relevant due to the ponderance analysis held by the following age categories: 0–14 years old, 15–64 years old and over 65 years old. From 2003 until present days the North-East region has annually registered negative values of the population growth. The migration process recorded (from urban to the rural) although positive, could not compensate for the decline of the rural population.

The technological environment is the one which leaves its hall-mark directly upon the activities of the farm, gathering the science of management, conducting and improving all the production factors. The management of the milk cow farms in the North-East region is mainly achieved in an intensive or semi-intensive system.

The lack of investments in new technologies (F8) has a negative effect reflected in achieving a low productivity that is felt as a severe disability in a competitive market.

Rising the anthropic pressure upon the environment and bio-diversity (F9) has already begun to show its side effects. The pressures exercised have a various character: the irrational usage of pesticides and chemical fertilizers, agricultural works made improperly, the deficient management of waste, etc., reasons for which the zootechnical farms can represent significant sources of pollution if they neglect this risk factor.

The analysis of uncertainty by using Fuzzy numbers

Many decisions reached by farmers in the management of the farm do not have a scientific substantiation based on actual facts. In most cases they are based on past experiences and on the spot convictions. If you were to interview farmers about the decision process and basis, they would use phrases of the sort: "My experience tells me that I am most probably right in this matter". The problem surfaces when we have to allocate a probability percentage to this type of statement.

In order to avoid this state of uncertainty we have done, by triangular fuzzy numbers, a classification of the risk factors determined through PEST analysis.

We have practically made and applied a questionary for getting actual data about the risk level which each and every factor could generate. The questionary has been applied to the farm management under the current study and also to the members of two specialist groups (scientific researchers of "Gheorghe Zane" Institute and USAMV Iasi), which have graded each risk factor. They gave grades between 0 and 10 each risk factor; 0 assuming risk with minimal impact and 10 the maximum impact.

The medium values of the grades obtained as a result of the application of the questionaries on the 3 experts' groups are shown in the **Table 4**: *The Initial Model (the matrix of the grades)*, where we have marked by F the risk factors and by E the zootechnical exploitations studied.

In the table, opposite each risk factor are passed vertically three components that form the triangular fuzzy numbers that average mark and center of gravity.

In order to calculate the center of gravity (real number associated), I used the following formula: $a_G = \ < \tilde{a} > \ = \frac{a_1 + 2a_2 + a_3}{4}$, thus obtaining the following results:

$$\frac{5+2\cdot 6+8}{4} = \frac{25}{4} = 6,25\,; \quad \frac{5+2\cdot 5+6}{4} = \frac{21}{4} = 5,25\,;$$

$$\frac{8+2\cdot 8+10}{4} = \frac{34}{4} = 8,5 \quad \ldots \quad \frac{4+2\cdot 5+6}{4} = \frac{20}{4} = 5$$

Table 4

The initial model (matrix of notes)

	Weight	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
E1	150	5	5	8	4	4	6	3	**1**	3	2
	0	6	5	8	8	6	7	6	2	4	4
	0	8	6	**10**	**10**	7	9	8	5	7	7
	0	*6.25*	*5.25*	*8.5*	*7.5*	*5.75*	*7.25*	*5.75*	*2.5*	*4.5*	*4.25*
E2	90	6	5	3	5	5	7	**2**	3	3	3
	0	6	5	6	8	8	7	4	7	5	5
	0	8	7	7	9	**10**	8	7	8	6	7
	0	*6.5*	*5.5*	*5.5*	*7.5*	*7.75*	*7.25*	*4.25*	*6.25*	*4.75*	*5*
E3	100	7	4	4	3	7	5	5	4	4	**2**
	0	7	5	5	8	7	6	7	6	5	4
	0	9	6	7	**10**	9	7	8	7	5	8
	0	*7.5*	*5*	*5.25*	*7.25*	*7.5*	*6*	*6.75*	*5.75*	*4.75*	*4.5*
E4	70	6	3	2	**1**	5	4	4	2	4	4
	0	7	4	5	9	7	5	6	5	5	6
	0	7	5	7	**9**	8	7	8	6	5	8
	0	*6.75*	*4*	*4.75*	*7*	*6.75*	*5.25*	*6*	*4.5*	*4.75*	*6*
E5	208	8	5	7	5	6	2	3	**1**	2	2
	0	8	5	7	8	8	5	5	3	4	4
	0	**10**	7	9	**10**	9	7	7	5	6	6
	0	*8.5*	*5.5*	*7.5*	*7.75*	*7.75*	*4.75*	*5*	*3*	*4*	*4*
E6	72	6	4	4	**1**	6	2	5	5	4	5
	0	8	4	7	7	7	5	6	6	6	5
	0	**9**	5	8	8	**9**	7	**9**	6	7	8
	0	*7.75*	*4.25*	*6.5*	*5.75*	*7.25*	*4.75*	*6.5*	*5.75*	*5.75*	*5.75*
E7	30	4	**3**	4	**3**	5	**3**	**3**	5	**3**	**3**
	0	6	5	4	8	6	6	4	5	3	5
	0	6	6	7	**8**	**8**	**8**	6	7	7	5
	0	*5.5*	*4.75*	*4.75*	*6.75*	*6.25*	*5.75*	*4.25*	*5.5*	*4*	*4.5*
E8	20	2	3	4	**1**	6	5	4	4	2	3
	0	5	4	6	9	7	7	7	7	4	5
	0	7	5	6	**10**	9	9	8	7	5	7
	0	*4.75*	*4*	*5.5*	*7.25*	*7.25*	*7*	*6.5*	*6.25*	*3.75*	*5*
E9	160	6	4	6	6	5	4	4	**1**	3	4
	0	8	5	7	7	7	5	5	3	5	5
	0	**9**	6	**9**	**9**	8	8	7	6	6	6
	0	*7.75*	*5*	*7.25*	*7.25*	*6.75*	*5.5*	*5.25*	*3.25*	*4.75*	*5*
E1-	45	5	4	5	**2**	7	5	3	**2**	**2**	6
	0	7	4	6	8	8	7	4	6	4	6
	0	7	6	6	**9**	**9**	**9**	7	7	6	7
	0	*6.5*	*4.5*	*5.75*	*6.75*	*8*	*7*	*4.5*	*5.25*	*4*	*6.25*
E11	101	7	5	5	**2**	6	3	4	3	**2**	3
	0	8	5	7	7	8	4	5	6	4	4
	0	8	5	**9**	**9**	8	8	8	6	6	6
	0	*7.75*	*5*	*7*	*6.25*	*7.5*	*4.75*	*5.5*	*5.25*	*4*	*4.25*

Table 4 (continued)

	Weight	**V1**	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**	**V9**	**V10**
E12	30	5	3	2	**1**	4	6	5	3	**1**	4
	0	6	5	5	9	6	6	7	5	4	5
	0	8	5	8	**10**	7	8	7	8	6	6
	0	*6.25*	*4.5*	*5*	*7.25*	*5.75*	*6.5*	*6.5*	*5.25*	*3.75*	*5*

Once accomplished matrix of triangular fuzzy numbers to their ordering we went through three methods: global unity, metooda maxi-max and Wald method.

a) Global utility method

In order to use this method must be done to normalize the operation of the lines, by interpolating the unit interval [0,1], thus resulting matrix of unit $(u_{ij})_{\substack{i=\overline{1,m}\\ j=\overline{1,n}}}$.

This shall be done simultaneously on all 12 ∗ 3 = 36 components (real) of each line using the following formula:

$$u_{ij} = \frac{N_i^{\max} - N_{ij}}{N_i^{\max} - N_i^{\min}} \ ,(\forall) i = \overline{1,m} \ , \qquad \text{where:} \qquad N_i^{\max} = \max_{1\le j\le n} \mathrm{N_{ij}} \ \text{ and } \ N_i^{\min} = \min_{1\le j\le n} \mathrm{N_{ij}}$$

The application of relationship is as follows:

$$N_1^{\min} = \min(5;6;8;5;5;6;8;8;10;4;8;10;4;6;7;6;7;9;3;6,8;1;2;5;3;4;7;2;4;7) = 1$$

$$N_1^{\max} = \max(5;6;8;5;5;6;8;8;10;4;8;10;4;6;7;6;7;9;3;6,8;1;2;5;3;4;7;2;4;7) = 10$$

In the table each line 2 extreme elements are bold.

$$N_{1x} \to \frac{N_1^{\max} - N_{1x}}{N_1^{\max} - N_1^{\min}} = \frac{10 - N_{1x}}{10 - 1} = \frac{10 - N_{1x}}{9}$$

$$5 \to \frac{10-5}{9} = \frac{5}{9} \approx 0.556 \ ; \qquad 6 \to \frac{10-6}{9} = \frac{4}{9} \approx 0.444 \ ;$$

$$8 \to \frac{10-8}{9} = \frac{2}{9} \approx 0.222 \qquad \tilde{u}_{11} = (0,\ 222;\ 0{,}444;\ 0.556)_{0{,}417} \ .$$

The positions of the three components were sorted in ascending order, all other utilities were similarly calculations.

Table 5

The matrix of utilities

	Weight	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**	**F10**
E1	0.139	0.222	0.444	0	0	0.333	0.111	0.222	0.556	0.333	0.333
	0	0.444	0.556	0.222	0.222	0.444	0.333	0.444	0.889	0.667	0.667
	0	0.556	0.556	0.222	0.667	0.667	0.444	0.778	1	0.778	0.889
	0	0.417	0.528	0.167	0.278	0.472	0.305	0.472	0.834	0.611	0.639

Table 5 (continued)

	Weight	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
E2	0.084	0.25	0.375	0.375	0.125	0	0.25	0.375	0.25	0.5	0.375
	0	0.5	0.625	0.5	0.25	0.25	0.375	0.75	0.375	0.625	0.625
	0	0.5	0.625	0.875	0.625	0.625	0.375	1	0.875	0.875	0.875
	0	0.438	0.563	0.563	0.313	0.281	0.344	0.719	0.469	0.656	0.625
E3	0.093	0.125	0.5	0.375	0	0.125	0.375	0.25	0.375	0.625	0.25
	0	0.375	0.625	0.625	0.25	0.375	0.5	0.375	0.5	0.625	0.75
	0	0.375	0.75	0.75	0.875	0.375	0.625	0.625	0.75	0.75	1
	0	0.313	0.625	0.594	0.344	0.313	0.5	0.406	0.531	0.656	0.688
E4	0.065	0.25	0.5	0.25	0	0.125	0.25	0.125	0.375	0.5	0.125
	0	0.25	0.625	0.5	0	0.25	0.5	0.375	0.5	0.5	0.375
	0	0.375	0.75	0.875	1	0.5	0.625	0.625	0.875	0.625	0.625
	0	0.281	0.625	0.531	0.25	0.281	0.469	0.375	0.563	0.531	0.375
E5	0.193	0	0.333	0.111	0	0.111	0.333	0.333	0.556	0.444	0.444
	0	0.222	0.556	0.333	0.222	0.222	0.556	0.556	0.778	0.667	0.667
	0	0.222	0.556	0.333	0.556	0.444	0.889	0.778	1	0.889	0.889
	0	0.167	0.5	0.278	0.25	0.25	0.584	0.556	0.778	0.667	0.667
E6	0.067	0	0.5	0.125	0.125	0	0.25	0	0.375	0.25	0.125
	0	0.125	0.625	0.25	0.25	0.25	0.5	0.375	0.375	0.375	0.5
	0	0.375	0.625	0.625	1	0.375	0.875	0.5	0.5	0.625	0.5
	0	0.156	0.594	0.313	0.406	0.219	0.531	0.313	0.406	0.406	0.406
E7	0.028	0.4	0.4	0.2	0	0	0	0.4	0.2	0.2	0.6
	0	0.4	0.6	0.8	0	0.4	0.4	0.8	0.6	1	0.6
	0	0.8	1	0.8	1	0.6	1	1	0.6	1	1
	0	0.5	0.65	0.65	0.25	0.35	0.45	0.75	0.5	0.8	0.7
E8	0.019	0.333	0.556	0.444	0	0.111	0.111	0.222	0.333	0.556	0.333
	0	0.556	0.667	0.444	0.111	0.333	0.333	0.333	0.333	0.667	0.556
	0	0.889	0.778	0.667	1	0.444	0.556	0.667	0.667	0.889	0.778
	0	0.584	0.667	0.5	0.306	0.305	0.333	0.389	0.417	0.695	0.556
E9	0.149	0	0.375	0	0	0.125	0.125	0.25	0.375	0.375	0.375
	0	0.125	0.5	0.25	0.25	0.25	0.5	0.5	0.75	0.5	0.5
	0	0.375	0.625	0.375	0.375	0.5	0.625	0.625	1	0.75	0.625
	0	0.156	0.5	0.219	0.219	0.281	0.438	0.469	0.719	0.531	0.5
E1-	0.042	0.286	0.429	0.429	0	0	0	0.286	0.286	0.429	0.286
	0	0.286	0.714	0.429	0.143	0.143	0.286	0.714	0.429	0.714	0.429
	0	0.571	0.714	0.571	1	0.286	0.571	0.857	1	1	0.429
	0	0.357	0.643	0.465	0.322	0.143	0.286	0.643	0.536	0.714	0.393
E11	0.094	0.143	0.571	0	0	0.143	0.143	0.143	0.429	0.429	0.429
	0	0.143	0.571	0.286	0.286	0.143	0.714	0.571	0.429	0.714	0.714
	0	0.286	0.571	0.571	1	0.429	0.857	0.714	0.857	1	0.857
	0	0.179	0.571	0.286	0.393	0.215	0.607	0.5	0.536	0.714	0.679
E12	0.028	0.222	0.556	0.222	0	0.333	0.222	0.333	0.222	0.444	0.444
	0	0.444	0.556	0.556	0.111	0.444	0.444	0.333	0.556	0.667	0.556
	0	0.556	0.778	0.889	1	0.667	0.444	0.556	0.778	1	0.667
	0	0.417	0.612	0.556	0.306	0.472	0.389	0.389	0.528	0.695	0.556

Weighted utilities are obtained by multiplying the estimated weight depending on farm size (milk cows heads).

Table 6

Fuzzy values of specific indicators for global unity method

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
$\tilde{U}_j$	0.128	0.434	0.149	0.018	0.13	0.208	0.243	0.416	0.424	0.345
	0.283	0.581	0.373	0.21	0.279	0.478	0.511	0.618	0.62	0.603
	0.409	0.639	0.53	0.732	0.494	0.67	0.726	0.887	0.827	0.788
	0.276	*0.559*	*0.356*	*0.293*	*0.296*	*0.459*	*0.498*	*0.635*	*0.623*	*0.585*

Table 7

Fuzzy matrix of weighted utilities

	Weight	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
E1	0.139	0.031	0.062	0	0	0.046	0.015	0.031	0.078	0.046	0.046
	0	0.062	0.078	0.031	0.031	0.062	0.046	0.062	0.124	0.093	0.093
	0	0.078	0.078	0.031	0.093	0.093	0.062	0.108	0.139	0.108	0.124
	0	0.058	0.074	0.023	0.039	0.066	0.042	0.066	0.116	0.085	0.089
E2	0.084	0.021	0.031	0.031	0.01	0	0.021	0.031	0.021	0.042	0.031
	0	0.042	0.052	0.042	0.021	0.021	0.031	0.063	0.031	0.052	0.052
	0	0.042	0.052	0.073	0.052	0.052	0.031	0.084	0.073	0.073	0.073
	0	0.037	0.047	0.047	0.026	0.024	0.029	0.06	0.039	0.055	0.052
E3	0.093	0.012	0.046	0.035	0	0.012	0.035	0.023	0.035	0.058	0.023
	0	0.035	0.058	0.058	0.023	0.035	0.046	0.035	0.046	0.058	0.07
	0	0.035	0.07	0.07	0.081	0.035	0.058	0.058	0.07	0.07	0.093
	0	0.029	0.058	0.055	0.032	0.029	0.046	0.038	0.049	0.061	0.064
E4	0.065	0.016	0.033	0.016	0	0.008	0.016	0.008	0.024	0.033	0.008
	0	0.016	0.041	0.033	0	0.016	0.033	0.024	0.033	0.033	0.024
	0	0.024	0.049	0.057	0.065	0.033	0.041	0.041	0.057	0.041	0.041
	0	0.018	0.041	0.035	0.016	0.018	0.031	0.024	0.037	0.035	0.024
E5	0.193	0	0.064	0.021	0	0.021	0.064	0.064	0.107	0.086	0.086
	0	0.043	0.107	0.064	0.043	0.043	0.107	0.107	0.15	0.129	0.129
	0	0.043	0.107	0.064	0.107	0.086	0.172	0.15	0.193	0.172	0.172
	0	0.032	0.096	0.053	0.048	0.048	0.113	0.107	0.15	0.129	0.129
E6	0.067	0	0.033	0.008	0.008	0	0.017	0	0.025	0.017	0.008
	0	0.008	0.042	0.017	0.017	0.017	0.033	0.025	0.025	0.025	0.033
	0	0.025	0.042	0.042	0.067	0.025	0.059	0.033	0.033	0.042	0.033
	0	0.01	0.04	0.021	0.027	0.015	0.036	0.021	0.027	0.027	0.027
E7	0.028	0.011	0.011	0.006	0	0	0	0.011	0.006	0.006	0.017
	0	0.011	0.017	0.022	0	0.011	0.011	0.022	0.017	0.028	0.017
	0	0.022	0.028	0.022	0.028	0.017	0.028	0.028	0.017	0.028	0.028
	0	0.014	0.018	0.018	0.007	0.01	0.013	0.021	0.014	0.023	0.02
E8	0.019	0.006	0.01	0.008	0	0.002	0.002	0.004	0.006	0.01	0.006
	0	0.01	0.012	0.008	0.002	0.006	0.006	0.006	0.006	0.012	0.01
	0	0.017	0.014	0.012	0.019	0.008	0.01	0.012	0.012	0.017	0.014
	0	0.011	0.012	0.009	0.006	0.006	0.006	0.007	0.008	0.013	0.01

Table 7 (continued)

	Weight	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
E9	0.149	0	0.056	0	0	0.019	0.019	0.037	0.056	0.056	0.056
	0	0.019	0.074	0.037	0.037	0.037	0.074	0.074	0.112	0.074	0.074
	0	0.056	0.093	0.056	0.056	0.074	0.093	0.093	0.149	0.112	0.093
	0	0.024	0.074	0.033	0.033	0.042	0.065	0.07	0.107	0.079	0.074
E10	0.042	0.012	0.018	0.018	0	0	0	0.012	0.012	0.018	0.012
	0	0.012	0.03	0.018	0.006	0.006	0.012	0.03	0.018	0.03	0.018
	0	0.024	0.03	0.024	0.042	0.012	0.024	0.036	0.042	0.042	0.018
	0	0.015	0.027	0.02	0.014	0.006	0.012	0.027	0.023	0.03	0.017
E11	0.094	0.013	0.054	0	0	0.013	0.013	0.013	0.04	0.04	0.04
	0	0.013	0.054	0.027	0.027	0.013	0.067	0.054	0.04	0.067	0.067
	0	0.027	0.054	0.054	0.094	0.04	0.08	0.067	0.08	0.094	0.08
	0	0.017	0.054	0.027	0.037	0.02	0.057	0.047	0.05	0.067	0.064
E12	0.028	0.006	0.016	0.006	0	0.009	0.006	0.009	0.006	0.012	0.012
	0	0.012	0.016	0.016	0.003	0.012	0.012	0.009	0.016	0.019	0.016
	0	0.016	0.022	0.025	0.028	0.019	0.012	0.016	0.022	0.028	0.019
	0	0.012	0.018	0.016	0.009	0.013	0.011	0.011	0.015	0.02	0.016

b) Method Maxi-Max

Specific indicators Maxi-Max method is calculated by the following formula: $\max\limits_{1\le i\le \mathrm{m}} u_{ij}$

M_j indicator Max Maxi-specific method is obtained by choosing the largest utilities column.

Fuzzy numbers will be chosen with maximum levels on columns Table 7, using their weight compared centers:

$$\tilde{M}_1 = \max_{1\le i\le 12} \tilde{u}_{i1} = \max(\tilde{u}_{11},\tilde{u}_{21},\tilde{u}_{31},\tilde{u}_{41},\tilde{u}_{51},\tilde{u}_{61},\tilde{u}_{71},\tilde{u}_{81},\tilde{u}_{91},\tilde{u}_{101},\tilde{u}_{111},\tilde{u}_{121}) =$$

$$= \tilde{u}_{11} = (0.031,\ 0.062,\ 0.078)_{0.058}$$

.....

$$\tilde{M}_{10} = \max_{1\le i\le 12} \tilde{u}_{i12} = \max(\tilde{u}_{110},\tilde{u}_{210},\tilde{u}_{310},\tilde{u}_{410},\tilde{u}_{510},\tilde{u}_{610},\tilde{u}_{710},\tilde{u}_{810},\tilde{u}_{910},\tilde{u}_{1010},\tilde{u}_{1110},\tilde{u}_{1210}) =$$

$$= \tilde{u}_{510} = (0.086,\ 0.129,\ 0.172)_{0.129}$$

Table 8

The values of specific indicators fuzzy ranking method maxi-max

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
$\tilde{M}_j$	0.031	0.064	0.035	0	0.046	0.064	0.064	0.107	0.086	0.086
	0.062	0.107	0.058	0.043	0.062	0.107	0.107	0.15	0.129	0.129
	0.078	0.107	0.07	0.107	0.093	0.172	0.15	0.193	0.172	0.172
	0.058	*0.096*	*0.055*	*0.048*	*0.066*	*0.113*	*0.107*	*0.15*	*0.129*	*0.129*

Centralization of the 12 fuzzy numbers are found in, where we can observe the following hierarchy of risk factors:

0.150 > 0.129 = 0.129 > 0.113 > 0.107 > 0.096 > 0.066 > 0.058 > 0.055 > 0.048

F8 > F9 > F10 > F6 > F7 > F2 > F5 > F1 > F3 > F4

The maxi-max method risk factor with minimal impact on the holding by F4 and with the highest risk factor is represented by F8.

c) Method Wald

The indicator is calculated Wald specific method through formula: $\min_{1 \le i \le m} u_{ij}$

W_j indicator Wald's specific method is obtained by choosing the smallest utilities column.

Minimum fuzzy numbers are either choose the columns comparing Table 6 centers of gravity:

$$\tilde{W}_1 = \min_{1 \le i \le 10} \tilde{u}_{i1} = \min(\tilde{u}_{11}, \tilde{u}_{21}, \tilde{u}_{31}, \tilde{u}_{41}, \tilde{u}_{51}, \tilde{u}_{61}, \tilde{u}_{71}, \tilde{u}_{81}, \tilde{u}_{91}, \tilde{u}_{101}, \tilde{u}_{111}, \tilde{u}_{121}) =$$

$$= \tilde{u}_{61} = (0,\ 0.008,\ 0.025)_{0.01}$$

.....

$$\tilde{W}_{10} = \min_{1 \le i \le 10} \tilde{u}_{i12} = \min(\tilde{u}_{110}, \tilde{u}_{210}, \tilde{u}_{310}, \tilde{u}_{410}, \tilde{u}_{510}, \tilde{u}_{610}, \tilde{u}_{710}, \tilde{u}_{810}, \tilde{u}_{910}, \tilde{u}_{1010}, \tilde{u}_{1110}, \tilde{u}_{1210}) =$$

$$= \tilde{u}_{810} = (0.006,\ 0.01,\ 0.014)_{0.01}.$$

Table 9

The values of specific indicators fuzzy ranking method Wald

	F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**	**F10**
$\tilde{W}_j$	0	0.01	0.008	0	0.002	0.002	0.004	0.006	0.01	0.006
	0.008	0.012	0.008	0.002	0.006	0.006	0.006	0.006	0.012	0.01
	0.025	0.014	0.012	0.019	0.008	0.01	0.012	0.012	0.017	0.014
	0.01	*0.012*	*0.009*	*0.006*	*0.006*	*0.006*	*0.007*	*0.008*	*0.013*	*0.01*

By ordering descending indicator values give the following hierarchy of risk factors:

0.013 > 0.012 > 0.010 > 0.010 > 0.009 > 0.008 > 0.007 > 0.006 > 0.006 > 0.006

F9 > F2 > F10 > F1 > F3 > F8 > F7 > F6 > F5 > F4

The interpretation given by Wald's method shows that factor F4 it has the lowest risk and factor F9 has the highest risk.

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